RK11/05F/J

RK11 BASIC LOGIC TEST 1

MD-11-DZRKJ-E

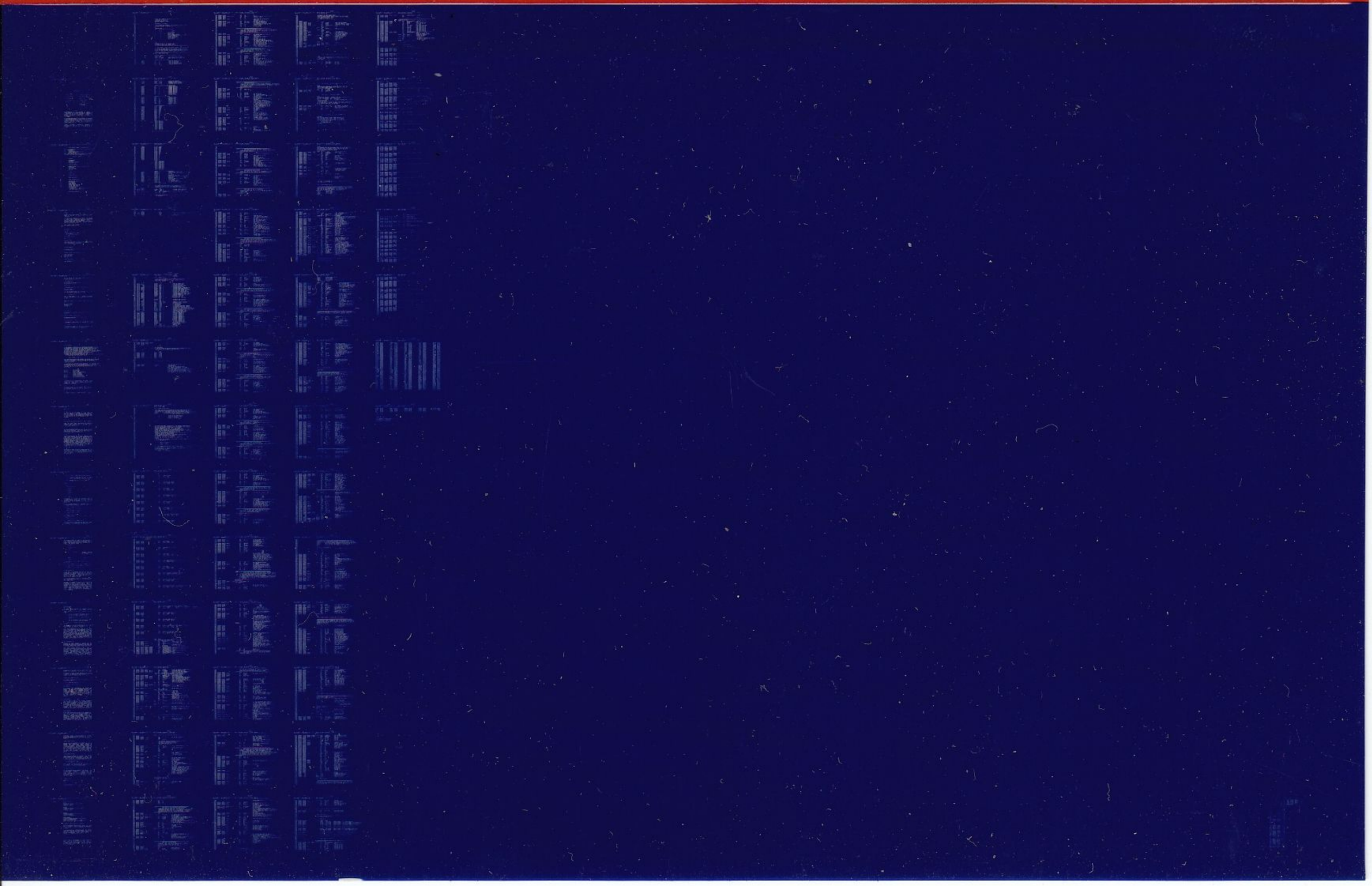
EP-DZRKJ-E-DL-A

FICHE 1 OF 1

AUG 1977

digital

MADE IN USA



[illegible]	00010000	770712	PDP10 411	HDR1DZRK.JESEQ	00010000	770712

IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DZRKJ-E-D
PRODUCT NAME:	RK11 BASIC LOGIC TEST I
DATE CREATED:	APRIL, 1977
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	JIM KAPADIA
REVISED BY:	PERVEZ ZAKI TOM SAWYER CHUCK HESS

QUICK LOOK-UP OPERATING INSTRUCTIONS

FOR A QUICK REFERENCE, LOOK UP THE FOLLOWING SECTIONS:
1.0 ABSTRACT
2.0 REQUIREMENTS
4.1 LOADING AND OPERATOR ACTION
5.0 SWITCH OPTIONS
FOR A MORE COMPLETE EXPLANATION REFER TO THE TABLE OF CONTENTS BELOW AND THE FOLLOWING DOCUMENT.

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1.0 ABSTRACT

THE RK11 LOGIC TESTS CONSIST OF A SERIES OF TESTS AIMED AT CHECKING THE BASIC LOGIC OF THE RK11 CONTROLLER.

THE LOGIC TESTS CONSISTS OF TWO PARTS. THIS PROGRAM IS PART-I AND IT CHECKS ONLY THE DRIVE-INDEPENDENT LOGIC OF THE RK11 CONTROLLER (SEE SEC. 9-0). IT SHOULD BE NOTED THAT LOGIC TEST-I AND LOGIC TEST-II TOGETHER CONSTITUTE A COMPLETE PROGRAM AND HENCE BOTH OF THEM SHOULD BE RUN.

USED CORRECTLY THIS PROGRAM CAN BE AN EFFECTIVE ANALYTIC AND DIAGNOSTIC TOOL.

2.0 REQUIREMENTS

2.1 EQUIPMENT

A. PDP11 WITH CONSOLE TELETYPE.
B. 8K OF MEMORY
C. RK11 OR RKV11 CONTROLLER

2.2 PRELIMINARY PROGRAMS

NONE

2.3 EXECUTION TIME

ERROR FREE FIRST PASS ON PDP11/20 WITH CORE MEMORY TAKES APPROXIMATELY ONE MINUTE. CONSIDERABLY LESS FOR FASTER MACHINES OR MEMORIES.

3.0 STARTING ADDRESS

200 FOR ANY MODE OF OPERATION. NORMAL START UP WITH ALL SWITCHES DOWN.

4.0 PROGRAM CONTROL MODES & OPERATOR ACTION

PAPER TAPE LOADING
RKDP DUMP MODE
RKDP CHAIN MODE
ACT11

4.1 PAPER TAPE LOADING

4.1.1 LOAD PROGRAM INTO MEMORY USING STANDARD PROCEDURE FOR .ABS TAPES.

4.1.2 PUT THE DRIVES ON 'WRT PROT' AND 'LOAD' AS A PRECAUTION AGAINST MALFUNCTIONING.

4.1.3 LOAD ADDRESS 200

4.1.4 SET SWITCHES IF DESIRED (SEE SEC 5.0 IF TESTING ON SIMULATOR PUT SW 10 UP.

PRESS START.

4.1.5 THE PROGRAM IDENTIFIES ITSELF (NAME,MAINDEC NO).

```
RK11 LOGIC TEST I
MAINDEC-11-DZRKJ-E
```

4.1.6 THEN THE PROGRAM PROCEEDS WITH TESTING. AT THE END OF A PASS THE FOLLOWING TYPE-OUT OCCURS

```
        END PASS # X
```

WHERE X= PASS NUMBER (1,2,3---), CONTROL IS PASSED TO THE BEGINNING OF THE PROGRAM AND RE-EXECUTION BEGINS.

4.1.7 ERROR FREE PASSES OF THE PROGRAM APPEAR AS SHOWN BELOW.

```
RK11 LOGIC TEST I
MAINDEC-11-DZRKJ-E
END PASS # 1
END PASS # 2
...
...
```

4.2 RKDP DUMP MODE

4.2.1 THE PROGRAM IS LOADED INTO THE MEMORY BY THE RKDP MONITOR

4.2.2 START AS NORMALLY USING SA 200

4.2.3 THE PROGRAM IDENTIFIES ITSELF (NAME,MAINDEC NO.) AND PROCEEDS WITH TESTING.

4.3 RKDP CHAIN MODE

THE PROGRAM IS CHAIN-LOADED FROM THE RKDP PACK. AFTER THE PROGRAM IDENTIFIES ITSELF, IT PROCEEDS WITH TESTING.

4.4 ACT11 MODE

THE PROGRAM IS LOADED BY THE ACT11 MONITOR. ON STARTING, IT PROCEEDS WITH THE EXECUTION OF THE TESTS AS BEFORE, BUT THE TITLE IS NOT TYPED OUT.

5.0 SWITCH OPTIONS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR (I.E. AN 11/34) THE PROGRAM WILL DETERMINE THAT THE HARDWARE SWITCH REGISTER IS NOT PRESENT AND WILL USE A 'SOFTWARE' SWITCH REGISTER. THE 'SOFTWARE' SWITCH REGISTER IS LOCATED AT LOCATION 176 (8). THE SETTINGS OF THE 'SOFTWARE' SWITCHES ARE CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALLED BY TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE THE 'CONTROL G' WHENEVER THE PROGRAM ENTERS THE SCOPE ROUTINE OR BEGINS A NEW TEST. THE 'SOFTWARE' SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN RESPONSE TO THE PROMPT FROM THE SWITCH ENTRY ROUTINE:

'SWR = NNNNNN NEW ='

EACH TIME SWITCH SETTING ARE ENTERED, THE ENTIRE SWITCH REGISTER IMAGE MUST BE ENTERED. LEADING ZEROS ARE NOT REQUIRED. 'RUBOUT' AND 'CONTROL U' FUNCTIONS MAY BE USED TO CORRECT TYPING ERRORS DURING SWITCH ENTRY.

ON PROCESSORS WITH HARDWARE SWITCH REGISTERS, THE 'SOFTWARE' SWITCH REGISTER MAY BE USED. IF THE PROGRAM FINDS ALL 16 SWITCHES IN THE 'UP' POSITION, ALL SWITCH REGISTER REFERENCES WILL BE TO THE 'SOFTWARE' REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

SW<15>=1	HALT ON ERROR
SW<14>=1	LOOP ON TEST
SW<13>=1	INHIBIT ERROR PRINTOUTS
SW<12>=1	CYCLE ON ERROR TO THE PREVIOUS 'SCOPE' STATEMENT
SW<11>=1	INHIBIT ITERATIONS
SW<10>=1	TESTING ON SIMULATOR
SW<09>=1	LOOP ON SPECIFIC ERROR
SW<08>=1	LOOP ON TEST AS PER SW<07:00>

5.1 SW<15>

THE PROGRAM HALTS ON ENCOUNTERING AN ERROR, AFTER TYPING OUT THE ERROR MESSAGE AND PERTINENT INFORMATION. PRESSING "CONTINUE" RESTORES NORMAL OPERATION OF THE PROGRAM.

5.2 SW<14>

THE PROGRAM LOOPS ON THE SUBTEST THAT IS BEING EXECUTED WHEN THE SWITCH IS PUT ON. THIS SWITCH IS USED NORMALLY ALONG WITH SW 15. SEE SEC 8.0.

5.3 SW <13>

THIS SWITCH INHIBITS ALL ERROR MESSAGES. NORMALLY USED WHEN LOOPING ON TEST (SW 14) OR LOOPING ON

ERROR (SW 9).

5.4 SW <12>

THIS SWITCH ALLOWS THE PORGRAM TO CYCLE FROM THE POINT OF ERROR TO THE PREVIOUS SCOPE STATEMENT. NOTE THAT IN DOING SO ANY INITIALIZATION BEING DONE AT THE BEGINING OF THE SUBTEST WILL BE DONE AGAIN AND AGAIN. SEE SEC 8.0 FOR DIFFERENT SCOPE LOOPS AVAILABLE.

5.5 SW <11>

EACH SUBTEST WILL BE EXECUTED ONLY ONCE. NORMALLY

AFTER THE FIRST PASS, EACH SUBTEST IS ITERATED A NUMBER OF TIMES (USUALLY 50, 5 IN SOME CASES). SETTING THIS SWITCH INHIBITS ITERATIONS, SO THAT QUICK PASSES CAN BE MADE.

5.6 SW <10>

THIS SWITCH WHEN SET INDICATES THAT TESTING IS BEING DONE ON A SIMULATOR. THE SWITCH SHOULD BE PUT UP BEFORE START- ING THE PROGRAM. NOTE THAT RK11C IS NOT COMPATIBLE WITH THE SIMULATOR.

5.7 SW <09>

THIS SWITCH PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP. NOTE THAT UNLIKE SW12 THE INITIALIZATION OF PARAMETERS AT THE BEGINNING OF THE SUBTEST MAY NOT BE DONE IN THIS CASE. THIS SWITCH IS HELPFUL WHEN A PARTICULAR PART OF A SUBTEST IS BEING REPEATED USING DIFFERENT PARAMETERS AND YOU WANT TO SCOPE ON THE PARAMETER IN ERROR. (EXAMPLE: RKDA IS BEING WRITTEN AND READ BACK WITH COUNT PATTERNS FROM 1 TO 177777. PATTERN 561 IS GIVING ERROR, YOU MIGHT NOT WANT TO GO THROUGH THE 560 PATTERNS BEFORE HITTING ERROR ON THE 561TH PATTERN. IN THIS CASE SW 9 WILL GIVE YOU A SCOPE LOOP ON THE 561TH PATTERN ONLY.)

5.8 SW <08>

THIS SWITCH IS USED TO SELECT A PARTICULAR TEST (AS PER SW<00-07>) FOR EXECUTION AND SUBSEQUENT LOOPING. THUS IF TEST 15 IS TO BE SELECTED THE SWITCH SETTING WOULD BE 000415. IT SHOULD BE NOTED THAT BEFORE SELECTING TEST 15, ALL THE PREVIOUS TESTS (1-14) WILL BE EXECUTED.

6.0 SCOPE LOOPS

THERE ARE THREE KINDS OF SCOPE LOOPS AVAILABLE

```
1.  SW14: LOOPING IS DONE FOR THE ENTIRE SUB-TEST

2.  SW12:  LOOPING IS DONE FROM THE POINT  OF  ERROR
           BACK TO THE PREVIOUS 'SCOPE' STATEMENT.

3.  SW09:  PROVIDE THE TIGHTEST POSSIBLE SCOPE  LOOP
           SEE SEC.  5.7

EXAMPLE:
TST1:   SCOPE
        :
        INITIALIZATION
        :
        ERROR 1
        :
        ERROR 2
        :
        ERROR 3
        :
        ERROR 4
        :
        :
TST2:   SCOPE
```

THE SEQUENCE OF LOOPING FOR DIFFERENT CASES IS EXPLAINED BELOW. NOTE THAT 'TST1' AND 'TST2' ARE TAGS WHICH DEFINE THE BOUNDARY OF A TEST, (IN THIS CASE TEST 1). TEST 1 STARTS AT 'TST1' AND ENDS JUST BEFORE 'TST2'.

IN THE ILLUSTRATION BELOW --> INDICATES THE POINT FROM WHERE RETURN IS MADE AND LOOPING IS DONE.

1. ERROR 2 OCCURS, SW 14 SET.

TST1..ERROR 2..TST2-->TST1..ERROR 2..TST2-->TST1...

2. ERROR 2 OCCURS, SW 12 SET.

TST1...ERROR 2-->TST1...ERROR2-->TST1...

3. ERROR 2,3; SW 14 SET.

TST1..ERROR 2..ERROR 3..TST2-->TST1..ERROR 2..ERROR 3..TST2-->TST1...

4. ERROR 2,3; SW 12 SET.

TST1...ERROR 2-->TST1...ERROR 2-->TST1....

NOTE THAT LOOPING IS DONE FROM THE VERY FIRST ERROR ENCOUNTERED. THE MORE BASIC AND ERROR THE EARLIER IT OCCURS AND IS DETECTED AND SHOULD BE FIXED.

IN THE ABOVE EXAMPLE NO PART OF THE SUB-TEST IS BEING REPEATED USING DIFFERENT PARAMETERS, HENCE IT SO HAP- PENS THAT SW 9 AND 12 GIVE THE SAME KIND OF LOOPS. THE EXAMPLE BELOW WILL DEMONSTRATE THE DIFFERENCE BETWEEN SW 9 AND 12.

```
TST1:   SCOPE
        :
        INITIALIZATION
        :
        ERROR 1

        :
        MOV     #1$,$LPERR      ;'$LPERR'   CONTAINS
                                ;THE ADDRESS TO LOOP
                                ;BACK ON ERROR- SW 9
        :
1$:     :                       ----
        :                       I
        ERROR 2                 I   N REPETITIONS
        :                       I
TST2:   SCOPE                   ----
```

1. SW 12 SET, ERROR 2 OCCURS DURING K.TH REPETITIONS

TST1..1,2...K.ERROR 2-->TST1..1,2...K.ERROR 2-->TST1..

2. SW 9 SET, ERROR 2 OCCURS DURING K.TH REPETITION

1$..K..ERROR 2-->1$..K..ERROR 2-->1$...

7.0 PROGRAM DESCRIPTION

IN THIS PART OF THE PROGRAM THAT PART OF THE RK11 CONTROLLER IS CHECKED WHICH DOES NOT DEPEND ON SIGNALS FROM THE DRIVE. THUS A DRIVE IS NOT NEEDED FOR THIS TEST, BUT IT SHOULD BE NOTED THAT THE PART-II OF THE 'BASIC LOGIC TESTS' MUST BE RUN, IN ORDER TO GET A COMPLETE COVERAGE.

THE TESTS ARE GRADUALLY BUILT UP, CHECKING THE MOST BASIC AND SIMPLE LOGIC FIRST AND THEN PROGRESSIVELY MORE COMPLEX LOGIC.

THE FIRST TEST CHECKS THAT ALL RK11 REGISTERS CAN BE REFERENCED WITHOUT TIMING OUT. THEN THE INITIALIZATION LOGIC OF RK11 IS CHECKED. THEN IT IS CHECKED THAT ALL REGISTERS CAN BE WRITTEN AND READ CORRECTLY, BY FLOATING A '1' AND THEN USING A COUNT PATTERN. THEN IT IS CHECKED THAT THE RK11 REGISTERS CAN BE CLEARED USING CONTROL RESET AND RESET (BUS INIT). FINALLY, THE WORD AND BYTE ADDRESSING LOGIC OF RK11 IS CHECKED TO SEE THAT EACH REGISTER IS UNIQUELY ADDRESSED.

8.0 ERROR REPORTING

THE ERROR TABLE STARTING AT $ERRTB CONTAINS INFORMATION PERTAINING TO EVERY ERROR THAT CAN OCCUR. EACH ITEM IN THE TABLE CONSISTS OF FOUR ENTRIES.

A. EM - THIS IS A POINTER TO THE ERROR MESSAGE TO BE TYPED OUT WHEN THE ERROR OCCURS.

B. DH - THIS IS A POINTER TO THE DATA HEADER TO BE TYPED OUT.

C. DT - THIS IS A POINTER TO THE DATA WHICH IS TO BE TYPED TYPED OUT UNDER THE HEADERS.

D. 0 - THIS IS A TERMINATOR SIGNIFYING THE END OF THE ITEM.

THE ERROR CALL IS AN EMT INSTRUCTION WITH ITS LOWER BYTE ENCODED TO INDICATE THE ERROR NUMBER. THUS "ERROR 1" WOULD BE (EMT+1) IE 104001.

EVERY ERROR CORRESPONDS TO AN ITEM IN THE ERROR TABLE. THUS "ERROR 14" WOULD CORRESPOND TO ITEM 14. AS FAR AS POSSIBLE, THE ERROR MESSAGES HAVE BEEN KEPT SHORT, BUT CLARITY IS NOT SACRIFICED FOR BREVITY. INSPITE OF THIS, IF THE USER FINDS A NEED, HE CAN LOOK UP THE ENTIRE ERROR MESSAGE IN THE ERROR ITEMS TABLE FOUND IN THE BEGINNING OF THE LISTINGS. THUS FOR "ERROR 14", "ITEM 14" IN THE ITEM TABLE CAN BE LOOKED UP. WHEN THE ERROR INSTRUCTION IS EXECUTED A TRAP OCCURS TO THE ERROR HANDLER LOCATED AT $ERROR WHICH PROCESSES THE ERROR CALL. SEE SEC 12.3

9.0 ERROR INTERPRETATION

WHENEVER AN ERROR MESSAGE IS PRINTED OUT, ALL REGISTERS AND OTHER DATA PERTAINING TO THE ERROR ARE ALSO GIVEN. RKDS, RKER...RKBA INDICATE THE CONTENTS OF THE CORRESPONDING REGISTERS AT THE TIME OF ERROR.

EVERY ERROR MESSAGE CONTAINS A PC. THIS PC INDICATES THE POSITION IN PROGRAM WHERE THE ERROR CALL IS LOCATED. THE ERROR MESSAGE, BECAUSE OF PRACTICAL CONSIDERATIONS IS MADE SHORT AND MEANINGFUL. THE USER IS ADVISED TO LOOK UP THE PC IN THE PROGRAM LISTING, WHERE HE WILL FIND MORE INFORMATION ABOUT THE ERROR. IN MANY INSTANCES, A SINGLE FAULT WILL GIVE RISE TO MORE THAN ONE ERROR REPORT. A LITTLE DELIBERATION AND CAREFUL

EXAMINATION OF THE DATA GIVEN WILL BE CERTAINLY VERY HELPFUL IN PINPOINTING THE FAULT. A BRIEF

EXPLANATION OF WHAT IS BEING CHECKED IN THE SUBTEST IS GIVEN AT THE BEGINNING OF EVERY SUBTEST. ALL THE NUMBERS GIVEN WITH ERPOR MESSAGES ARE IN OCTAL.

10.0 HANDLERS AND COMMON ROUTINES

THE COMMONLY USED ROUTINES USED IN THE PROGRAM ARE CALLED IN TWO WAYS.

A. AS A SUBROUTINE THROUGH 'JSR' CALL

B. THROUGH A 'TRAP' HANDLER

10.1 TRAP HANDLER

MANY COMMONLY USED ROUTINES IN THE PROGRAM ARE CALLED USING THE TRAP INSTRUCTION AND THE 'TRAP' HANDLER. THE LOWER BYTE OF THE TRAP INSTRUCTION IS ENCODED DIFFERENTLY FOR DIFFERENCT ROUTINES. THE TRAP HANDLER IS LOCATED AT '$TRAP'. WHEN A CALL FOR A ROUTINE IS EXECUTED, A TRAP OCCURS TO THE HANDLER AT '$TRAP'. THE HANDLER PICKS UP THE LOWER BYTE OF THE "CALL INSTRUCTION" AND USES IT TO FORM THE STARTING ADDRESS OF THE ROUTINE TO GO TO FOR SERVICE.

10.2 SCOPE HANDLER

THE 'IOT' TRAP IS USED BY THE 'SCOPE' STATEMENT. WHEN 'SCOPE' IS EXECUTED, AN IOT TRAP OCCURS TO MEMORY LOCATION '$SCOPE'. THE SCOPE HANDLER STARTS AT $SCOPE. DEPENDING ON THE SWITCH SETTINGS THE HANDLER DECIDES TO LOOP ON TEXT, INHIBIT ITERATIONS ETC. THERE ARE CERTAIN POINTERS AND FLAGS WHICH ARE ADJUSTED. THUS, IT IS NOT ADVISABLE TO START THE PROGRAM AT ANY GIVEN LOCATION SINCE THE VARIOUS POINTERS AND FLAGS MAY NOT BE CORRECTLY ADJUSTED.

10.3 ERROR HANDLER

AN EMT TRAP INSTRUCTION IS USED BY THE ERROR CALL. THE LOWER BYTE IS ENCODED TO GIVE DIFFERENT ERROR CALLS. (EX: ERROR 1 = 104000+1; ERROR 16 = 104000+16). WHEN THE ERROR STATEMENT IS EXECUTED, A TRAP OCCURS TO MEMORY LOCATION '$ERROR'. THE ERROR HANDLER IS LOCATED AT '$ERROR'. THE HANDLER FORMS THE POINTER TO ERROR TABLE, WHICH IS USED IF AN ERROR MESSAGE IS TO BE TYPED OUT. DEPENDING ON THE SWITCH SETTINGS, A DECISION ABOUT HALTING ON ERROR.

INHIBITING TYPEOUT, LOOPING ON ERROR ETC. IS MADE. IF AN ERROR MESSAGE IS TO BE TYPED OUT, AN EXIT IS MADE TO THE ERROR MESSAGE TYPEOUT ROUTINE LOCATED AT '$ERRTYP'.

10.4 CONTROL RESET ROUTINE

THE CALL FOR THIS ROUTINE IS "CNT.RESET" AND IS AN ENCODED 'TRAP' INSTRUCTION. WHEN "CNT.RESET" IS EXECUTED THE CONTROL RESET ROUTINE STARTING AT "CN.RST" IS ENTERED. A CONTROL RESET IS ISSUED AND THE PROGRAM WAITS TILL THE CONTROL READY SETS, ON WHICH THE ROUTINE IS EXITED. IF CONTROL READY DOES NOT SET WITHIN A CERTAIN TIME AN ERROR IS REPORTED. THE PC TYPED OUT IS THE LOCATION WHERE THE "CNT.RESET" CALL IS LOCATED. THE WAITING TIME IS 2.8 MS FOR 11/20 AND 560 US FOR 11/45 WITH BIPOLAR MEMORY.

10.5 CONTROL READY ROUTINE

THIS ROUTINE IS CALLED BY "CNT.RDY" (AN ENCODED 'TRAP' INSTRUCTION) AND IS LOCATED AT "CN.RDY". THE ROUTINE WAITS FOR THE CONTROL READY TO SET AND WHEN IT DOES, EXITS OUT. IF CONTROL READY DOES NOT SET WITHIN A SPECIFIED TIME AN ERROR MESSAGE IS GIVEN

```
CNTRL RDY DIDN'T SET
PC = XXXXXX     RKCS = YYYYYY
```

THE PC IS THE LOCATION AT WHICH THE "CNT.RDY" CALL IS LOCATED. THE WAITING TIME IS 949 MS FOR 11/20 AND 189 MS FOR 11/45 WITH BIPOLAR MEMORY.

10.6 TIME DELAY ROUTINE

THIS ROUTINE PROVIDES A VARIABLE TIME DELAY. THE CALL IS DELAY .N WHERE N=1 TO 177777 (OCTAL) TIME DELAY PROVIDED= 7.5 TIMES(X) N MICRO SECS FOR 11/20, 1.5N US FOR 11/45 (N CONVERTED TO DECIMAL BEFORE COMPUTING DELAY) IF THE USER WANTS TO CHANGE THE DELAY AT ANY POINT IT CAN BE DONE BY SIMPLY CHANGING VARIABLE 'N'.

10.7 OTHER ROUTINES

THERE ARE OTHER COMMONLY USED ROUTINES AS LISTED BELOW.

$TYPE:

TYPE ROUTINE FOR TYPING OUT ASCII STRINGS.
LOCATED AT "$TYPE"

CALLED BY "TYPE"

$TYPOC:
ROUTINE FOR TYPING OUT OCTAL NUMBERS.
LOCATED AT "$TYPOC"
CALLED BY "TYPOC"

$TYPDS:
ROUTINE FOR TYPING OUT DECIMAL NUMBERS.
LOCATED AT "$TYPDS"
CALLED BY "TYPDS"

$ERRTYP:
ROUTINE FOR TYPING OUT ERROR MESSAGES.
LOCATED AT $ERRTYP
CALLED BY "JSR $ERRTYP"

$PWRDN,$PWRUP:
ROUTINE FOR HANDLING POWER FAILURE/POWER UP.
LOCATED AT $PWRDN,$PWRUP
$PWRFL,CALLED WHEN THERE IS A POWER FAILURE.
$PWRUP,CALLED WHEN THERE IS A POWER UP.

11.0 UNEXPECTED TIMEOUTS AND RK11 INTERRUPTS

WHEN AN UNEXPECTED TIMEOUT OCCURS, THE PC AT WHICH TIME OUT OCCURED IS TYPED OUT AND THE PROGRAM HALTS. IF IT IS INTACT, IT CAN BE RESTARTED BY PRESSING CONTINUE.

IF AN UNEXPECTED RK11 INTERRUPTIOCBURS THE PROGRAM TYPES OUT THE PC AT WHICH THE INTERRUPT CAME IN AND THEN HALTS. PRESSING CONTINUE WOULD RESTART THE PROGRAM FROM BEGINING. SW 9- LOOPING CAPABILITY IS PROVIDED AS A TROUBLE SHOOTING AID.

12.0 QUICK VERIFYING MODE

THE FIRST PASS OF THE PROGRAM IS A QUICK VERIFYING MODE. ALL THE TESTS ARE DONE ONLY ONCE, ON SUBSEQUENT PASSES THE TESTS ARE ITERATED (NORMALLY 50 TIMES, 5 IN SOME CASES). THUS THE FIRST PASS TAKES A SHORTER TIME TO COMPLETE, WHEREAS SUBSEQUENT PASSES TAKE MORE TIME.
%

```
                        .TITLE  MD-11-DZRKJ-E, RK11 BASIC LOGIC TEST 1
                        ;*COPYRIGHT (C) 1974,1977
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY JIM KAPADIA
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                        ;*
                        ;*JANUARY 1975
                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        12            CYCLE ON ERROR TO PREVIOUS 'SCOPE' STATEMENT
                        ;*        11            INHIBIT ITERATIONS
                        ;*        10            TESTING ON SIMULATOR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<7:0>


                        ;*
                        ;*PROGRAM REVISED BY TOM SAWYER, MARCH 1976
                        ;*REVISED BY CHUCK HESS, AUGUST 1976
                        ;*****************************************************************
                        ;YOU ARE ADVISED TO READ THE DOCUMENT BEFORE USING THIS PROGRAM.

                        ;ON GETTING AN ERROR REFER TO THE LISTINGS AT THE PC POINTED
                        ;OUT IN THE ERROR MESSAGE. ADJACENT ERROR MESSAGES IF FOLLOWED
                        ;CAREFULLY COULD LEAD TO AN EASY PINPOINTING OF THE FAULT

                        ;*****************************************************************
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
000100:                 STACK=  1100
                        .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE FOR LINE FEED
000015                  CR=     15              ;;CODE FOR CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
177776                  PS=     177776          ;;PROCESSOR STATUS WORD
                        .EQUIV  PS,PSW
```

```
                        177774          STKLMT= 177774          ;;STACK LIMIT REGISTER
                        177772          PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
                        177570          DSWR=   177570          ;;HARDWARE SWITCH REGISTER
                        177570          DDISP=  177570          ;;HARDWARE DISPLAY REGISTER

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

                                        ;*PRIORITY LEVEL DEFINITIONS
                        000000          PR0=    0               ;;PRIORITY LEVEL 0
                        000040          PR1=    40              ;;PRIORITY LEVEL 1
                        000100          PR2=    100             ;;PRIORITY LEVEL 2
                        000140          PR3=    140             ;;PRIORITY LEVEL 3
                        000200          PR4=    200             ;;PRIORITY LEVEL 4
                        000240          PR5=    240             ;;PRIORITY LEVEL 5
                        000300          PR6=    300             ;;PRIORITY LEVEL 6
                        000340          PR7=    340             ;;PRIORITY LEVEL 7

                                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                        100000          SW15=   100000
                        040000          SW14=   40000
                        020000          SW13=   20000
                        010000          SW12=   10000
                        004000          SW11=   4000
                        002000          SW10=   2000
                        001000          SW09=   1000
                        000400          SW08=   400
                        000200          SW07=   200
                        000100          SW06=   100
                        000040          SW05=   40
                        000020          SW04=   20
                        000010          SW03=   10
                        000004          SW02=   4
                        000002          SW01=   2
                        000001          SW00=   1
                                        .EQUIV  SW09,SW9
                                        .EQUIV  SW08,SW8
                                        .EQUIV  SW07,SW7
                                        .EQUIV  SW06,SW6
                                        .EQUIV  SW05,SW5
                                        .EQUIV  SW04,SW4
                                        .EQUIV  SW03,SW3
                                        .EQUIV  SW02,SW2
                                        .EQUIV  SW01,SW1
                                        .EQUIV  SW00,SW0

                                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15
```

```
                        100000                  BIT15=  100000
                        040000                  BIT14=  40000
                        020000                  BIT13=  20000
                        010000                  BIT12=  10000
                        004000                  BIT11=  4000
                        002000                  BIT10=  2000
                        001000                  BIT09=  1000
                        000400                  BIT08=  400
                        000200                  BIT07=  200
                        000100                  BIT06=  100
                        000040                  BIT05=  40
                        000020                  BIT04=  20
                        000010                  BIT03=  10
                        000004                  BIT02=  4
                        000002                  BIT01=  2
                        000001                  BIT00=  1
                                                .EQUIV  BIT09,BIT9
                                                .EQUIV  BIT08,BIT8
                                                .EQUIV  BIT07,BIT7
                                                .EQUIV  BIT06,BIT6
                                                .EQUIV  BIT05,BIT5
                                                .EQUIV  BIT04,BIT4
                                                .EQUIV  BIT03,BIT3
                                                .EQUIV  BIT02,BIT2
                                                .EQUIV  BIT01,BIT1
                                                .EQUIV  BIT00,BIT0

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

                        000000                          .=0
                                                ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                        000174                          .=174
000174  000000                                  DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000                                  SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                                .SBTTL  STARTING ADDRESS(ES)
000200  000137  001542                                  JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
                                                .SBTTL  ACT11 HOOKS

                                                ;;**************************************************************
                                                ;HOOKS REQUIRED BY ACT11
                        000204                          $S:PC=.                 ;SAVE PC
```

```
                        000046                          .=46
000046  005400          $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$ECP
                        000052                          .=52
000052  000000          .WORD   0                       ;;2)SET LOC.52 TO ZERO
                        000204                          .=$SVPC                 ;; RESTORE PC
```

```
                                        .SBTTL  COMMON TAGS

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

        001100                                  .=1100
001100                                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000                          $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
001102     000                          $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103     000                          $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000                          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000                          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000                          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000                          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114     000                          $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115     001                          $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000                          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000                          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000                          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000                          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000                          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                                  .WORD   0
001134     000                          $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135     000                          $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                                  .WORD   0
001140  177570                          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570                          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560                          $TKS:   177560                  ;;TTY KBD STATUS
001146  177562                          $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564                          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566                          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154     000                          $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155     002                          $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156     012                          $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157     000                          $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES
001160  000000                          $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                                        ;;WHICH ($REG0) WAS OBTAINED
001162  000000                          $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001164  000000                          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001166  000000                          $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
001170  000000                          $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
001172  000000                          $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
001174  000000                          $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
001176  000000                          $REG6:  .WORD   0               ;;CONTAINS (($REGAD)+14)
001200  000000                          $REG7:  .WORD   0               ;;CONTAINS (($REGAD)+16)
001202  000000                          $REG10: .WORD   0               ;;CONTAINS (($REGAD)+20)
001204  000000                          $REG11: .WORD   0               ;;CONTAINS (($REGAD)+22)
001206  000000                          $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001210  000000                          $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001212     077                          $QUES:  .ASCII  /?/             ;;QUESTION MARK
001213     015                          $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001214  000012                          $LF:    .ASCIZ  <12>            ;;LINE FEED
                                        ;;*******************************************************************
001216  005015  047103  020124          MSG3:   .ASCIZ  <15><12>/CNT RDY DIDN'T SET
```

```
000224  042122  020131  044504
000232  047104  052047  051440
000240  052105     000
001244                          .EVEN

                                ;RK11 REGISTERS
                                ;IF FOR ANY REASON THE REGISTER ADDRESSES ARE DIFFERENT FROM THESE
                                ;(GIVEN BELOW), THE CONTENTS OF THE APPROPRIATE POINTERS SHOULD BE
                                ;MODIFIED SO THAT THE CORRECT ADDRESS IS USED.
                                ;
                                .EVEN
001244  177400                  RKDS:   177400
001246  177402                  RKER:   177402
001250  177404                  RKCS:   177404
001252  177406                  RKWC:   177406
001254  177410                  RKBA:   177410
001256  177412                  RKDA:   177412
001260  177416                  RKDB:   177416


                                ;TAGS AND GENERAL DATA AREA
                                ;
                                ;
001262  000000                  FTITLE: 0               ;FLAG FOR PRINTING PROGRAM TITLE
001264  000000                  TIMER:  0               ;TIMER REGISTER
001266  000200                  RKPRI:  200             ;CONTAINS THE CPU LEVEL AT WHICH
                                                        ;RK11 NORMALLY INTERRUPTS. THIS WORD
                                                        ;SHOULD BE CHANGED IF RK11 IS DESINGATED
                                                        ;A BR LEVEL OTHER THAN 5. E.G. IF IT IS CHANGED
                                                        ;TO 6, THIS WORD SHOULD BE CHANGED TO 240.
001270  000220                  RKVEC:  220             ;CONTAINS THE NORMAL VECTOR ADDRESS TO WHICH
                                                        ;RK11 INTERRUPTS. IF THIS IS NOT SO, CHANGE
                                                        ;THIS WORD TO CONTAIN MODIFIED VECTOR ADDRESS.
```

```
                        .SBTTL  ERROR POINTER TABLE

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

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

 001276                 $ERRTB:



                        ;THE ERROR ITEMS TABLE CONSISTS OF ALL THE POSSIBLE ERROR MESSAGES
                        ;USED IN THIS PROGRAM. AN ERROR CALL IN THE PROGRAM CORRESPONDS TO
                        ;THE ITEM NUMBER IN THE ERROR TABLE. THUS 'ERROR       1' IN THE
                        ;PROGRAM CORRESPONDS TO 'ITEM   1' IN THE ERROR TABLE.
                        ;'EM###' IS THE  POINTER TO THE ERROR MESSAGE WHICH WILL BE TYPED
                        ;OUT IN CASE THAT ERROR WERE TO OCCUR. THUS FOR 'ERROR  1' THE ERROR
                        ;MESSAGE TYPE OUT WILL BE 'TIME OUT ON RK11 REG'.
                        ;'DH###' IS THE POINTER TO THE HEADER BLOCK WHICH WILL BE TYPED OUT
                        ;IMMEDIATELY AFTER THE ERROR MESSAGE.
                        ;'DT###'  SERVES AS A POINTER TO THE MEMORY LOCATIONS WHERE
                        ;THE INFORMATION RELEVANT TO THE ERROR TYPE OUTS (LIKE PC, CONTENTS
                        ;OF RKCS ETC.) WILL BE PICKED UP FROM.
                        ;THE LAST ROW CONTAINING '0' SERVES AS A TERMINATOR.
                        ;EXAMPLE:
                        ;IF ON RUNNING THIS PROGRAM A TIMEOUT WERE TO OCCUR ON ADDRESSING RKCS
                        ; 177400), BECAUSE OF SOME FAULT, THE FOLLOWING TYPEOUT WOULD
                        ;OCCUR ON THE TELETYPE.
                        ;
                        ;         TIME OUT ON RK11 REG
                        ;           PC          REG
                        ;         ######    177400
                        ;
                        ;NOTE THAT ###### WOULD BE THE ACTUAL PC WHERE 'ERROR   1' IS LOCATED.

                        ;THE ERROR HANDLER IS LOCATED AT '$ERROR'. THE ERROR CALL IS AN 'EMT'
                        ;INSTRUCTION WITH ITS LOWER BYTE ENCODED TO PROVIDE INDEXING TO THE
                        ;ITEMS IN THE ERROR TABLE.
                        ;THUS 'ERROR    1'   IS 104001
                        ;     'ERROR    126' IS 104126   ETC.



                              ;ERROR ITEMS TABLE
```

```
                                        ;ITEM   1
                                
001272  010336                                EM1     ;TIME OUT ON RK11 REG
001274  011546                                DH1     ;PC     REG
001276  011476                                DT1     ;SERRPC $REGO
000300  000000                                0

                                        ;ITEM   2

001302  010370                                EM2     ;REGISTER NOT CLEARED
001304  011566                                DH2     ;PC     REGADD  RECVD
001306  011504                                DT2     ;SERRPC $REGO   $REG1
001310  000000                                0

                                        ;ITEM   3

001312  010415                                EM3     ;RKCS ERROR
001314  011643                                DH3     ;PC     WROTE   READ
001316  011504                                DT2     ;SERRPC $REGO   $REG1
001320  000000                                0

                                        ;ITEM   4

001322  010430                                EM4     ;RKCS ERROR-ON WRITING READ ONLY BITS
001324  011615                                DH4     ;PC     EXPCT   RECVD
001326  011504                                DT2     ;SERRPC $REGO   $REG1
001330  000000                                0

                                        ;ITEM   5

001332  010475                                EM5     ;BUS INIT DID NOT CLEAR RKCS
001334  011670                                DH5     ;PC     RECVD
001336  011476                                DT1     ;SERRPC $REGO
001340  000000                                0

                                        ;ITEM   6

001342  010531                                EM6     ;'CNTRL RESET' DIDN'T CLEAR RKCS, ON SETING GO
001344  011670                                DH5     ;PC     RECVD
001346  011476                                DT1     ;SERRPC $REGO
001350  000000                                0

                                        ;ITEM   7

001352  010607                                EM7     ;'CNTRL RDY' DIDN'T SET AFTER CONTROL RESET
001354  012221                                DH30    ;PC     RKCS    RKER    RKDS
001356  011534                                DT26    ;SERRPC $REGO   $REG1   $REG2
001360  000000                                0

                                        ;ITEM   10

001362  010656                                EM10    ;REGISTER NOT CLEARED
001364  011566                                DH2     ;PC     REGADD  RECVD
001366  011504                                DT2     ;SERRPC $REGO   $REG1
001370  000000                                0
```

```
:046                                    ;ITEM   11
:047
1048  001372  010703                            EM11    ;RKWC ERROR
1049  001374  011706                            DH11    ;PC     WROTE   READ
1050  001376  011504                            DT2     ;SERRPC $REG0   $REG1
:051  001400  000000                            0
:052
1053                                    ;ITEM   12
:054
1055  001402  011443                            EM43    ;UNEXPECTED Rk11 INTERRUPT
1056  001404  011733                            DH21    ;PC
1057  001406  011530                            DT21    ;SERRPC
1058  001410  000000                            0
1059
1060                                    ;ITEM   13
1061
1062  001412  010716                            EM13    ;RKBA ERROR
1063  001414  011706                            DH11    ;PC     WROT    READ
1064  001416  011504                            DT2     ;SERRPC $REG0   $REG1
1065  001420  000000                            0
1066
1067                                    ;ITEM   14
1068
1069  001422  010731                            EM14    ;CNTRL RESET DID NOT CLEAR REGISTER
1070  001424  011566                            DH2     ;PC     REGADD  RECVD
1071  001426  011504                            DT2     ;SERRPC $REG0   $REG1
1072  001430  000000                            0
1073
1074                                    ;ITEM   15
1075
1076  001432  010773                            EM15    ;RKDA ERROR
1077  001434  011706                            DH11    ;PC     WROTE   READ
1078  001436  011504                            DT2     ;SERRPC $REG0   $REG1
1079  001440  000000                            0
1080
1081                                    ;ITEM   16
1082
1083  001442  011321                            EM26    ;RKCS ALTERERED ON CLEARING 'REG-BYTE'
1084  001444  012107                            DH26    ;PC     REG-BYTE (RKCS)EXP (RKCS)RECVD
1085  001446  011534                            DT26    ;SERRPC $REG0   $REG1   $REG2
1086  001450  000000                            0
1087
1088                                    ;ITEM   17
1089
1090  001452  011006                            EM17    ;BUS INIT DIDN'T CLEAR REGISTER
1091  001454  011566                            DH2     ;PC     REGADD  RECVD
1092  001456  011504                            DT2     ;SERRPC $REG0   $REG1
1093  001460  000000                            0
1094
1095                                    ;ITEM   20
1096
1097  001462  011042                            EM20    ;ADDRESSING ERROR-TRIED TO ADDRESS REG1, GOT REG2
1098  001464  011740                            DH20    ;PC     REG1    REG2    (REG1)  (REG2)
1099  001466  011514                            DT20    ;SERRPC $REG0   $REG1   $REG2   $REG3
1100  001470  000000                            0
1101
```

```
1102                                    ;ITEM   21
1103
1104  001472  011365                            EM27    ;TRIED TO CLEAR 'REG-BYTE', CHANGED 'REG-BYT2'
1105  001474  012151                            DH27    ;PC     REG-BYT1        REG-BYT2        BYT2-EXPCT      BYT2-RECVD
1106  001476  011514                            DT20    ;SERRPC $REG0           $REG1           $REG2           $REG3
1107  001500  000000                            0
1108
1109                                    ;ITEM   22
1110
1111  001502  011123                            EM22    ;DID NOT CLEAR RKCS LO BYTE
1112  001504  011615                            DH4     ;PC     EXPCT   RECVD
1113  001506  011504                            DT2     ;SERRPC $REG0   $REG1
1114  001510  000000                            0
1115
1116                                    ;IEM    23
1117
1118  001512  011156                            EM23    ;DID NOT CLEAR RKCS HI BYTE
1119  001514  011615                            DH4     ;PC     EXPCT   RECVD
1120  001516  011504                            DT2     ;SERRPC $REG0   $REG1
1121  001520  000000                            0
1122
1123                                    ;ITEM   24
1124
1125  001522  011212                            EM24    ;TRIED TO CLEAR RKCS 'BYTE', CHANGED 'REGIS'
1126  001524  012007                            DH24    ;PC     BYTE    REGIS   (REG)EXP         (REG)RECVD
1127  001526  011514                            DT20    ;SERRPC $REG0   $REG1   $REG2   $REG3
1128  001530  000000                            0
1129
1130                                    ;ITEM   25
1131
1132  001532  011266                            EM25    ;FAILED TO CLEAR 'REG-BYTE'
1133  001534  012061                            DH25    ;PC     REG-BYTE RECVD
1134  001536  011504                            DT2     ;SERRPC $REG0   $REG1
1135  001540  000000                            0
1136
1137
1138
1139
1140  001542  000005          START:  RESET                   ;CLEAR THE BUS
1141                          .SBTTL  INITIALIZE THE COMMON TAGS
1142                          ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
1143  001544  012706  001100          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
1144  001550  005026                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
1145  001552  022706  001140          CMP     #SWR,R6 ;;DONE?
1146  001556  001374                  BNE     .-6             ;;LOOP BACK IF NO
1147  001560  012706  001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
1148                          ;;INITIALIZE A FEW VECTORS
1149  001564  012737  005642  000020  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
1150  001572  012737  000340  000022  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
1151  001600  012737  006114  000030  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
1152  001606  012737  000340  000032  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
1153  001614  012737  010066  000034  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
1154  001622  012737  000340  000036  MOV     #340,@#TRAPVEC+2;LEVEL 7
1155  001630  012737  010154  000024  MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
1156  001636  012737  000340  000026  MOV     #340,@#PWRVEC+2 ;;LEVEL 7
1157  001644  005037  001206          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
```

```
1158  001650  005037  001210                CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
1159  001654  112737  000001  001115        MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
1160  001662  012737  001662  001106        MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
1161  001670  012737  001670  001110        MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
1162                                  ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
1163                                  ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
1164  001676  013746  000004                MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
1165  001702  012737  001736  000004        MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
1166  001710  012737  177570  001140        MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
1167  001716  012737  177570  001142        MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
1168  001724  022777  177777  177206        CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
1169  001732  001012                        BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
1170                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
1171  001734  000403                        BR      65$             ;;BRANCH IF NO TIMEOUT
1172  001736  012716  001744        64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
1173  001742  000002                        RTI
1174  001744  012737  000176  001140  65$:  MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
1175  001752  012737  000174  001142        MOV     #DISPREG,DISPLAY
1176  001760  012637  000004        66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
1177
1178  001764  023737  000042  000046        CMP     @#42,@#46       ;ARE WE IN ACT11 AUTOMATIC MODE?
1179  001772  001416                        BEQ     69$             ;IF YES, SKIP TITLE
1180                                  .SBTTL  TYPE PROGRAM NAME
1181                                  ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
1182  001774  005227  177777                INC     #-1             ;;FIRST TIME?
1183  002000  001043                        BNE     67$             ;;BRANCH IF NO
1184  002002  104401  002040                TYPE    ,68$            ;;TYPE ASCIZ STRING
1185                                  .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
1186  002006  005737  000042                TST     @#42            ;;ARE WE RUNNING UNDER XXDP ACT?
1187  002012  001006                        BNE     69$             ;;BRANCH IF YES
1188  002014  023727  001140  000176        CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
1189  002022  001005                        BNE     70$             ;;BRANCH IF NO
1190  002024  104406                        GTSWR                   ;;GET SOFT-SWR SETTINGS
1191  002026  000403                        BR      70$
1192  002030  112737  000001  001134  69$:  MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
1193  002036                        70$:
1194  002036  000424                        BR      67$             ;;GET OVER THE ASCIZ
1195                                  ;;68$:  .ASCIZ  <CRLF>/RK11 LOGIC TEST I/<15><12>/MAINDEC-11-DZRKJ-E  CRLF
1196  002110                        67$:
1197                                  ;
1198  002110  012737  002126  000004  START1: MOV     #BADTMO,@#4     ;SET TIME OUT VECTOR FOR UNEXPECTED
1199                                                                ;TIME OUTS
1200  002116  012777  002212  177144        MOV     #BADINT,@RKVEC  ;SET UP RK11 INTERRUPT VECTOR FOR
1201                                                                ;UNEXPECTED INTERRUPTS FROM RK11
1202  002124  000516                        BR      TST1            ;GO TO TEST 1
1203
1204
1205
1206
1207                                  ;THIS ROUTINE HANDLES UNEXPECTED TIME OUTS
1208
1209  002130  011600                BADTMO: MOV     (SP),R0 ;SAVE PC WHERE TIME OUT OCCURED
1210  002132  005740                        TST     -(R0)
1211  002134  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
1212  002136  104401  002142                TYPE    ,65$            ;;TYPE ASCIZ STRING
1213  002142  000417                        BR      64$             ;;GET OVER THE ASCIZ
```

```
                                        ;;65$:  .ASCIZ  <15><12>/UNEXPECTED TIME OUT AT PC=/
                                        64$:
002200                                          MOV     R0,-(SP)        ;SET UP FOR TYPING OUT PC
002200  010046                                 TYPOC                   ;GO TYPE OUT OCTAL PC
002202  104402                                 HALT
002204  000000                                 JMP     @#START
002206  000137  001542
                                        ;THIS ROUTINE HANDLES UNEXPECTED INTERRUPTS FROM RK11
                                        ;SW 9 AND 10 FOR LOOPING ON ERROR
                                        ;AND LOOPING ON TEST IN WHICH TIMEOUT
                                        ;OCCURRED, ARE PROVIDED.

002212                                  BADINT: MOV     (SP),R0         ;SAVE PC WHERE INTERRUPT OCCURED
002212  011600                                 TST     -(R0)
002214  005740                                 BIT     #20000,@SWR     ;INHIBIT ERROR TYPEOUT?
002216  032777  020000  176714                 BNE     1$              ;YES, DON'T TYPE OUT
002224  001015                                 TYPE
002226  104401                                 $CRLF
002230  001213                                 TYPE
002232  104401                                 EM43                    ;TYPE 'UNEXPEXTED RK11 INTERRUPT'
002234  011443                                                         ;TYPE ' AT PC='
                                                TYPE    ,65$            ;;TYPE ASCIZ STRING
002236  104401  002244                         BR      64$             ;;GET OVER THE ASCIZ
002242  000404                                 ;;65$:  .ASCIZ  / AT PC=/
                                        64$:
002254                                          MOV     R0,-(SP)        ;SET UP FOR TYPING OUT PC
002254  010046                                 TYPOC                   ;GO TYPE OCTAL PC WHERE BAD
002256  104402                                                         ;INTERUPT OCCURED

002260  032777  001000  176652          1$:     BIT     #1000,@SWR      ;LOOP ON ERROR?
002266  001403                                 BEQ     2$              ;NO, BRANCH
002270  022626                                 CMP     (SP)+,(SP)+     ;YES, REPOSITION STACK
002272  000177  176610                         JMP     @$LPADR         ;GO TO THE STARTING ADDRESS OF
                                                                        ;THE TEST THAT GAVE UNEXPECTED INTERRUPT
002276  032777  040000  176634          2$:     BIT     #40000,@SWR     ;LOOP ON TEST?
002304  001401                                 BEQ     3$              ;NO, BRANCH
002306  000002                                 RTI                     ;YES, LOOP. GO BACK WHER U INTERRUPTED FROM.
002310  000000                          3$:     HALT                    ;UNEXPECTED INTERRUPT OCCURED AS
                                                                        ;INDICATED IN THE TYPE OUT.U CAN LOOP
                                                                        ;ON ERROR, TEST,OR INHIBIT TYPEOUT BY
                                                                        ;SETTING APPROPRIATE SWITCHES.
002312  000137  001542                         JMP     @#START         ;GO BACK TO THE START OF THE
                                                                        ;PROGRAM. THUS PRESSING CONTINUE
                                                                        ;AFTER THE ABOVE HALT WILL
                                                                        ;RESTART THE PROGRAM


                                        ;RESTART AFTER POWER FAIL
                                        ;THE PROGRAM WOULD RESTART HERE IF POWER CAME BACK AFTER A FALIURE.

002316                                  PFSTRT:
002316  104401  002324                         TYPE    ,65$            ;;TYPE ASCIZ STRING
002322  000411                                 BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12>/PWR UP,RESTART/
002346                                  64$:
002346  005000                                 CLR     R0
```

```
1270  002350  005001                  CLR     R1
1271  002352  005201          1$:     INC     R1
1272  002354  001376                  BNE     1$
1273  002356  105200                  INCB    R0
1274  002360  001374                  BNE     1$
1275
1276
1277
1278                          ;;*****************************************************************
                              ;*TEST 1         TEST THAT ALL RK11 REGISTERS CAN BE REFERENCED
1279                          ;*THIS TEST CHECKS IF EVERY RK11 REGISTER CAN BE
1280                          ;*REFERENCED WITHOUT TIMING OUT.  IF A TIME OUT OCCURS THE ERROR IS
1281                          ;*REPORTED & AN ERROR FLAG (R2) IS INCREMENTED.  IT THERE WAS
1282                          ;*AN ERROR DURING THIS TEST, THE ENTIRE PROGRAM IS ABORTED
1283                          ;;*****************************************************************
1284  002362  000004          TST1:   SCOPE
1285  002364  005002                  CLR     R2
1286  002366  012737  002412  001110  MOV     #T1,$LPERR      ;SET RETURN ADRES FOR LUP
1287                                                          ;ON EROR (SW9)
1288  002374  012737  002466  000004  MOV     #TIMOUT,@#4     ;SET UP ADDRESS FOR TIMEOUT VECTOR
1289  002402  012700  177771          MOV     #-7,R0          ;INITIALIZE R0 TO KEEP TRACK OF REGIS REFERENCED
1290  002406  012701  001244          MOV     #RKDS,R1        ;INITIALIZE R1 WITH RKDS ADDRESS
1291  002412  005731          T1:     TST     @(R1)+          ;REFERENCE THE REGISTER,
1292                                                          ;IF IT CAN'T BE, TIMEOUT TRAP WILL OCCUR
1293                                                          ;SHIFT THE POINTER
1294  002414  005200                  INC     R0              ;ALL REGISTERS REFERENCED?
1295  002416  001375                  BNE     T1              ;IF NOT, LOOP BACK & REFERENCE NEXT REGISTER
1296  002420  012737  002126  000004  MOV     #BADTM0,@#4
1297  002426  005702                  TST     R2              ;WAS THERE AN ERROR?
1298  002430  001415                  BEQ     1$              ;NO,BRANCH
1299  002432  104401  002440          TYPE    ,65$            ;;TYPE ASCIZ STRING
1300  002436  000410                  BR      64$             ;;GET OVER THE ASCIZ
1301                          ;;65$:  .ASCIZ  <15><12>/PROG ABORTED/
1302  002460                  64$:
1303  002460  000137  005370          JMP     $GET42          ;IF YES, ABORT THIS ENTIRE TEST
1304  002464                  1$:
1305  002464  000407                  BR      TST2            ;;EXIT
1306  002466  022626          TIMOUT: CMP     (SP)+,(SP)+
1307  002470  014137  001162          MOV     -(R1),$REG0     ;GET ADDRESS OF REGISTER THAT TIMED OUT
1308  002474  104001                  ERROR   1               ;TIMED OUT WHEN REFERENCING RK11
1309                                                          ;REGISTERS
1310  002476  005721                  TST     (R1)+           ;REPOSITION POINTER TO THE NEXT REGISTER ADDRESS
1311  002500  005202                  INC     R2              ;SET FLAG INDICATING ERROR
1312  002502  000744                  BR      T1+2            ;BRANCH BACK & REFERENCE THE NXT REGISTER
1313                                   ;
1314
1315                          ;;*****************************************************************
                              ;*TEST 2         CHECK RK11 INITIALIZATION
1316                          ;*THIS TEST CHECKS THAT THE CONTROLLER LOGIC IS INITIALIZED
1317                          ;*CORRECTLY, RKWC, RKDA, RKDA, RKDB SHOULD BE CLEAR AND
1318                          ;*RKCS SHOULD HAVE 'CNTRL RDY' BIT SET.
1319                          ;;*****************************************************************
1320
1321  002504  000004          TST2:   SCOPE
1322  002506  000005                  RESET                   ;ISSUE A BUS INIT
1323  002510  012700  177772          MOV     #-6,R0          ;SET COUNT FOR 6 REGISTERS
1324  002514  012701  001246          MOV     #RKER,R1        ;INITIALIZE ADRES
1325  002520  023711  001250  1$:     CMP     RKCS,@R1        ;IS IT RKCS?
```

```
1326  002524  001005                        BNE     2$                      ;NO
1327  002526  022771  000200  000000        CMP     #200,@(R1)              ;ONLY BIT 7 OF RKCS SHOULD BE SET!
1328  002534  001004                        BNE     3$                      ;BRANCH IF ERROR
1329  002536  000411                        BR      4$
1330  002540  005771  000000        2$:     TST     @(R1)                   ;CHECK THAT REST OF REGISTERS
1331                                                                        ;ARE CLEAR
1332  002544  001406                        BEQ     4$                      ;BRANCH IF REGISTER IS CLR
1333  002546  011137  001162        3$:     MOV     @R1,$REG0               ;GET ADRES OF REGISTER
1334  002552  017137  000000  001164        MOV     @(R1),$REG1             ;GET CONTENTS OF REGISTER
1335  002560  104002                        ERROR   2                       ;RK11 REGISTER WAS FOUND TO B NOT CLEAR
1336  002562  005721                4$:     TST     (R1)+                   ;INCREMNT POINTER TO NXT REG
1337  002564  005200                        INC     R0                      ;CHKD ALL REGS?
1338  002566  001354                        BNE     1$                      ;IF NOT LUP BAK
1339                                        ;
1340                                        ;;*****************************************************************
1341                                        ;*TEST 3         TEST RKCS FUNCTION BITS - 1,2,3
1342                                        ;*THIS TEST CHECKS IF THE FUNCTION BIT-1,2,3 IN RKCS CAN BE WRITTEN &
1343                                        ;*READ BACK.  R0 CONTAINS THE BIT THAT WAS WRITTEN.  R1 CONTAINS THE
1344                                        ;*BITS THAT WAS/WERE READ BACK.
1345                                        ;;*****************************************************************
1346  002570  003004                TST3:   SCOPE
1347  002572  012737  002604  001110        MOV     #1$,$LPERR              ;SET RETURN ADRES FOR LOPING ON
1348                                                                        ;ERROR (SW 9)
1349  002600  012700  000002                MOV     #2,R0                   ;INITIALIZE BIT TO BE WRITTEN IN RKCS
1350  002604  010077  176440        1$:     MOV     R0,@RKCS                ;WRITE THAT BIT IN RKCS
1351  002610  017701  176434                MOV     @RKCS,R1                ;GET RKCS
1352  002614  042701  000200                BIC     #200,R1                 ;MASK OUT CNTRL RDY BIT
1353  002620  020001                        CMP     R0,R1                   ;WAS RECVD BIT SAME AS WRITTEN BIT
1354  002622  001406                        BEQ     2$                      ;YES, BRANCH OTHERWISE REPORT ERROR
1355  002624  010037  001162                MOV     R0,$REG0                ;GET EXPCTD RKCS, BIT THAT WAS WRITTEN
1356  002630  017737  176414  001164        MOV     @RKCS,$REG1             ;GET RECVD RKCS, BIT READ
1357  002636  104003                        ERROR   3                       ;BIT THAT WAS WRITTEN WAS NOT READ BACK
1358  002640  006300                2$:     ASL     R0                      ;SHIFT TO WRITE NEXT BIT
1359  002642  020027  000020                CMP     R0,#20                  ;HAVE U CHKD ALL 3 BITS 1, 2, 3
1360  002646  001356                        BNE     1$                      ;IF NOT, LOOP BACK & CHECK THE NXT BIT
1361                                        ;
1362                                        ;;*****************************************************************
1363                                        ;*TEST 4         TEST RKCS EXTENDED MEMORY BITS - 4,5
1364                                        ;*THIS TEST CHECKS IF THE 'EXTENDED MEMORY' BITS CAN BE WRITTEN
1365                                        ;*AND READ BACK CORRECTLY.
1366                                        ;;*****************************************************************
1367  002650  000004                TST4:   SCOPE
1368  002652  012737  002664  001110        MOV     #1$,$LPERR              ;SET RETURN ADRES FOR LUPING
1369                                                                        ;ON EROR (SW 9)
1370  002660  012700  000020                MOV     #20,R0                  ;INITIALIZE BIT TO BE WRITTEN IN RKCS
1371  002664  010077  176360        1$:     MOV     R0,@RKCS                ;WRITE THAT BIT IN RKCS
1372  002670  017701  176354                MOV     @RKCS,R1                ;GET RKCS
1373  002674  042701  000200                BIC     #200,R1                 ;MASK OUT CNTRL RDY BIT
1374  002700  020001                        CMP     R0,R1                   ;WAS RECVD BIT SAME AS WRITTEN BIT
1375  002702  001406                        BEQ     2$                      ;YES, BRANCH
1376  002704  010037  001162                MOV     R0,$REG0                ;GET EXPCTD RKCS, BIT THAT WAS WRITTEN
1377  002710  017737  176334  001164        MOV     @RKCS,$REG1             ;GET RKCD RECVD, BIT THAT WAS READ
1378  002716  104003                        ERROR   3                       ;BIT THAT WAS WRITTEN WAS NOT READ BACK
1379  002720  006300                2$:     ASL     R0                      ;SHIFT TO WRITE NEXT BIT
1380  002722  022700  000100                CMP     #100,R0                 ;HAVE U CHKD BOTH BITS, 4, 5
1381  002726  001356                        BNE     1$                      ;IF NOT, LOOP BACK & CHECK THE NXT BIT
```

```
                                        ;
                                        ;;*****************************************************************
                                        ;*TEST 5         CHECK RKCS IDE BIT - 6
                                                ;*THIS TEST CHECKS IF IDE BIT CAN BE WRITTEN & READ BACK.  THE PROCESSOR
                                                ;*STATUS IS SET AT PRIORITY 7 SO THAT UNWANTED INTERRUPTS ARE LOCKED OUT.
                                                ;*THEN IDE BIT IS CLEARED AND PROCESSOR PRIORITY IS LOWERED TO INSURE THAT
                                                ;*NO INTERRUPTS OCCUR.
                                        ;;*****************************************************************
002730  000004                  ST5:    SCOPE
002732  012746  000340                  MOV     #340,-(SP)
002736  012746  002744                  MOV     #64$,-(SP)
002742  000002                          RTI
002744                          64$:
002744  013700  001250                  MOV     RKCS,R0
002750  012710  000100                  MOV     #100,@R0        ;SET THE IDE BIT
002754  022710  000300                  CMP     #300,@R0        ;WAS IT WRITTEN CORRECTLY
002760  001406                          BEQ     1$              ;YES, BRANCH OTHERWISE REPORT ERROR
002762  012737  000300  001162          MOV     #300,$REG0      ;GET EXPCT RKCS
002770  011037  001164                  MOV     @R0,$REG1       ;GET RKCS RECVD
002774  104003                          ERROR   3               ;IDE BIT WAS WRITTEN, BUT WAS NOT
                                                                ;READ BACK
002776  104412                  1$:     CNT.RESET               ;CONTROL RESET, CLEAR IDE
                                                                ;THIS IS A CALL FOR THE 'CNTRL-
                                                                ;RESET' ROUTINE.  A CONTROL RESET
                                                                ;IS ISSUED AND AFTER A CERTAIN TIME
                                                                ;IF THE 'CNTRL RDY' DOES NOT SET
                                                                ;AN ERROR IS REPORTED. NOTE THAT
                                                                ;THE PC IN ERROR MESSAGE IS THE
                                                                ;PC WHERE 'CNT.RESET' IS LOCATED.
003000  022710  000200                  CMP     #200,@R0        ;DID IDE BIT GET CLRD?
003004  001406                          BEQ     2$              ;YES, BRANCH
003006  010037  001162                  MOV     R0,$REG0        ;GET ADRES OF RKCS
003012  011037  001164                  MOV     @R0,$REG1       ;GET RKCS
003016  104010                          ERROR   10              ;IDE BIT COULD NOT B CLRD
003020  000430                          BR      TST6            ;;EXIT
003022  104414  000010          2$:     DELAY   .10             ;WAIT FOR AT LEAST 60 US
                                                                ;ON 11/20  12 US FOR 11/45
003026  012777  003076  176234          MOV     #3$,@RKVEC      ;SET RK11 INTERUPT VECTOR TO
                                                                ;WHICH RK11 CAN INTERUPT IF THERE
                                                                ;IS FAULTY LOGIC
003034  013746  001266                  MOV     RKPRI,-(SP)     ;LOWER CPU PRIORITY SO THAT
003040  012746  003046                  MOV     #4$,-(SP)       ;RK11 CAN POSSIBLY INTERRUPT IF
003044  000002                          RTI                     ;THER IS MALFUNCTIONINIG LOGIC
003046  000240                  4$:     NOP                     ;THE INTERRUPT WOULD OCCUR
003050  000240                          NOP
003052  000240                          NOP
003054  012746  000340                  MOV     #340,-(SP)
003060  012746  003066                  MOV     #65$,-(SP)
003064  000002                          RTI
003066                          65$:
                                                                ;PRIORITY
003066  012777  002212  176174          MOV     #BADINT,@RKVEC  ;SET UP UNEXPCTD INTRUPT VECTOR
003074  000402                          BR      TST6            ;;EXIT
003076  022626                  3$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
003100  104012                          ERROR   12              ;AN UNEXPECTED RK11 INTERRUPT
                                                                ;OCCURED PROBABLY DUE TO FAULTY LOGIC
```

```
                                        TS      CHECK RKCS IDE BIT - 6

                                        ;
                                        ;;*****************************************************************
                                        ;*TEST 6         CHECK RKCS SSE,EXB,FMT,IBA BITS - 8,9,10,11
                                                ;*THIS TEST CHECKS IF THE SSE, EXB, FMT & IBA BITS CAN BE WRITTEN
                                                ;*AND READ BACK CORRECTLY
                                        ;;*****************************************************************
003102  000004                        TST6:   SCOPE
003104  012701  000400                        MOV     #400,R1         ;INITIALIZE BIT TO BE WRITTEN IN RKCS
003110  013702  001250                        MOV     RKCS,R2
003114  010112                        1$:     MOV     R1,@R2          ;WRITE THAT BIT IN RKCS
003116  011200                                MOV     @R2,R0          ;GET RKCS
003120  042700  000200                        BIC     #200,R0         ;MASK CNTRL RDY BIT
003124  020100                                CMP     R1,R0           ;WAS THE READ BIT SAME AS THE
                                                                        ;WRITTEN BIT
003126  001405                                BEQ     2$              ;YES BRANCH, OTHERWISE REPORT ERROR
003130  013137  001162                        MOV     R1,$REG0        ;GET EXPTD RKCS
003134  011237  001164                        MOV     @R2,$REG1       ;GET RECVD RKCS
003140  104003                                ERROR   3               ;BIT THAT WAS WRITTEN WAS IN $REG0
                                                                        ;WAS NOT READ BACK
003142  006301                        2$:     ASL     R1              ;SHIFT TO WRITE NEXT BIT
003144  022701  010000                        CMP     #10000,R1       ;HAVE U CHECKED ALL BITS 8, 9, 10, 11
003150  001361                                BNE     1$              ;IF NOT, LOOP BACK & CHECK THE NXT BIT

                                        ;
                                        ;;*****************************************************************
                                        ;*TEST 7         CHECK READ ONLY BITS OF RKCS
                                                ;*THIS TEST CHECKS THAT TRYING TO SET THE UNUSED BIT OF THE READ ONLY
                                                ;*BITS DOES NOT SET THEM OR AFFECT ANY OTHER BITS IN RKCS
                                        ;;*****************************************************************
003152  000004                        TST7:   SCOPE
003154  013700  001250                        MOV     RKCS,R0
003160  012710  170200                        MOV     #170200,@R0     ;TRY SETTING THE UNUSED BIT & RD
                                                                        ;ONLY BITS
003164  011001                                MOV     @R0,R1          ;GET RKCS
003166  042701  010000                        BIC     #10000,R1       ;MASK BIT 12
003172  022701  000200                        CMP     #200,R1         ;IS 'RDY' BIT SET? NO OTHER
                                                                        ;BIT SHOULD BE SET.
003176  001406                                BEQ     TST10           ;;OK, EXIT
003200  012737  000200  001162                MOV     #200,$REG0      ;GET EXPCTD RKCS
003206  011037  001164                        MOV     @R0,$REG1       ;GET RKCS RECVD
003212  104004                                ERROR   4               ;TRIED TO SET UNUSED & RD ONLY BITS
                                                                        ;OF RKCS
                                                                        ;SHOULD NOT HAVE AFFECTED ANY BITS

                                        ;
                                        ;;*****************************************************************
                                        ;*TEST 10        CHECK THAT 'GO' BIT (0) CAN BE SET
                                                ;*THIS TEST CHECKS THAT THE 'GO' BIT CAN BE SET, BY PERFORMING
                                                ;*CONTROL RESET & SEEING THAT THE EXB & IBA SET PREVIOUSLY
                                                ;*WERE CLEARED.
                                        ;;*****************************************************************
003214  000004                        TST10:  SCOPE
003216  012746  000340                        MOV     #340,-(SP)
003222  012746  003230                        MOV     #64$,-(SP)
003226  000002                                RTI
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 1494  003230                          64$:
 1495  003230  013701  001250                MOV     RKCS,R1
 1496  003234  012711  007576                MOV     #7576,@R1       ;SET ALL BITS EXCEPT GO
 1497  003240  005000                        CLR     R0              ;
 1498  003242  000005                        RESET                   ;ISSUE BUS INIT
 1499  003244  022711  000200                CMP     #200,@R1        ;CHECK IF RKCS WAS CLEARED?
 1500  003250  001403                        BEQ     1$              ;YES, BRANCH OTHERWISE REPORT ERROR
 1501  003252  011137  001162                MOV     @R1,$REG0       ;GET RKCS
 1502  003256  104005                        ERROR   5               ;BUS INIT DID NOT CLEAR RKCS
 1503  003260  012711  005000          1$:   MOV     #5000,@R1       ;SET IBA & EXB IN RKCS
 1504  003264  005211                        INC     @R1             ;SET GO, CONTROL RESET
 1505  003266  005200                2$:     INC     R0              ;KEEP TIME
 1506  003270  105700                        TSTB    R0              ;HAVE U WAITED LONG FOR CNTRL RDY
 1507                                                                ;TO SET?
 1508  003272  100411                        BMI     3$              ;IF YES, BRANCH & REPORT ERROR
 1509  003274  105711                        TSTB    @R1             ;WAS CNTRL RDY SET?
 1510  003276  100373                        BPL     2$              ;IF NOT LOOP BACK & WAIT FOR IT
 1511  003300  022711  000200                CMP     #200,@R1        ;IF CNTRL RDY WAS SET, CHK IF 'CNTRL
 1512                                                                ;RESET' CLEARED IBA & EXB BITS
 1513  003304  001407                        BEQ     TST11           ;;IF YES, EXIT. OTHERWISE ERROR
 1514  003306  011137  001162                MOV     @R1,$REG0       ;GET RKCS
 1515  003312  104006                        ERROR   6               ;GO BIT COULD NOT BE SET OR FAULT IN
 1516                                                                ;THE 'INIT L' GENERATING LOGIC
 1517  003314  000403                        BR      TST11           ;;EXIT
 1518  003316  004737  005434          3$:   JSR     PC,GT3RG        ;GO, GET RKCS, ER, DS
 1519  003322  104007                        ERROR   7               ;CONTROL READY DID NOT SET AFTER
 1520                                                                ;CONTROL RESET
 1521                                  ;
 1522                                  ;;*****************************************************************
 1523                                  ;*TEST 11       CHECK RKCS WITH A COUNT PATTERN
 1524                                  ;*THIS TEST CHECKS THAT RKCS CAN BE CLEARED FROM 7576 THEN A COUNT
 1525                                  ;*PATTERN FROM 2 TO 7777 IS RUN. NOTE: ALL PATTERNS WITH BIT 0 SET
 1526                                  ;*(GO BIT) ARE AVOIDED SO THAT RK11 MAY NOT START AN UNDESIRED OPERATION.
 1527                                  ;*R1 CONTAINS THE COUNT PATTERN THAT WAS WRITTEN
 1528                                  ;;*****************************************************************
 1529  003324  000004                TST11:  SCOPE
 1530  003326  012737  000010  001206        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
 1531  003334  012746  000340                MOV     #340,-(SP)
 1532  003340  012746  003346                MOV     #64$,-(SP)
 1533  003344  000002                        RTI
 1534  003346                          64$:
 1535  003346  013700  001250                MOV     RKCS,R0
 1536  003352  012710  007576                MOV     #7576,@R0       ;SET ALL BITS IN RKCS EXCEPT GO
 1537  003356  005010                        CLR     @R0             ;CLEAR RKCS
 1538  003360  022710  000200                CMP     #200,@R0        ;WAS IT CLEARED
 1539  003364  001405                        BEQ     1$              ;YES,BRANCH
 1540  003366  010037  001162                MOV     R0,$REG0        ;GET ADRES OF RKCS
 1541  003372  011037  001164                MOV     @R0,$REG1       ;NO, GET RKCS
 1542  003376  104010                        ERROR   10              ;RKCS COULD NOT BE CLEARED
 1543  003400  012701  000002          1$:   MOV     #2,R1           ;WRITE THIS BIT IN RKCS
 1544  003404  012737  003416  001110        MOV     #2$,$LPERR
 1545  003412  012705  177773                MOV     #-5,R5
 1546  003416  010110                2$:     MOV     R1,@R0          ;WRITE IT
 1547  003420  010102                        MOV     R1,R2           ;GET BIT THAT WAS WRITTEN
 1548  003422  052702  000200                BIS     #200,R2         ;SET CNTRL RDY BIT
 1549  003426  011003                        MOV     @R0,R3
```

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1550  003430  020203                        CMP     R2,R3           ;WAS THAT BIT WRITTEN CORRECTLY?
1551  003432  001407                        BEQ     3$              ;YES, BRANCH
1552  003434  010237  001162                MOV     R2,$REGO        ;GET EXPCTD WORD
1553  003440  010337  001164                MOV     R3,$REG1        ;GET RKCS RECVD
1554  003444  104003                        ERROR   3               ;DID NOT READ BAK THE BIT THAT
1555                                                                ;WAS WRITTEN
1556  003446  005205                        INC     R5
1557  003450  001405                        BEQ     TST12           ;;EXIT
1558  003452  062701  000002        3$:     ADD     #2,R1           ;GENERATE NXT PATTERN TO BE WRITTEN
1559  003456  022701  010000                CMP     #10000,R1       ;ALL PATTERNS WRITTEN?
1560  003462  001355                        BNE     2$              ;IF NOT, LUP BAK & CHK NXT PATTERN
1561                                ;
1562                                ;;*****************************************************************
1563                                ;*TEST 12       CHECK THAT RKWC BIT 0-15 CAN BE SET
1564                                        ;*THIS TEST FLOATS A '1' THROUGH RKWC BIT 0-15 AND CHECKS THAT IT
1565                                        ;*CAN BE READ BACK CORRECTLY. R0 CONTAINS THE WORD THAT IS WRITTEN
1566                                ;;*****************************************************************
1567  003464  000004                TST12:  SCOPE
1568  003466  012700  000001                MOV     #1,R0           ;INITIALIZE R0 FOR THE BIT TO BE WRITTEN IN RKWC
1569  003472  013701  001252                MOV     RKWC,R1
1570  003476  012737  003504  001110        MOV     #1$,$LPERR      ;SET UP RETURN ADRES FOR
1571                                                                ;LUPING ON ERROR (SW 9)
1572  003504  010011                1$:     MOV     R0,@R1          ;WRITE THAT BIT IN RKWC
1573  003506  011102                        MOV     @R1,R2
1574  003510  020002                        CMP     R0,R2           ;WAS IT WRITTEN CORRECTLY
1575  003512  001405                        BEQ     2$              ;YES, BRANCH. OTHERWISE, ERROR
1576  003514  010037  001162                MOV     R0,$REGO        ;GET EXPCTD RKWC BIT THAT WAS WRITTEN
1577  003520  010237  001164                MOV     R2,$REG1        ;GET RKWC (THAT WAS READ BACK)
1578  003524  104011                        ERROR   11              ;DID NOT READ BACK THE BIT THAT
1579                                                                ;WAS WRITTEN IN RKWC
1580  003526  006300                2$:     ASL     R0              ;SHIFT TO WRITE THE NXT BIT
1581  003530  001365                        BNE     1$              ;IF ALL THE BITS HAVE NOT BEEN
1582                                                                ;DONE, LOOP BACK
1583                                ;
1584                                ;;*****************************************************************
1585                                ;*TEST 13       CHECK RKWC WITH A COUNT PATTERN
1586                                        ;*THIS TEST CHECKS THAT RKWC CAN BE CLEARED, THEN A COUNT PATTERN
1587                                        ;*FROM 0 TO 177777 IS WRITTEN & CHECKED IF IT WAS WRITTEN CORRECTLY
1588                                ;;*****************************************************************
1589  003532  000004                TST13:  SCOPE
1590  003534  012737  000010  001206        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
1591  003542  013700  001252                MOV     RKWC,R0
1592  003546  012710  177777                MOV     #177777,@R0     ;SET ALL BITS IN RKWC
1593  003552  005010                        CLR     @R0             ;CLEAR RKWC
1594  003554  005710                        TST     @R0             ;WAS IT CLEARED?
1595  003556  001405                        BEQ     1$              ;YES, BRANCH
1596  003560  010037  001162                MOV     R0,$REGO        ;GET ADRES OF RKWC
1597  003564  011037  001164                MOV     @R0,$REG1       ;NO, GET RKWC
1598  003570  104010                        ERROR   10              ;RKWC COULD NOT BE CLEARED
1599
1600  003572  005001                1$:     CLR     R1              ;INITIALIZE COUNT PATTERN
1601  003574  012705  177773                MOV     #-5,R5
1602  003600  012737  003606  001110        MOV     #2$,$LPERR
1603  003606  010110                2$:     MOV     R1,@R0          ;WRITE THE PATTERN IN THE REGISTER
1604  003610  011002                        MOV     @R0,R2
1605  003612  020102                        CMP     R1,R2           ;WAS IT WRITTEN CORRECTLY?
```

```
                                ;*13      CHECK RKWC WITH A COUNT PATTERN
                                ;
003614  001407                          BEQ     3$              ;YES, BRANCH
003616  010137  001162                  MOV     R1,$REG0        ;GET EXPECTED WORD
003622  010237  001164                  MOV     R2,$REG1        ;GET WORD THAT WAS RECVD
003626  104011                          ERROR   11              ;DID NOT READ BACK THE PATTERN THAT
                                                                ;WAS WRITTEN INTO THE REGISTER
003630  005205                          INC     R5
003632  001402                          BEQ     TST14           ;;EXIT
003634  005201                  3$:     INC     R1              ;INCREMENT COUNT PATTERN
003636  001363                          BNE     2$              ;LUP BAK & WRITE NXT PATTERN IF NOT
                                                                ;DONE WITH ALL
                                ;
                                ;;*********************************************************************
                                ;*TEST 14        CHECK THAT RKBA CAN BE SET
                                ;*THIS TEST FLOATS A '1' THROUGH RKBA BITS 0-15 AND CHECKS THAT
                                ;*IT CAN BE READ BACK CORRECTLY. R0 CONTAINS THE WORD THAT WAS
                                ;*WRITTEN.
                                ;;*********************************************************************
003640  000004                  TST14:  SCOPE
003642  012700  000001                  MOV     #1,R0           ;INITIALIZE R0 FOR BIT TO BE
                                                                ;WRITTEN IN RKBA
003646  013701  001254                  MOV     RKBA,R1
003652  012737  003660  001110          MOV     #1$,$LPERR      ;SET UP RETURN ADRES FOR
                                                                ;LUPING ON EROR (SW 12)
003660  010011                  1$:     MOV     R0,@R1          ;WRITE THAT BIT IN RKBA
003662  011102                          MOV     @R1,R2
003664  020002                          CMP     R0,R2           ;WAS IT WRITTEN CORRECTLY?
003666  001405                          BEQ     2$              ;YES, BRANCH
003670  010037  001162                  MOV     R0,$REG0        ;GET EXPCTD RKBA (BIT WRITTEN)
003674  010237  001164                  MOV     R2,$REG1        ;GET RKBA (BIT READ BACK)
003700  104013                          ERROR   13              ;DID NOT READ BACK THE BIT THAT
                                                                ;WAS WRITTEN IN RKBA
003702  006300                  2$:     ASL     R0              ;SHIFT R0, TO WRITE NEXT BIT
003704  001365                          BNE     1$              ;IF ALL BITS ARE NOT CHKD, LOOP
                                                                ;BACK & WRITE NXT BIT
                                ;
                                ;;*********************************************************************
                                ;*TEST 15        CHECK RKBA WITH A COUNT PATTERN
                                ;*THIS TEST CHECKS THAT RKBA CAN BE CLEARED, THEN IT RUNS A COUNT
                                ;*PATTERN FROM 0 TO 177777. R1 CONTAINS THE COUNT PATTERN TO BE WRITTEN
                                ;;*********************************************************************
003706  000004                  TST15:  SCOPE
003710  012737  000010  001206          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
003716  013700  001254                  MOV     RKBA,R0
003722  012710  177777                  MOV     #177777,@R0     ;SET ALL BITS IN RKBA
003726  005010                          CLR     @R0             ;CLEAR RKBA
003730  005710                          TST     @R0             ;WAS IT CLEARED?
003732  001405                          BEQ     1$              ;YES, BRANCH
003734  010037  001162                  MOV     R0,$REG0        ;GET ADRES OF RKBA
003740  011037  001164                  MOV     @R0,$REG1       ;NO, GET RKBA
003744  104010                          ERROR   10              ;RKBA COULD NOT BE CLEARED
                                
003746  005001                  1$:     CLR     R1              ;INITIALIZE COUNT PATTERN
003750  012705  177773                  MOV     #-5,R5
003754  012737  003762  001110          MOV     #2$,$LPERR
003762  010110                  2$:     MOV     R1,@R0          ;WRITE THE PATTERN IN THE
                                                                ;REGISTER
```

```
                        ;CHECK RKBA WITH A COUNT PATTERN

003764  011302                MOV     @R0,R2
003766  020102                CMP     R1,R2           ;WAS IT WRITTEN CORRECTLY
003770  001405                BEQ     3$              ;YES, BRANCH
003772  010137  001162        MOV     R1,$REG0        ;GET EXPECTED WORD
003776  011037  001164        MOV     @R0,$REG1       ;GET WORD THAT WAS RECVD
004002  104013                ERROR   13              ;DID NOT READ BACK THE PATTERN THAT
                                                      ;WAS WRITTEN INTO THE REGISTER
004004  005205                INC     R5
004006  001402                BEQ     TST16           ;;EXIT
004010  005201        3$:     INC     R1              ;INCREMENT COUNT PATTERN
004012  001363                BNE     2$              ;LUP BAK & WRITE NXT PATTERN IF NOT
                                                      ;DONE WITH ALL
                        ;
                        ;;*****************************************************************
                        ;*TEST 16       CHECK THAT RKDA CAN BE SET
                        ;*THIS TEST FLOATS A '1' THROUGH RKDA AND CHECKS THAT THE WORD WRI - ---
                        ;*WRITTEN IS READ BACK CORRECTLY
                        ;;*****************************************************************
004014  000004          ST16:   SCOPE
004016  005077  175226        CLR     @RKCS           ;CLEAR RKCS
004022  012700  000001        MOV     #1,R0           ;INITIALIZE R0 FOR BIT TO BE WRITTEN IN RKDA
004026  013701  001256        MOV     RKDA,R1
004032  012737  004040  001110        MOV     #1$,$LPERR      ;SET UP RETURN ADRES
                                                      ;FOR LUPING ON EROR
004040  010011          1$:     MOV     R0,@R1          ;WRITE THAT BIT IN RKDA
004042  011102                MOV     @R1,R2
004044  020002                CMP     R0,R2           ;WAS IT WRITTEN CORRECTLY
004046  001405                BEQ     2$              ;YES, BRANCH
004050  010037  001162        MOV     R0,$REG0        ;NO, GET EXPCTD RKDA (BIT WRITTEN
004054  010237  001164        MOV     R2,$REG1        ;GET RKDA (BIT READ BACK)
004060  104015                ERROR   15              ;DID NOT READ BACK THE BIT THAT
                                                      ;WAS WRITTEN IN RKDA
004062  006300          2$:     ASL     R0              ;SHIFT R0, TOWRITE NXT BIT
004064  001365                BNE     1$              ;IF ALL BITS ARE NOT CHKD, LOOP
                                                      ;BACK & WRITE NXT BIT
                        ;
                        ;;*****************************************************************
                        ;*TEST 17       CHECK RKDA WITH A COUNT PATTERN
                        ;*THIS TEST CHECKS THAT RKDA CAN BE CLEARED, THEN A COUNT PATTERN
                        ;*FROM 0 TO 177777 IS WRITTEN AND CHECKED. R1 CONTAINS THE COUNT
                        ;*PATTERN TO BE WRITTEN
                        ;;*****************************************************************
004066  000004          ST17:   SCOPE
004070  012737  000010  001206        MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004076  013700  001256        MOV     RKDA,R0
004102  012710  177777        MOV     #177777,@R0     ;SET ALL BITS IN RKDA
004106  005010                CLR     @R0             ;CLEAR RKDA
004110  005710                TST     @R0             ;WAS IT CLEARED?
004112  001405                BEQ     1$              ;YES, BRANCH
004114  010037  001162        MOV     R0,$REG0        ;GET ADRES OF RKDA
004120  011037  001164        MOV     @R0,$REG1       ;GO, GET RKDA
004124  104010                ERROR   10              ;RKDA COULD NOT BE CLEARED

004126  005001          1$:     CLR     R1              ;INITIALIZE COUNT PATTERN
004130  012705  177773        MOV     #-5,R5
004134  012737  004142  001110        MOV     #2$,$LPERR
```

```
                                        ;*     CHECK RKDA WITH A COUNT PATTERN

 1718  004142  010110                   2$:    MOV     R1,@R0          ;WRITE THE PATTERN IN THE REGISTER
 1719  004144  011002                           MOV     @R0,R2
 1720  004146  020102                           CMP     R1,R2           ;WAS IT WRITTEN CORRECTLY?
 1721  004150  001407                           BEQ     3$              ;YES, BRANCH
 1722  004152  010137  001162                   MOV     R1,$REG0        ;GET EXPECTED WORD
 1723  004156  010237  001164                   MOV     R2,$REG1        ;GET WORD THAT WAS RECVD
 1724  004162  104015                           ERROR   15              ;DID NOT READ BACK THE PATTERN THAT
 1725                                                                   ;WAS WRITTEN INTO THE REGISTER
 1726  004164  005205                           INC     R5
 1727  004166  001402                           BEQ     TST20           ;;EXIT
 1728  004170  005201                   3$:     INC     R1              ;INCREMENT COUNT PATTERN
 1729  004172  001363                           BNE     2$              ;LUP BAK & WRITE NXT PATTERN IF NOT
 1730                                                                   ;DONE WITH ALL
 1731
 1732                                  ;;*****************************************************************
 1733                                  ;*TEST 20       CHECK THAT RKWC,RKBA,RKDA CAN BE CLEARED BY RESET
 1734                                          ;*THIS TEST CHECKS THAT RKWC, RKBA AND RKDA CAN BE CLEARED BY BUS INIT.
 1735                                          ;*RESET INSTRUCTION IS USED
 1736                                  ;;*****************************************************************
 1737  004174  000004                   TST20:  SCOPE
 1738  004176  013700  001252                   MOV     RKWC,R0         ;INITIALIZE R0 TO PRINT TO RKWC
 1739  004202  010002                           MOV     R0,R2
 1740  004204  012701  177775                   MOV     #-3,R1          ;SET UP COUNT FOR 3 REGISTERS TO BE CHKD
 1741  004210  010103                           MOV     R1,R3
 1742  004212  012720  177777           1$:     MOV     #177777,(R0)+   ;SET ALL BITS IN RKWC
 1743  004216  005201                           INC     R1              ;       RKBA
 1744  004220  001374                           BNE     1$              ;       RKDA
 1745  004222  000005                           RESET                   ;ISSUE A BUS INIT
 1746  004224  005712                   2$:     TST     (R2)            ;WAS THE REGISTER (PTD TO BY R2) CLEARED?
 1747  004226  001405                           BEQ     3$              ;YES, BRANCH
 1748  004230  010237  001162                   MOV     R2,$REG0        ;NO, GET ADRES OF REG IS THAT WAS NOT CLEARED
 1749  004234  011237  001164                   MOV     @R2,$REG1       ;GET CONTENTS OF THAT REGISTER
 1750  004240  104017                           ERROR   17              ;RK11 REGISTER (ADRES IN R0) COULD
 1751                                                                   ;NOT BE CLEARED BY BUS INIT
 1752  004242  005722                   3$:     TST     (R2)+           ;INCREMENT POINTER TO NXT REGISTER
 1753  004244  005203                           INC     R3              ;HAVE U CHKD ALL 3 REGISTERS?
 1754  004246  001366                           BNE     2$              ;IF NOT, LOOP BACK & CHK NXT
 1755
 1756                                  ;;*****************************************************************
 1757                                  ;*TEST 21       CHECKTHAT RKCS, RKWC, RKBA, RKDA CAN BE CLEARED BY CONTROL RESET
 1758                                          ;*RKCS IS SET TO 7560, RKWC, RKBA, RKDA ARE ALL SET
 1759                                          ;*TO 177777.  CONTROL RESET IS DONE AND IT IS CHECKED
 1760                                          ;*IF ALL THESE REGISTERS ARE CLEARED.
 1761                                  ;;*****************************************************************
 1762  004250  000004                   TST21:  SCOPE
 1763  004252  012746  000340                   MOV     #340,-(SP)
 1764  004256  012746  004264                   MOV     #64$,-(SP)
 1765  004262  000002                           RTI
 1766  004264                           64$:
 1767  004264  013700  001250                   MOV     RKCS,R0
 1768  004270  012710  007560                   MOV     #7560,@R0       ;SET ALL WRITABLE BITS IN RKCS
 1769  004274  005210                           INC     @R0             ;SET GO, CONTROL RESET
 1770  004276  005005                           CLR     R5
 1771  004300  105710                   1$:     TSTB    @R0             ;DID CNTRL RDY SET?
 1772  004302  100405                           BMI     2$              ;YES, BRANCH
 1773  004304  005205                           INC     R5              ;WAITED LONG?
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1774  004306  001374                        BNE     1$                      ;IF NOT LUP BAK & WAIT
1775  004310  004737  005434                JSR     PC,GT3RG                ;GET RKCS,ER,DS
1776  004314  104007                        ERROR   7                       ;CNTRL RDY DID NOT SET
1777                                                                        ;AFTER CNTRL RESET
1778  004316  022710  000200        2$:     CMP     #200,@R0                ;DID CNTRL RESET CLEAR RKCS
1779  004322  001405                        BEQ     3$                      ;YES, BRANCH
1780  004324  010037  001162                MOV     R0,$REG0                ;GET ADRES OF RKCS
1781  004330  011037  001164                MOV     @R0,$REG1               ;GET CONTENTS OF RKCS
1782  004334  104014                        ERROR   14                      ;CONTROL RESET DID NOT CLEAR RKCS
1783  004336  013702  001252        3$:     MOV     RKWC,R2
1784  004342  010204                        MOV     R2,R4
1785  004344  012701  177777                MOV     #177777,R1
1786  004350  010122                        MOV     R1,(R2)+                ;SET ALL BITS IN RKWC
1787  004352  010122                        MOV     R1,(R2)+                ;       RKBA
1788  004354  010122                        MOV     R1,(R2)+                ;       RKDA
1789  004356  104412                        CNT.RESET                       ;GO, DO CONTROL RESET
1790                                                                        ;THIS IS A CALL FOR THE 'CNTRL-
1791                                                                        ;RESET' ROUTINE. A CONTROL RESET IS
1792                                                                        ;DONE & AFTER A CERTAIN TIME IF
1793                                                                        ;'CNTRL RDY' DOES NOT SET AN ERROR IS
1794                                                                        ;REPORTED. NOTE THAT THE PC IN ERROR
1795                                                                        ;IS THE PC WHERE CNT.RESET IS
1796                                                                        ;LOCATED. THIS IS A VERY BASIC ERROR &
1797                                                                        ;IF IT OCCURS GO BACK TO TEST 10.
1798  004360  012703  177775                MOV     #-3,R3
1799  004364  005714                4$:     TST     (R4)                    ;WAS THE REGISTER CLEARED?
1800  004366  001405                        BEQ     5$                      ;YES, BRANCH
1801  004370  010437  001162                MOV     R4,$REG0                ;GET ADRES OF REGISTER IN ERROR
1802  004374  011437  001164                MOV     @R4,$REG1               ;GET CONTENTS OF THAT REGISTER
1803  004400  104014                        ERROR   14                      ;CONTROL RESET DID NOT CLEAR THE
1804                                                                        ;REGISTER WHOOSE ADRES IS IN R4
1805  004402  005724                5$:     TST     (R4)+                   ;INCREMENT POINTER TO NXT REGISTER
1806  004404  005203                        INC     R3                      ;CHKD ALL REGS?
1807  004406  001366                        BNE     4$                      ;IF NOT, LUP BAK & CHK THE NXT REG
1808
1809                                ;;*****************************************************************
1810                                ;*TEST 22       CHECK THAT EACH RK11 REGISTER IS UNIQUELY ADRESSED
1811                                        ;*THIS TEST CHECKS THAT EACH RK11 REGISTER CAN BE UNIQUELY ADDRESSED
1812                                        ;*1) RKCS RKWC, RKBA, RKDA ARE FIRST SET TO 177777 (17576 FOR RKCS)
1813                                        ;*2) REGISTER WHOOSE ADDRESS IS IN R0 IS CLEARED
1814                                        ;*3) EVERY OTHER REGISTER IS CHECKED FOR ERRONEOUS CLEARING BECAUSE OF
1815                                        ;*ADDRESSING ERROR. IF SO THE MULTIPLE ADRESSING ERROR IS REPORTED
1816                                        ;*4) ADDRESS IN R0 IS CHANGED TO THE NEXT REGISTER & THE PROCESS IS
1817                                        ;*   REPEATED.
1818                                ;;*****************************************************************
1819  004410  000004                T$T22:  SCOPE
1820  004412  012746  000340                MOV     #340,-(SP)
1821  004416  012746  004424                MOV     #64$,-(SP)
1822  004422  000002                        RTI
1823  004424                        64$:
1824  004424  012705  177771                MOV     #-7,R5                  ;SET UP COUNT FOR THE # OF
1825                                                                        ;REGISTERS TO BE UNIQELY ADDRSD
1826  004430  013700  001244                MOV     RKDS,R0                 ;INITIALIZE POINTER TO REGIS TO BE SET
1827  004434  012701  177774        1$:     MOV     #-4,R1
1828  004440  013702  001250                MOV     RKCS,R2
1829  004444  012722  017576                MOV     #17576,(R2)+            ;SET BITS IN RKCS
```

```
1830  004450  012722  177777          2$:     MOV     #177777,(R2)+   ;SET BITS IN RKWC
1831  004454  005201                          INC     R1              ;       RKBA
1832  004456  001374                          BNE     2$              ;       RKDA
1833                                                                  ;       RKMR IF RK11C
1834  004460  005010                          CLR     @R0             ;CLEAR REGISTER (WHOSE ADDR IS IN RC
1835  004462  013702  001250                  MOV     RKCS,R2
1836  004466  020002                          CMP     R0,R2           ;WAS THE CLEARED REGISTER RKCS?
1837  004470  001406                          BEQ     3$              ;YES
1838                                                                  ;NO-CHECK IF IT WAS INADVERTENTLY
1839  004472  011203                          MOV     @R2,R3          ;CLEARED BECAUSE OF ADDRESSING
1840  004474  042703  170200                  BIC     #170200,R3      ;ERROR
1841  004500  022703  007576                  CMP     #7576,R3
1842  004504  001020                          BNE     6$              ;IF SO, REPORT ERROR
1843  004506  005722                  3$:     TST     (R2)+           ;INCREMENT POINTER TO NEXT REGISTER
1844  004510  012701  177775                  MOV     #-3,R1          ;SET COUNT FOR 3 REGISTERS
1845  004514  020200                  4$:     CMP     R2,R0           ;WAS THE CLEARED REGISTER SAME AS
1846                                                                  ;THE REGISTER POINTED TO BY R2
1847  004516  001404                          BEQ     5$              ;YES
1848                                                                  ;NO, CHECK IF THE REGIS UNDER TEST
1849                                                                  ;(POINTED BY R2) WAS INADVERTENTLY
1850                                                                  ;CLEARED WHEN CLEARING THE  REGIS
1851                                                                  ;POINTED TO BY R0, DUE TO
1852                                                                  ;ADDRESSING ERROR
1853  004520  011203                          MOV     @R2,R3          ;GET CONTENTS OF REGIS BEING CHECKED
1854  004522  010304                          MOV     R3,R4           ;FOR INADVERTENT CLEARING
1855  004524  005104                          COM     R4              ;CHECK IF ANY BIT WAS ERRORNEOUSLY CLEARED
1856  004526  001007                          BNE     6$              ;IF SO, REPORT ERROR
1857  004530  005722                  5$:     TST     (R2)+           ;INCRMENT PTR TO NEXT REGISTER
1858  004532  005201                          INC     R1              ;INCRMENT COUNT
1859  004534  001367                          BNE     4$              ;CHECK THE REST
1860                                                                  ;
1861  004536  005720                          TST     (R0)+           ;INCREMENT PTR TO THE NXT REGIS TO  BE CLEARED
1862  004540  005205                          INC     R5              ;HAVE ALL THE REGIS BEEN CHECKED
1863  004542  001334                          BNE     1$              ;IF NOT, LOOP BACK
1864  004544  000415                          BR      TST23           ;;EXIT, IF DONE
1865  004546  010037  001162          6$:     MOV     R0,$REG0        ;GET ADRES OF REGISTER THAT WAS
1866                                                                  ;TRIED TO REFERENCE
1867  004552  010237  001164                  MOV     R2,$REG1        ;GET ADRES OF REGISTER THAT GOT
1868                                                                  ;REFERENCED INSTEAD
1869  004556  011037  001166                  MOV     @R0,$REG2       ;GET CONTENTS OF REG THAT WAS
1870                                                                  ;ADDRESED & MEANT TO BE CLEARED
1871  004562  010337  001170                  MOV     R3,$REG3        ;GET CONTENTS OF REGISTER THAT GOT
1872                                                                  ;CHANGED INSTEAD
1873  004566  104020                          ERROR   20              ;POSSIBLE ADRESING ERROR. TRIED
1874                                                                  ;ADRESING RK11 REGISTER, ANOTHER ONE
1875                                                                  ;GOT ADRESED. REGIS IN R0 WAS THE
1876                                                                  ;ADRESED ONE, REG IN R2
1877                                                                  ;WAS THE ONE THAT GOT ADRESED INSTEAD
1878  004570  023702  001250                  CMP     RKCS,R2
1879  004574  001744                          BEQ     3$              ;RETURN TO THE
1880  004576  000754                          BR      5$              ;RIGHT POINT
1881                                  ;;**************************************************************
1882                                  ;*TEST 23        CHECK THAT HI & LO BYTES OF RKCS CAN BE ADDRESSED
1883                                          ;*THIS TEST CHECKS THAT THE HI & LO BYTES OF RKCS CAN BE
1884                                          ;*ADDRESSED CORRECTLY.
1885                                          ;*BITS IN ALL REGISTERS THAT CAN BE WRITTEN ARE SET. THEN EAC-
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                                ;*BYTE OF RKCS IS REFERENCED BY 'CLRB' & IT IS CHECKED THAT ONLY
                                ;*THAT BYTE & NO OTHER REGISTER BYTE GETS CLEARED
                        ;;**************************************************************
004600  000004          TST23:  SCOPE
004602  012702  177776          MOV     #-2,R2          ;SET COUNT FOR 2BYTES-HI & LO
004606  012700  177775          MOV     #-3,R0          ;SET COUNT
004612  012746  000340          MOV     #340,-(SP)
004616  012746  004624          MOV     #64$,-(SP)
004622  000002                  RTI
004624                  64$:
004624  013701  001250          MOV     RKCS,R1         ;INITIALIZE PTR. TO RKCS
004630  012721  007576          MOV     #7576,(R1)+     ;SET ALL BITS IN RKCS
004634  012721  177777  1$:     MOV     #177777,(R1)+   ;SET ALL BITS IN RKWC
004640  005200                  INC     R0              ;                RKBA
004642  001374                  BNE     1$              ;                RKDA
004644  013701  001250          MOV     RKCS,R1         ;INITIALIZE PTR TO RKCS LO BYTE
004650  105011          2$:     CLRB    @R1             ;CLER RKCS LO OR HI BYTE
004652  010104                  MOV     R1,R4
004654  017703  174370          MOV     @RKCS,R3        ;GET RKCS WORD
004660  022702  177776          CMP     #-2,R2          ;R U CHKING HI OR LO BYTE?
004664  001011                  BNE     3$              ;BRANCH IF HI BYTE
004666  042703  177600          BIC     #177600,R3      ;MASK HI BYTE
004672  001417                  BEQ     4$              ;OK IF LO BYTE WAS CLEARED
004674  005037  001162          CLR     $REG0           ;GET EXPCTD RKCS.
004700  010337  001164          MOV     R3,$REG1        ;GET RKCS RECVD, LO BYTE
004704  104022                  ERROR   22              ;ALL RK11 REGISTER'S WERE LOADED WITH
                                                        ;1'S THEN TRIED TO ADRES & CLR RKCS
                                                        ;LO BYTE, IT COULD NOT BE CLEARED.
004706  000411                  BR      4$
004710  042703  000377  3$:     BIC     #377,R3         ;MASK LO BYTE
004714  001406                  BEQ     4$              ;OK IF HI BYTE WAS CLEARED
004716  005037  001162          CLR     $REG0           ;GET EXPCTD RKCS, HI BYTE
                                                        ;GET WHAT WAS ACTUALLY RECVD
004722  000303                  SWAB    R3
004724  010337  001164          MOV     R3,$REG1
004730  104023                  ERROR   23              ;ALL RK11 REGISTER'S WERE LOADED WITH
                                                        ;1'S THEN TRIED TO ADRES & CLR RKCS
                                                        ;HI BYTE IT COULD NOT BE CLEARED.
004732  012700  177774  4$:     MOV     #-4,R0          ;INITIALIZE COUNT FOR REST OF REGISTERS
004736  013705  001250          MOV     RKCS,R5         ;INITIALIZE POINTER TO RKCS
004742  005725          5$:     TST     (R5)+           ;INCREMENT PTR TO NXT REGIS
004744  005200                  INC     R0              ;ALL REGS DONE?
004746  001417                  BEQ     6$              ;IF YES, GO & ADRES TO CLEAR RKCS HI BYTE
004750  011503                  MOV     @R5,R3          ;IF NOT, GET CONTENTS OF THE REGIS
                                                        ;BEING CHKD
004752  005103                  COM     R3              ;COMPLEMENT THE CONTENTS, SHOULD BE
                                                        ;0 FOR IT WAS
004754  001772                  BEQ     5$              ;PREVIOUSLY SET TO ALL 1'S IF IT'S
                                                        ;0 BRANCH, IF NOT REPORT ERROR
004756  010137  001162          MOV     R1,$REG0        ;GET RKCS-BYTE-ADRES WHICH WAS TRIED
                                                        ;TO ADRES
004762  010537  001164          MOV     R5,$REG1        ;GET ADRES OF REGIS WHICH GOT ADRESED
                                                        ;INSTEAD
004766  012737  177777  001166  MOV     #177777,$REG2   ;GET EXPCTD CONTENTS OF REGISTER
                                                        ;THAT GO ADRESED
004774  005103                  COM     R3              ;GET CONTENTS RECVD FROM THAT REGIS
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1942  004776  010337  001170                MOV     R3,$REG3
1943  005002  104024                        ERROR   24              ;ALL RK11 REGISTERS WERE LOADED
1944                                                                ;WITH 1'S.  RKCS
1945                                                                ;BYTE (ADRES UNDER 'BYTE' IN ER
1946                                                                ;MSGE) WAS ADRESED
1947                                                                ;USING 'CLRB', BUT REGISTER (ADRES
1948                                                                ;UNDER 'REGIS' IN
1949                                                                ;ER MSG) GOT CHANGED AS A RESULT.
1950  005004  000756                        BR      5$
1951  005006  005201                6$:     INC     R1              ;POSITION PTR TO RKCS HI BYTE
1952  005010  005202                        INC     R2              ;CHK IF BOTH HI & LO BYTES (RKCS)
1953                                                                ;WERE CLEARED
1954  005012  001316                        BNE     2$              ;IF NOT BRANCH BACK
1955                                        ;
1956                                        ;;*****************************************************************
1957                                        ;*TEST 24       CHECK THAT HI & LO BYTES OF RKWC,BA,DA CAN BE ADDRESSED
1958                                                ;*THIS TEST CHECKS THAT BYTE OPERATIONS ON RKWC, RKBA & RKDA CAN BE DONE
1959                                                ;*CORRECTLY. FIRST RKWC, RKCS, RKBA, RKDA ARE SET TO 177777.
1960                                                ;*1) REGISTER BYTE POINTED TO BY R2 IS CLEARED USING 'CLRB'
1961                                                ;*2) IT IS CHECKED THAT ONLY THAT BYTE AND NO OTHER BYTES GET CLEARED
1962                                                ;*3) POINTER R2 IS INCREMENTED TO THE NEXT REGISTER-BYTE & THE PROCESS
1963                                                ;*IS REPEATED. LO BYTE IS DONE FIRST, THEN HI-BYTE IS DONE.
1964                                        ;;*****************************************************************
1965  005014  000004                TST24:  SCOPE
1966  005016  012746  000340                MOV     #340,-(SP)
1967  005022  012746  005030                MOV     #64$,-(SP)
1968  005026  000002                        RTI
1969  005030                        64$:
1970  005030  012704  177772                MOV     #-6,R4          ;SET UP COUNT FOR 6 REG-BYTES TO BE ADRESED
1971  005034  013702  001252                MOV     RKWC,R2         ;INITIALIZE POINTER TO RKWC
1972  005040  012700  177775        1$:     MOV     #-3,R0
1973  005044  013701  001250                MOV     RKCS,R1
1974  005050  012721  007576                MOV     #7576,(R1)+     ;SET RKCS BITS
1975  005054  012721  177777        2$:     MOV     #177777,(R1)+   ;     RKWC
1976  005060  005200                        INC     R0              ;        RKBA
1977  005062  001374                        BNE     2$              ;        RKDA
1978
1979  005064  105012                        CLRB    @R2             ;ADDRESS & CLEAR REGIS BYTE UNDER TEST
1980
1981  005066  010200                        MOV     R2,R0
1982  005070  042700  000001                BIC     #1,R0           ;CONVERT THE BYTE ADRES INTO WORD
1983                                                                ;ADRES THAT IT BELONGS TO
1984  005074  011001                        MOV     @R0,R1          ;GET THE ENTIRE REGIS WRD
1985  005076  032702  000001                BIT     #1,R2           ;WAS THE CLRD BYTE HI OR LO?
1986  005102  001003                        BNE     3$              ;WAS HI, BRANCH
1987  005104  042701  177400                BIC     #177400,R1      ;WAS LO-MASK HI BYTE
1988  005110  000402                        BR      4$
1989  005112  042701  000377        3$:     BIC     #377,R1         ;MASK LO BYTE
1990  005116  001411                4$:     BEQ     5$              ;WAS THE ADDRESSED BYTE CLEARED? BR IF YES
1991  005120  010237  001162                MOV     R2,$REG0        ;GET ADRES OF REG-BYTE THAT WAS
1992                                                                ;TRIED TO B ADRESED & CLEARED
1993  005124  032702  000001                BIT     #1,R2
1994  005130  001401                        BEQ     11$
1995  005132  000301                        SWAB    R1
1996  005134  010137  001164        11$:    MOV     R1,$REG1        ;GET CONTENTS OF REG-BYTE
1997  005140  104025                        ERROR   25              ;TRIED TO ADRES & CLR A REGISTER BYTE
```

```
                                                                ;(ADRES UNDER 'REG-BYTE' IN ER MSGE). COULD
                                                                ;NOT CLEAR IT.
005142  017701  174102          5$:   MOV     @RKCS,R1          ;
005146  022701  007776                CMP     #7776,R1          ;WAS RKCS ERRONEOUSLY CLRD?
005152  001410                        BEQ     6$                ;NO, BRANCH
005154  010237  001162                MOV     R2,$REG0          ;GET ADRES OF REG-BYTE THAT WAS
                                                                ;TRIED TO B ADRESED & CLEARED.
005160  012737  007776  001164        MOV     #7776,$REG1       ;GET EXPCTD RKCS
005166  010137  001166                MOV     R1,$REG2          ;GET RKCS RECVD
005172  104016                        ERROR   16                ;ALL RK11 REGISTRS WERE LOADED WITH 1'S
                                                                ;TRIED TO ADRES & CLR 'REGIS-BYTE' (IN ER MSGE)
                                                                ;RKCS GOT CHANGED AS A RESULT.  '(RKCS)EXP'
                                                                ;CONTAINS EXPCTD RKCS.  'RKCS (RECVD)' CONTAINS
                                                                ;RKCS RECVD.
005174  012700  177772          6$:   MOV     #-6,R0            ;SET COUNT FOR BYTES
005200  013701  001252                MOV     RKWC,R1           ;INITIALIZE PTR TO RKWC
005204  020102                  7$:   CMP     R1,R2             ;WAS THE CLEARED BYTE (PTD TO BY R2)
                                                                ;SAME AS BYTE TO BE CHKD (PTD TO BY R1)?
005206  001433                        BEQ     10$               ;IF YES, DO NOT CHK THIS BYTE
005210  010105                        MOV     R1,R5
005212  042705  000001                BIC     #1,R5             ;STRIP WORD ADDRESS FROM BYTE ADDRS
005216  011503                        MOV     @R5,R3
005220  032701  000001                BIT     #1,R1             ;IS THE BYTE TO B CHKD LO OR HI BYTE?
005224  001003                        BNE     8$                ;HI BYTE-BRANCH
005226  042703  177400                BIC     #177400,R3        ;MASK HI BYTE
005232  000402                        BR      9$
005234  042703  000377          8$:   BIC     #377,R3           ;MASK LO BYTE
005240  001016                9$:   BNE     10$
005242  010237  001162                MOV     R2,$REG0          ;GET ADRES OF REG-BYTE THAT WAS
                                                                ;TRIED TO B ADRESED & CLEARED
005246  010137  001164                MOV     R1,$REG1          ;GET ADRS OF REG-BYTE THAT GOT
                                                                ;ADRESED INSTEAD
005252  012737  000377  001166        MOV     #377,$REG2        ;GET EXPCTD CONTENTS OF REG-BYTE
                                                                ;THAT GOT ADRESED
005260  032701  000001                BIT     #1,R1
005264  001401                        BEQ     12$
005266  000303                        SWAB    R3
005270  010337  001170          12$:  MOV     R3,$REG3          ;GET CONTENTS RECVD FOR THAT REG-BYTE
005274  104021                        ERROR   21                ;ALL RK11 REGISTRS WERE LOADED WITH 1'S.
                                                                ;TRIED TO ADRES & CLR 'REG-BYT1' (IN ER MSGE)
                                                                ;'REG-BYT2' GOT CHANGD AS A RESULT.
                                                                ;'BYT2-EXPCT' (IN ER MSGE) IS THE EXPCTD CONTENTS
                                                                ;OF REG-BYT2.  'BYT2-RECVD' IS THE CONTENTS RECVD.
005276  005201          10$:  INC     R1                        ;INCREMENT PTR TO NXT REG BYTE
005300  005200                INC     R0                        ;ALL BYTES CHKD?
005302  001340                BNE     7$                        ;NO, LOOP BACK
005304  005202                INC     R2                        ;INCREMENT PTR TO NXT REG BYTE TO B CLRD
005306  005204                INC     R4                        ;ALL BYTES CLRD?
005310  001253                BNE     1$                        ;LOOP BACK


                          .SBTTL  END OF PASS ROUTINE

                          ;;*****************************************************************
```

```
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                        ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO START1

005312                                  $EOP:
005312  000004                                  SCOPE
005314  005037  001102                          CLR     $TSTNM          ;;ZERO THE TEST NUMBER
005320  005037  001206                          CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
005324  005237  001100                          INC     $PASS           ;;INCREMENT THE PASS NUMBER
005330  042737  100000  001100                BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
005336  005327                                  DEC     (PC)+           ;;LOOP?
005340  000001                          $EOPCT: .WORD   1
005342  003022                                  BGT     $DOAGN          ;;YES
005344  012737                                  MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
005346  000001                          $ENDCT: .WORD   1
005350  005340                                  $EOPCT
005352  104401  005417                          TYPE    ,$ENDMG         ;;TYPE "END PASS #"
005356  013746  001100                          MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
005362  104405                                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
005364  104401  005414                          TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
005370  013700  000042                  $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
005374  001403                                  BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
005376  000005                                  RESET                   ;;CLEAR THE WORLD
005400  004710                          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
005402  000240                                  NOP                     ;;SAVE ROOM
005404  000240                                  NOP                     ;;FOR
005406  000240                                  NOP                     ;;ACT11
005410                                  $DOAGN:
005410  000137                                  JMP     @(PC)+          ;;RETURN
005412  002110                          $RTNAD: .WORD   START1
005414     377     377     000          $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
005417     015  042412  042116          $ENDMG: .ASCIZ  <15><12>/END PASS #/
005424  050040  051501  020123
005432  000043
```

```
                                        .SBTTL  GT3RG:  ROUTINE FOR GETTING RKCS, RKER, RKDS

                                        ;GT3RG
                                        ;SUBROUTINE FOR TRANSFERRING THE CONTENTS OF RKCS, RKER, RKDS
                                        ;TO  $REG0, $REG1, $REG2 RESPECTIVELY BEFORE TYPING OUT AN
                                        ;ERROR MESSAGE.
                                        ;CALL:  JSR     PC,GT3RG

005434  017737  173610  001162  GT3RG:  MOV     @RKCS,$REG0     ;GET RKCS
005442  017737  173600  001164          MOV     @RKER,$REG1     ;GET RKER
005450  017737  173570  001166          MOV     @RKDS,$REG2     ;GET RKDS
005456  000207                          RTS     PC              ;EXIT FROM THIS SUBROUTINE
```

```
                                        .SBTTL  GT4RG:  ROUTINE FOR GETTING RKCS, RKER, RKDS, RKDA

                                ;GT4RG
                                ;SUBROUTINE FOR TRANSFERRING CONTENTS OF RKCS, RKER, RKDS
                                ;RKDA TO $REG0, $REG1, $REG2, $REG3 RESPECTIVELY BEFORE
                                ;TYPING OUT AN ERROR MESSAGE.
                                ;CALL:  JSR     PC,GT4RG
005460  004737  005434          GT4RG:  JSR     PC,GT3RG
005464  017737  173566  001170          MOV     @RKDA,$REG3
005472  000207                          RTS     PC

                                        .SBTTL  DELAY:  TIME DELAY ROUTINE

                                ;DELAY
                                ;THIS ROUTINE PROVIDES  A VARIABLE TIME DELAY. THE CALL FOR THIS
                                ;ROUTINE IS AN ENCODED 'TRAP' INSTRUCTION.
                                ;CALL:          DELAY   ,N      N IS ANY OCTAL NO. FROM 1 TO 177777
                                ;THE DELAY PROVIDED IS 7.5N US (CONVERT N TO DECIMAL) FOR 11/20
                                ;1.5N US FOR 11/45
                                ;IF THE USER WANTS TO CHANGE THE DELAY TIME (EXMP: SHORTER DELAY TO
                                ;GET A TIGHTER SCOPE LOOP) THE VARIABLE 'N' FOLLOWING 'DELAY' SHOULD
                                ;BE CHANGED TO SUIT THE INDIVIDUAL NEED.

005474  017637  000000  001264  DELAY:  MOV     @(SP)+,TIMER    ;GET 'AMOUNT' (N) FOR WHICH
005502  062716  000002                  ADD     #2,(SP)         ;DELAY IS TO BE PROVIDED
                                                                ;ADJUST STACK POINTER TO SKIP OVER 'N'
005506  005337  001264          1$:     DEC     TIMER           ;COUNT DOWN TO 0
005512  001375                          BNE     1$
005514  000002                          RTI                     ;RETURN TO MAIN PROGRAM

                                        .SBTTL  CON.RESET:      CONTROL REST ROUTINE

                                ;CON.RESET
                                ;THIS ROUTINE ISSUES A CONTROL RESET AND WAITS FOR
                                ;THE 'CNTRL RDY' FLAG TO SET.  WHEN THE FLAG SETS
                                ;AN EXIT IS MADE OUT OF THE ROUTINE.  IF 'CNTRL-RDY'
                                ;DOES NOT SET WITHIN A CERTAIN TIME AN ERROR MESSAGE
                                ;       CNT RDY DIDN'T SET
                                ;       PC=XXXXXX RKCS=YYYYYY
                                ;IS GIVEN. NOTE THAT XXXXXX IS THE PC WHERE 'CNT.RESET' OR 'CNT.RDY'
                                ;IS CALLED.

                                ;CALL:  CNT.RESET

                                        .SBTTL  CNT.RDY:        WAIT FOR CONTROL READY ROUTINE
```

```
                                        ;CN.RDY
                                        ;THIS ROUTINE WAITS FOR THE CONTROL READY BIT TO SET AND WHEN IT
                                        ;SETS EXITS OUT. IF WITHIN A CERTAIN TIME CNTRL RDY DOES
                                        ;NOT SET AN ERROR IS REPORTED. WAITING TIME IS 883 MS FOR 11/20
                                        ;175 MS FOR 11/45 WITH BIPOLAR MEMORY.
                                        ;CALL:  CNT.RDY
005516  012777  000001  173524  CN.RST: MOV     #1,@RKCS        ;ISSUE A CONTROL RESET
005524  012737  177500  001170          MOV     #-300,$REG3     ;SET UP COUNT
005532  000402                          BR      CN.RDY+4                ;SKIP OVER CN.RDY
005534  005037  001170          CN.RDY: CLR     $REG3
005540  105777  173504          1$:     TSTB    @RKCS           ;DID CNTRL-RDY SET?
005544  100435                          BMI     3$              ;YES, EXIT
005546  005237  001170                  INC     $REG3           ;WAITED LONG?
005552  001372                          BNE     1$              ;IF NOT, GO BAK & WAIT
005554  032777  020000  173356  2$:     BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
005562  001026                          BNE     3$              ;IF YES, SKIP TYPEOUT
005564  104401                          TYPE
005566  001216                          MSG3
005570  104401  005576                  TYPE    ,65$            ;;TYPE ASCIZ STRING
005574  000403                          BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <15><12>"PC="
005604                                  64$:
005604  011646                          MOV     (SP),-(SP)
005606  162716  000002                  SUB     #2,(SP)
005612  104402                          TYPOC                   ;GO TYPE PC IN THE MAIN PROGRAM.
                                                                ; WHERE ERROR OCCURRED
005614  104401  005622                  TYPE    ,67$            ;;TYPE ASCIZ STRING
005620  000404                          BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  " RKCS="
005632                                  66$:
005632  017746  173412                  MOV     @RKCS,-(SP)     ;GET RKCS
005636  104402                          TYPOC                   ;GO TYPE IT

005640  000002          3$:     RTI                             ;RETURN FROM THIS
                                                                ;ROUTINE TO THE MAIN
                                                                ;PROGRAM


                                ;THIS PART OF THE PROGRAM CONTAINS THE COMMON ROUTINES CALLED
                                ;FROM THE SYSMAC.SML PACKAGE
                                ;

                                .SBTTL  SCOPE HANDLER ROUTINE

                                ;;**************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:3
                                ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW11=1         INHIBIT ITERATIONS
                                ;*SW09=1         LOOP ON ERROR
                                ;*SW08=1         LOOP ON TEST IN SWR<7:0>
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=ICT
```

```
2222  005642                                  $SCOPE:
2223  005642  104407                                  CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
2224  005644  032777  040000  173266  1$:     BIT     #BIT14,@SWR             ;;LOOP ON PRESENT TEST?
2225  005652  001111                          BNE     $OVER                   ;;YES IF SW14=1
2226                                          ;*****START OF CODE FOR THE XOR TESTER*****
2227  005654  000416                          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
2228                                                                          ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
2229  005656  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
2230  005662  012737  005702  000004                  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
2231  005670  005737  177060                          TST     @#177060        ;;TIME OUT ON XOR?
2232  005674  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
2233  005700  000463                          BR      $SVLAD                  ;;GO TO THE NEXT TEST
2234  005702  022626                          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
2235  005704  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
2236  005710  000423                          BR      7$                      ;;LOOP ON THE PRESENT TEST
2237  005712                                  6$:;*****END OF CODE FOR THE XOR TESTER*****
2238  005712  032777  000400  173220                  BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
2239  005720  001404                          BEQ     2$                      ;;BR IF NO
2240  005722  127737  173212  001102                  CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
2241  005730  001462                          BEQ     $OVER                   ;;BR IF YES
2242  005732  105737  001103          2$:     TSTB    $ERFLG                  ;;HAS AN ERROR OCCURRED?
2243  005736  001421                          BEQ     3$                      ;;BR IF NO
2244  005740  123737  001115  001103                  CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
2245  005746  101015                          BHI     3$                      ;;BR IF NO
2246  005750  032777  001000  173162                  BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
2247  005756  001404                          BEQ     4$                      ;;BR IF NO
2248  005760  013737  001110  001106  7$:     MOV     $LPERR,$LPADR           ;;SET LOOP ADDRESS TO LAST SCOPE
2249  005766  000443                          BR      $OVER
2250  005770  105037  001103          4$:     CLRB    $ERFLG                  ;;ZERO THE ERROR FLAG
2251  005774  005037  001206                  CLR     $TIMES                  ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
2252  006000  000415                          BR      1$                      ;;ESCAPE TO THE NEXT TEST
2253  006002  032777  004000  173130  3$:     BIT     #BIT11,@SWR            ;;INHIBIT ITERATIONS?
2254  006010  001011                          BNE     1$                      ;;BR IF YES
2255  006012  005737  001100                  TST     $PASS                   ;;IF FIRST PASS OF PROGRAM
2256  006016  001406                          BEQ     1$                      ;;      INHIBIT ITERATIONS
2257  006020  005237  001104                  INC     $ICNT                   ;;INCREMENT ITERATION COUNT
2258  006024  023737  001206  001104          CMP     $TIMES,$ICNT            ;;CHECK THE NUMBER OF ITERATIONS MADE
2259  006032  002021                          BGE     $OVER                   ;;BR IF MORE ITERATION REQUIRED
2260  006034  012737  000001  001104  1$:     MOV     #1,$ICNT                ;;REINITIALIZE THE ITERATION COUNTER
2261  006042  013737  006112  001206          MOV     $MXCNT,$TIMES           ;;SET NUMBER OF ITERATIONS TO DO
2262  006050  105237  001102          $SVLAD: INCB    $TSTNM                  ;;COUNT TEST NUMBERS
2263  006054  011637  001106                  MOV     (SP),$LPADR             ;;SAVE SCOPE LOOP ADDRESS
2264  006060  011637  001110                  MOV     (SP),$LPERR             ;;SAVE ERROR LOOP ADDRESS
2265  006064  005037  001210                  CLR     $ESCAPE                 ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
2266  006070  112737  000001  001115          MOVB    #1,$ERMAX               ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
2267  006076  013777  001102  173036  $OVER:  MOV     $TSTNM,@DISPLAY         ;;DISPLAY TEST NUMBER
2268  006104  013716  001106                  MOV     $LPADR,(SP)             ;;FUDGE RETURN ADDRESS
2269  006110  000002                          RTI                             ;;FIXES PS
2270  006112  000050                  $MXCNT: 50                              ;;MAX. NUMBER OF ITERATIONS
2271
2272
2273                                          ;;******************************************************************************
2274
2275                                          .SBTTL  ERROR HANDLER ROUTINE
2276
2277                                          ;*SW15=1        HALT ON ERROR
```

```
                                        ;*SW13=1        INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1        BELL ON ERROR
                                        ;*SW09=1        LOOP ON ERROR
                                        ;*SW12=1        CYCLE ON ERROR TO PREVIOUS 'SCOPE'
                                        ;*GO TO @ERRTYP ON ERROR

006114  104407                 $ERROR: CKSWR                           ;CHECK FOR SOFTWARE SWITCH ENTRY REQUEST
006116  105237  001103          6$:     INCB    $ERFLG                  ;SET THE ERROR FLAG
006122  001775                          BEQ     7$                      ;DON'T LET THE FLAG GO TO ZERO
006124  013777  001102  173010          MOV     $TSTNM,@DISPLAY         ;DISPLAY TEST NUMBER AND ERROR FLAG
006132  005237  001112          1$:     INC     $ERTTL                  ;COUNT THE NUMBER OF ERRORS
006136  011637  001116                  MOV     (SP),$ERRPC             ;GET ADDRESS OF ERROR INSTRUCTION
006142  162737  000002  001116          SUB     #2,$ERRPC
006150  117737  172742  001114          MOVB    @$ERRPC,$ITEMB          ;STRIP AND SAVE THE ERROR ITEM CODE
006156  032777  020000  172754          BIT     #SW13,@$SWR             ;SKIP TYPEOUT IF SET
006164  001004                          BNE     2$                      ;SKIP TYPEOUTS
006166  004737  006264                  JSR     PC,@#$ERRTYP            ;GO TO USER ERROR ROUTINE
006172  104401  001213                  TYPE    ,$CRLF
006176  023737  000042  000046  2$:     CMP     @#42,@#46               ;ARE WE IN ACT11 AUTOMATIC MODE?
006204  001403                          BEQ     .+10                    ;IF YES, HALT ON ERROR
006206  005777  172726                  TST     @$SWR                   ;HALT ON ERROR
006212  100002                          BPL     3$                      ;SKIP IF CONTINUE
006214  000000                          HALT                            ;HALT ON ERROR!
006216  104407                          CKSWR                           ;CHECK FOR SOFTWARE SWITCH ENTRY REQUEST
006220  032777  010000  172712  3$:     BIT     #SW12,@$SWR             ;SW 12 SET?
006226  001402                          BEQ     .+6                     ;NO, BRANCH
006230  013716  001106                  MOV     $LPADR,(SP)             ;ADJUST RETURN ADRES FOR SW12
006234  032777  001000  172676          BIT     #SW09,@$SWR             ;LOOP ON ERROR SWITCH SET?
006242  001402                          BEQ     4$                      ;BR IF NO
006244  013716  001110                  MOV     $LPERR,(SP)             ;FUDGE RETURN FOR LOOPING
006250  005737  001210          4$:     TST     $ESCAPE                 ;CHECK FOR AN ESCAPE ADDRESS
006254  001402                          BEQ     5$                      ;BR IF NONE
006256  013716  001210                  MOV     $ESCAPE,(SP)            ;FUDGE RETURN ADDRESS FOR ESCAPE
006262  000002                  5$:     RTI                             ;RETURN

                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

                                ;;**************************************************************
                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHIC-
                                ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" $ERRTB ,
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

006264                  $ERRTYP:
006264  104401  001213          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
006270  010046                  MOV     R0,-(SP)        ;;SAVE R0
006272  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
006274  153700  001114          BISB    @#$ITEMB,R0
006300  001004                  BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
006302  013746  001116          MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
006306  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS
006310  000426                  BR      5$              ;;GET OUT
006312  005300          1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WI--
006314  006300                  ASL     R0              ;;        WORK FOR THE ERROR TABLE
006316  006300                  ASL     R0
```

```
                        006320  006300                  ASL     R0
                        006322  062700  001272          ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
                        006326  012037  006336          MOV     @R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
                        006332  001404                  BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
                        006334  104401                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
                        006336  000000          2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
                        006340  104401  001213          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
                        006344  012037  006354  3$:     MOV     @(R0)+,4$       ;;PICKUP "DATA HEADER" POINTER
                        006350  001404                  BEQ     5$              ;;SKIP TYPEOUT IF 0
                        006352  104401                  TYPE                    ;;TYPE THE "DATA HEADER"
                        006354  000000          4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
                        006356  104401  001213          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
                        006362  011000          5$:     MOV     @(R0),R0        ;;PICKUP "DATA TABLE" POINTER
                        006364  001004                  BNE     7$              ;;GO TYPE THE DATA
                        006366  012600          6$:     MOV     (SP)+,R0        ;;RESTORE R0
                        006370  104401  001213          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
                        006374  000207                  RTS     PC              ;;RETURN
                        006376                  7$:
                        006376  013046                  MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
                        006400  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII,ALL DIGITS
                        006402  005710                  TST     (R0)            ;;IS THERE ANOTHER NUMBER?
                        006404  001770                  BEQ     6$              ;;BR IF NO
                        006406  104401  006414          TYPE    ,8$             ;;TYPE TWO(2) SPACES
                        006412  000771                  BR      7$              ;;LOOP
                        006414  020040      040 8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
                        006420                          .EVEN

                                                .SBTTL  TTY INPUT ROUTINE

                                                ;;**********************************************************************
                                                .ENABL  LSB

                                                ;;**********************************************************************
                                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                                ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                                ;*WHEN OPERATING IN TTY FLAG MODE.
  006420  022737  000176  001140  $CKSWR: CMP     #$SWREG,SWR     ;;IS THE SOFT-SWR SELECTED?
  006426  001074                  BNE     15$             ;;BRANCH IF NO
  006430  105777  172510          TSTB    @$TKS           ;;CHAR THERE?
  006434  100071                  BPL     15$             ;;IF NO, DON'T WAIT AROUND
  006436  117746  172504          MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
  006442  042716  177600          BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
  006446  022726  000007          CMP     #7,(SP)+        ;;IS IT A CONTROL G?
  006452  001062                  BNE     15$             ;;NO, RETURN TO USER
  006454  123727  001134  000001  CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
  006462  001456                  BEQ     15$             ;;BRANCH IF YES
                                  
  006464  104401  007145          TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G ^G
  006470  104401  007152  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
  006474  013746  000176          MOV     $SWREG,-(SP)    ;;SAVE SWREG FOR TYPEOUT
  006500  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII,ALL DIGITS
  006502  104401  007163          TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
  006506  005046          19$:    CLR     -(SP)           ;;CLEAR COUNTER
  006510  005046                  CLR     -(SP)           ;;THE NEW SWR
  006512  105777  172426  7$:     TSTB    @$TKS           ;;CHAR THERE?
```

H04


```
006516  100375                           BPL     7$               ;;IF NOT TRY AGAIN

006520  117746  172422                   MOVB    @$TKB,-(SP)      ;;PICK UP CHAR
006524  042716  177600                   BIC     #^C177,(SP)      ;;MAKE IT 7-BIT ASCII



006530  021627  000025           9$:     CMP     (SP),#25         ;;IS IT A CONTROL-U?
006534  001005                           BNE     10$              ;;BRANCH IF NOT
006536  104401  007140                   TYPE    ,$CNTLU          ;;YES, ECHO CONTROL-U (^U)
006542  062706  000006           20$:    ADD     #6,SP            ;;IGNORE PREVIOUS INPUT
006546  000757                           BR      19$              ;;LET'S TRY IT AGAIN


006550  021627  000015           10$:    CMP     (SP),#15         ;;IS IT A <CR>?
006554  001022                           BNE     16$              ;;BRANCH IF NO
006556  005766  000004                   TST     4(SP)            ;;YES, IS IT THE FIRST CHAR?
006562  001403                           BEQ     11$              ;;BRANCH IF YES
006564  016677  000002  172346           MOV     2(SP),@SWR       ;;SAVE NEW SWR
006572  062706  000006           11$:    ADD     #6,SP            ;;CLEAR UP STACK
006576  104401  001213           14$:    TYPE    ,$CRLF           ;;ECHO <CR> AND <LF>
006602  123727  001135  000001           CMPB    $INTAG,#1        ;;RE-ENABLE TTY KBD INTERRUPTS?
006610  001003                           BNE     15$              ;;BRANCH IF NOT
006612  012777  000100  172324           MOV     #100,@STKS       ;;RE-ENABLE TTY KBD INTERRUPTS
006620  000002                   15$:    RTI                      ;;RETURN
006622  004737  007344           16$:    JSR     PC,$TYPEC        ;;ECHO CHAR
006626  021627  000060                   CMP     (SP),#60         ;;CHAR < 0?
006632  002420                           BLT     18$              ;;BRANCH IF YES
006634  021627  000067                   CMP     (SP),#67         ;;CHAR > 7?
006640  003015                           BGT     18$              ;;BRANCH IF YES
006642  042726  000060                   BIC     #60,(SP)+        ;;STRIP-OFF ASCII
006646  005766  000002                   TST     2(SP)            ;;IS THIS THE FIRST CHAR
006652  001403                           BEQ     17$              ;;BRANCH IF YES
006654  006316                           ASL     (SP)             ;;NO, SHIFT PRESENT
006656  006316                           ASL     (SP)             ;;    CHAR OVER TO MAKE
006660  006316                           ASL     (SP)             ;;    ROOM FOR NEW ONE.
006662  005266  000002           17$:    INC     2(SP)            ;;KEEP COUNT OF CHAR
006666  056616  177776                   BIS     -2(SP),(SP)      ;;SET IN NEW CHAR
006672  000707                           BR      7$               ;;GET THE NEXT ONE
006674  104401  001212           18$:    TYPE    ,$QUES           ;;TYPE ?<CR><LF>
006700  000720                           BR      20$              ;;SIMULATE CONTROL-U
                                 .DSABL  LSB



                                 ;;*******************************************************************
                                 ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                 ;*CALL:
                                 ;*       RDCHR                    ;;INPUT A SINGLE CHARACTER FROM THE TTY
                                 ;*       RETURN HERE              ;;CHARACTER IS ON THE STACK
                                 ;*                                ;;WITH PARITY BIT STRIPPED OFF
                                 ;

006702  011646                   $RDCHR: MOV     (SP),-(SP)       ;;PUSH DOWN THE PC
006704  016666  000004  000002           MOV     4(SP),2(SP)      ;;SAVE THE PS
006712  105777  172226           1$:     TSTB    @STKS            ;;WAIT FOR
006716  100375                           BPL     1$               ;;A CHARACTER
```

```
2446  006720  117766  172222  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
2447  006726  042766  177600  000004          BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
2448  006734  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
2449  006742  001013                          BNE     3$              ;;BRANCH IF NO
2450  006744  105777  172174          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
2451  006750  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
2452  006752  117746  172170                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
2453  006756  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
2454  006762  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
2455  006766  001366                          BNE     2$              ;;IF NOT DISCARD IT
2456  006770  000750                          BR      1$              ;;YES, RESUME
2457  006772  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
2458  007000  002407                          BLT     4$              ;;BRANCH IF YES
2459  007002  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
2460  007010  003003                          BGT     4$              ;;BRANCH IF YES
2461  007012  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
2462  007020  000002          4$:             RTI                     ;;GO BACK TO USER
2463                                          ;;**************************************************************
2464                                          ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
2465                                          ;*CALL:
2466                                          ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
2467                                          ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
2468                                          ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
2469
2470  007022  010346          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
2471  007024  012703  007130  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
2472  007030  022703  007140  2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
2473  007034  101405                  BLOS    4$              ;;BR IF YES
2474  007036  104410                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
2475  007040  112613                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
2476  007042  122713  000177  10$:     CMPB    #177,(R3)       ;;IS IT A RUBOUT
2477  007046  001003                  BNE     3$              ;;SKIP IF NOT
2478  007050  104401  001212  4$:     TYPE    ,$QUES          ;;TYPE A '?'
2479  007054  000763                  BR      1$              ;;CLEAR THE BUFFER AND LOOP
2480  007056  111337  007126  3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
2481  007062  104401  007126          TYPE    ,9$
2482  007066  122723  000015          CMPB    #15,(R3)+       ;;CHECK FOR RETURN
2483  007072  001356                  BNE     2$              ;;LOOP IF NOT RETURN
2484  007074  105063  177777          CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
2485  007100  104401  001214          TYPE    ,$LF            ;;TYPE A LINE FEED
2486  007104  012603                  MOV     (SP)+,R3        ;;RESTORE R3
2487  007106  011646                  MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
2488  007110  016666  000004  000002  MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
2489  007116  012766  007130  000004  MOV     #$TTYIN,4(SP)
2490  007124  000002                  RTI                     ;;RETURN
2491  007126     000          9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
2492  007127     000                  .BYTE   0               ;;TERMINATOR
2493  007130  000010          $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
2494  007140  052536  005015     000  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
2495  007145     136  006507  000012  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
2496  007152  005015  053523  020122  $MSWR:  .ASCIZ  <15><12>/SWR = /
2497  007160  020075     000
2498  007163     040  047040  053505  $MNEW:  .ASCIZ  /  NEW = /
2499  007170  036440  000040
2500
2501                                  .SBTTL  TYPE ROUTINE
```

```
2502
2503                            ;:*****************************************************************
2504                            ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
2505                            ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
2506                            ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
2507                            ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
2508                            ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
2509                            ;*
2510                            ;*CALL:
2511                            ;*1) USING A TRAP INSTRUCTION
2512                            ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
2513                            ;*OR
2514                            ;*      TYPE
2515                            ;*      MESADR
2516                            ;*
2517
2518  007174  105737  001157    $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
2519  007200  100002                    BPL     1$              ;;BR IF YES
2520  007202  000000                    HALT                    ;;HALT HERE IF NO TERMINAL
2521  007204  000407                    BR      3$              ;;LEAVE
2522  007206  010046            1$:     MOV     R0,-(SP)        ;;SAVE R0
2523  007210  017600  000002            MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
2524  007214  112046            2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
2525  007216  001005                    BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
2526  007220  005726                    TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
2527  007222  012600            60$:    MOV     (SP)+,R0        ;;RESTORE R0
2528  007224  062716  000002    3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
2529  007230  000002                    RTI                     ;;RETURN
2530  007232  122716  000011    4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
2531  007236  001430                    BEQ     8$
2532  007240  122716  000200            CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
2533  007244  001006                    BNE     5$
2534  007246  005726                    TST     (SP)+           ;;POP  <CR><LF> EQUIV
2535  007250  104401                    TYPE                    ;;TYPE A CR AND LF
2536  007252  001213                    $CRLF
2537  007254  105037  007410            CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
2538  007260  000755                    BR      2$              ;;GET NEXT CHARACTER
2539  007262  004737  007344    5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
2540  007266  123726  001156    6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
2541  007272  001350                    BNE     2$              ;;IF NO GO GET NEXT CHAR.
2542  007274  013746  001154            MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
2543                                                            ;;AND THE NULL CHAR.
2544  007300  105366  000001    7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
2545  007304  002770                    BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
2546  007306  004737  007344            JSR     PC,$TYPEC       ;;GO TYPE A NULL
2547  007312  105337  007410            DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
2548  007316  000770                    BR      7$              ;;LOOP
2549
2550                            ;HORIZONTAL TAB PROCESSOR
2551
2552  007320  112716  000040    8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
2553  007324  004737  007344    9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
2554  007330  132737  000007  007410    BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
2555  007336  001372                    BNE     9$              ;;TAB STOP
2556  007340  005726                    TST     (SP)+           ;;POP SPACE OFF STACK
2557  007342  000724                    BR      2$              ;;GET NEXT CHARACTER
```

```
2558  007344  105777  171600          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
2559  007350  100375                          BPL     $TYPEC
2560  007352  116677  000002  171572          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG
2561  007360  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
2562  007366  001003                          BNE     1$              ;;BRANCH IF NO
2563  007370  105037  007410                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
2564  007374  000406                          BR      $TYPEX          ;;EXIT
2565  007376  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
2566  007404  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
2567  007406  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
2568  007410  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
2569  007412  000207          $TYPEX: RTS     PC
2570
2571
2572                                  .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
2573
2574                                  ;;**********************************************************************
2575                                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
2576                                  ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
2577                                  ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
2578                                  ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
2579                                  ;*REPLACED WITH SPACES.
2580                                  ;*CALL:
2581                                  ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
2582                                  ;*      TYPDS                   ;;GO TO THE ROUTINE
2583
2584  007414                          $TYPDS:
2585  007414  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
2586  007416  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
2587  007420  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
2588  007422  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
2589  007424  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
2590  007426  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
2591  007432  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
2592  007436  100004                          BPL     1$              ;;BR IF INPUT IS POS.
2593  007440  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
2594  007442  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
2595  007450  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
2596  007452  012703  007630                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
2597  007456  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
2598  007462  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
2599  007464  016001  007620                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
2600  007470  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
2601  007472  002402                          BLT     4$              ;;BR IF DONE
2602  007474  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
2603  007476  000774                          BR      3$
2604  007500  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
2605  007502  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
2606  007504  001002                          BNE     5$              ;;FALL THROUGH IF 0
2607  007506  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
2608  007510  100407                          BMI     7$              ;;BR IF YES
2609  007512  106316                  5$:     ASLB    (SP)            ;;MSD?
2610  007514  103003                          BCC     6$              ;;BR IF NO
2611  007516  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
2612  007524  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
2613  007530  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
```

```
 2614  007534  1.3223                          MOVB    R2,(R3 +        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
 2615  007536  005720                          TST     (R0)+           ;;JUST INCREMENTING
 2616  007540  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
 2617  007544  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
 2618  007546  003002                          BGT     8$              ;;GO TO EXIT
 2619  007550  010502                          MOV     R5,R2           ;;GET THE LSD
 2620  007552  000764                          BR      6$              ;;GO CHANGE TO ASCII
 2621  007554  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
 2622  007556  100003                          BPL     9$              ;;BR IF NO
 2623  007560  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
 2624  007566  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
 2625  007570  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 2626  007572  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 2627  007574  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 2628  007576  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 2629  007600  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 2630  007602  104401  007630                  TYPE    $DBLK           ;;NOW TYPE THE NUMBER
 2631  007606  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 2632  007614  012616                          MOV     (SP)+,(SP)
 2633  007616  000002                          RTI                     ;;RETURN TO USER
 2634  007620  023420                  $DTBL:  10000.
 2635  007622  001750                          1000.
 2636  007624  000144                          100.
 2637  007626  000012                          10.
 2638  007630  000004                  $DBLK:  .BLKW   4
 2639
 2640                                          .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
 2641
 2642                                          ;;**************************************************************
 2643                                          ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
 2644                                          ;*OCTAL (ASCII) NUMBER AND TYPE IT.
 2645                                          ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
 2646                                          ;*CALL:
 2647                                          ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
 2648                                          ;*      TYPOS                   ;;CALL FOR TYPEOUT
 2649                                          ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
 2650                                          ;*      .BYTE   M               ;;M=1 OR 0
 2651                                          ;*                                      ;;1=TYPE LEADING ZEROS
 2652                                          ;*                                      ;;0=SUPPRESS LEADING ZEROS
 2653                                          ;*
 2654                                          ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
 2655                                          ;*$TYPOS OR $TYPOC
 2656                                          ;*CALL:
 2657                                          ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
 2658                                          ;*      TYPON                   ;;CALL FOR TYPEOUT
 2659                                          ;*
 2660                                          ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
 2661                                          ;*CALL:
 2662                                          ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
 2663                                          ;*      TYPOC                   ;;CALL FOR TYPEOUT
 2664
 2665  007640  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
 2666  007644  116637  000001  013063          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
 2667  007652  112637  010065                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
 2668  007656  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
 2669  007662  000406                          BR      $TYPON
```

```
2670  007664  112737  000001  010063  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
2671  007672  112737  000006  010065          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
2672  007700  112737  000005  010062  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
2673  007706  010346                          MOV     R3,-(SP)        ;;SAVE R3
2674  007710  010446                          MOV     R4,-(SP)        ;;SAVE R4
2675  007712  010546                          MOV     R5,-(SP)        ;;SAVE R5
2676  007714  113704  010065                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
2677  007720  005404                          NEG     R4
2678  007722  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
2679  007726  110437  010064                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
2680  007732  113704  010063                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
2681  007736  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
2682  007742  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
2683  007744  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
2684  007746  000404                          BR      3$              ;;GO DO MSB
2685  007750  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
2686  007752  006105                          ROL     R5
2687  007754  006105                          ROL     R5
2688  007756  010503                          MOV     R5,R3
2689  007760  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
2690  007762  105337  010064                  DECB    $OMODE          ;;TYPE THIS DIGIT?
2691  007766  100016                          BPL     7$              ;;BR IF NO
2692  007770  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
2693  007774  001002                          BNE     4$              ;;TEST FOR 0
2694  007776  005704                          TST     R4              ;;SUPPRESS THIS 0?
2695  010000  001403                          BEQ     5$              ;;BR IF YES
2696  010002  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
2697  010004  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2698  010010  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2699  010014  110337  010060                  MOVB    R3,8$           ;;SAVE FOR TYPING
2700  010020  104401  010060                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
2701  010024  105337  010062          7$:     DECB    $OCNT           ;;COUNT BY 1
2702  010030  003347                          BGT     2$              ;;BR IF MORE TO DO
2703  010032  002402                          BLT     6$              ;;BR IF DONE
2704  010034  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2705  010036  000744                          BR      2$              ;;GO DO THE LAST DIGIT
2706  010040  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
2707  010042  012604                          MOV     (SP)+,R4        ;;RESTORE R4
2708  010044  012603                          MOV     (SP)+,R3        ;;RESTORE R3
2709  010046  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2710  010054  012616                          MOV     (SP)+,(SP)
2711  010056  000002                          RTI                     ;;RETURN
2712  010060     000          8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2713  010061     000                  .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2714  010062     000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
2715  010063     000          $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
2716  010064  000000          $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
2717
2718                          .SBTTL  TRAP DECODER
2719
2720                          ;;**************************************************************
2721                          ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
2722                          ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
2723                          ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
2724                          ;*GO TO THAT ROUTINE.
2725
```

```
2726  010066  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
2727  010070  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
2728  010074  005740                          TST     -(R0)           ;;BACKUP BY 2
2729  010076  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
2730  010100  006300                          ASL     R0              ;;POSITION FOR INDEXING
2731  010102  016000  010122                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
2732  010106  000200                          RTS     R0              ;;GO TO ROUTINE
2733
2734
2735                                  ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
2736
2737  010110  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
2738  010112  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
2739  010120  000002                          RTI                     ;;RESTORE THE PSW
2740
2741                                  .SBTTL  TRAP TABLE
2742
2743                                  ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
2744                                  ;*BY THE "TRAP" INSTRUCTION.
2745
2746                                  ;       ROUTINE
2747                                  ;       -------
2748  010122  010110                  $TRPAD: .WORD   $TRAP2
2749  010124  007174                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
2750  010126  007664                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
2751  010130  007640                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
2752  010132  007700                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
2753  010134  007414                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
2754
2755  010136  006470                          $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING
2756
2757  010140  006420                          $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
2758  010142  006702                          $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
2759  010144  007022                          $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
2760
2761  010146  005516                          CN.RST  ;;CALL=CNT.RESET        TRAP+12(104412) CONTROL RESET ROUTINE
2762
2763  010150  005534                          CN.RDY  ;;CALL=CNT.RDY  TRAP+13(104413) WAIT FOR CNTRL RDY TO SET
2764
2765  010152  005474                          DELA.Y  ;;CALL=DELAY    TRAP+14(104414) TIME DELAY ROUTINE
2766
2767
2768                                  .SBTTL  POWER DOWN AND UP ROUTINES
2769
2770                                  ;;*****************************************************************
2771                                  ;POWER DOWN ROUTINE
2772  010154  012737  010320  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
2773  010162  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
2774  010170  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
2775  010172  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
2776  010174  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
2777  010176  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
2778  010200  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
2779  010202  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
2780  010204  017746  170730                  MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
2781  010210  010637  010324                  MOV     SP,$SAVR6       ;;SAVE SP
```

```
                                                        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
                                                        HALT
                                                        BR      .-2              ;;HANG UP

                                                ;;*****************************************************************
                                                ;POWER UP ROUTINE
                                                $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
                                                        MOV     $SAVR6,SP        ;;GET SP
                                                        CLR     $SAVR6           ;;WAIT LOOP FOR THE TTY
                                                1$:     INC     $SAVR6           ;;WAIT FOR THE INC
                                                        BNE     1$               ;;OF  WORD
                                                        MOV     (SP)+,@SWR       ;;POP STACK INTO @SWR
                                                        MOV     (SP)+,R5         ;;POP STACK INTO R5
                                                        MOV     (SP)+,R4         ;;POP STACK INTO R4
                                                        MOV     (SP)+,R3         ;;POP STACK INTO R3
                                                        MOV     (SP)+,R2         ;;POP STACK INTO R2
                                                        MOV     (SP)+,R1         ;;POP STACK INTO R1
                                                        MOV     (SP)+,R0         ;;POP STACK INTO R0
                                                        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
                                                        MOV     #340,@#PWRVEC+2  ;;PRIO:7
                                                        TYPE                     ;REPORT THE POWER FAILURE
                                                $PWRMG: .WORD   $POWER           ;;POWER FAIL MESSAGE POINTER
                                                        MOV     (PC)+,(SP)       ;;RESTART AT PFSTRT
                                                $PWRAD: .WORD   PFSTRT           ;;RESTART ADDRESS
                                                        RTI
                                                $ILLUP: HALT                     ;;THE POWER UP SEQUENCE WAS STARTED
                                                        BR      .-2              ;; BEFORE THE POWER DOWN WAS COMPLETE
                                                $SAVR6: 0                        ;;PUT THE SP HERE
                                                $POWER: .ASCIZ  <15><12>"POWER"

                                                        .EVEN

                                                ;ERROR MESSAGES

                                                        .SBTTL  ERROR MESSAGES

                                                EM1:    .ASCIZ  /TIME OUT ON RK11 REGISTER

                                                EM2:    .ASCIZ  /REGISTER NOT CLEARED

                                                EM3:    .ASCIZ  /RKCS ERROR

                                                EM4:    .ASCIZ  /RKCS ERROR-ON WRITING READ ONLY BITS
```

```
2838  010474     000
2839
2840  010475     102  051525  044440  EM5:    .ASCIZ  BUS INIT DID NOT CLEAR RKCS/
2841  010502  044516  020124  044504
2842  010510  020104  047516  020124
2843  010516  046103  040505  020122
2844  010524  045522  051503     000
2845
2846  010531     103  052116  046122  EM6:    .ASCIZ  /CNTRL RESET DIDN'T CLEAR RKCS, ON SETING 'GO'
2847  010536  051040  051505  052105
2848  010544  042040  042111  023516
2849  010552  020124  046103  040505
2850  010560  020122  045522  051503
2851  010566  020054  047117  051440
2852  010574  052105  047111  020107
2853  010602  043447  023517     000
2854
2855  010607     103  052116  046122  EM7:    .ASCIZ  /CNTRL RDY DIDN'T SET AFTER CNTRL RESET
2856  010614  051040  054504  042040
2857  010622  042111  023516  020124
2858  010630  042523  020124  043101
2859  010636  042524  020122  047103
2860  010644  051124  020114  042522
2861  010652  042523  000124
2862
2863  010656  042522  044507  052123  EM10:   .ASCIZ  /REGISTER NOT CLEARED/
2864  010664  051105  047040  052117
2865  010672  041440  042514  051101
2866  010700  042105     000
2867
2868  010703     122  052513  020103  EM11:   .ASCIZ  /RKWC ERROR/
2869  010710  051105  047522  000122
2870
2871
2872  010716  045522  040502  042440  EM13:   .ASCIZ  /RKBA ERROR/
2873  010724  051122  051117     000
2874
2875  010731     103  052116  046122  EM14:   .ASCIZ  /CNTRL RESET DIDN'T CLEAR REGISTER
2876  010736  051040  051505  052105
2877  010744  042040  042111  023516
2878  010752  020124  046103  040505
2879  010760  020122  042522  044507
2880  010766  052123  051105     000
2881
2882  010773     122  042113  020101  EM15:   .ASCIZ  /RKDA ERROR/
2883  011000  051105  047522  000122
2884
2885  011006  052502  020123  047111  EM17:   .ASCIZ  /BUS INIT DIDN'T CLR REGISTR/
2886  011014  052111  042040  042111
2887  011022  023516  020124  046103
2888  011030  020122  042522  044507
2889  011036  052123  000122
2890
2891  011042  042101  051104  051505  EM20:   .ASCIZ  /ADDRESSING ERROR-TRIED TO ADDRESS REGI, GOT REGI
2892  011050  044523  043516  042440
2893  011056  051122  051117  052055
```

```
2894  011064  044522  042105  052040
2895  011072  020117  042101  051104
2896  011100  051505  020123  042522
2897  011106  030507  020054  047503
2898  011114  020124  042522  031107
2899  011122     000
2900
2901  011123     104  042111  023516  EM22:   .ASCIZ  /DIDN'T CLEAR RKCS LOW BYTE/
2902  011130  020124  046103  040505
2903  011136  020122  045522  051503
2904  011144  046040  053517  041040
2905  011152  052131  000105
2906
2907  011156  044504  047104  052047  EM23:   .ASCIZ  /DIDN'T CLEAR RKCS HIGH BYTE/
2908  011164  041440  042514  051101
2909  011172  051040  041513  020123
2910  011200  044510  044107  041040
2911  011206  052131  000105
2912
2913  011212  051124  042511  020104  EM24:   .ASCIZ  /TRIED TO CLEAR RKCS 'BYTE', CHANGED 'REGIS'/
2914  011220  047524  041440  042514
2915  011226  051101  051040  041513
2916  011234  020123  041047  052131
2917  011242  023505  020054  044103
2918  011250  047101  042507  020104
2919  011256  051047  043505  051511
2920  011264  000047
2921
2922  011266  040506  046111  042105  EM25:   .ASCIZ  /FAILED TO CLEAR 'REG-BYTE'/
2923  011274  052040  020117  046103
2924  011302  040505  020122  051047
2925  011310  043505  041055  052131
2926  011316  023505     000
2927
2928  011321     122  041513  020123  EM26:   .ASCIZ  /RKCS ALTERED ON CLEARING 'REG-BYTE'/
2929  011326  046101  042524  042522
2930  011334  020104  047117  041440
2931  011342  042514  051101  047111
2932  011350  020107  051047  043505
2933  011356  041055  052131  023505
2934  011364     000
2935
2936  011365     124  044522  042105  EM27:   .ASCIZ  /TRIED TO CLEAR 'REG-BYTE', CHANGED 'REG-BYTE'/
2937  011372  052040  020117  046103
2938  011400  040505  020122  051047
2939  011406  043505  041055  052131
2940  011414  023461  020054  044103
2941  011422  047101  042507  020104
2942  011430  051047  043505  041055
2943  011436  052131  023462     000
2944
2945  011443     125  042516  050130  EM43:   .ASCIZ  /UNEXPECTED RK11 INTERRUPT
2946  011450  041505  042524  020104
2947  011456  045522  030461  044440
2948  011464  052116  051105  052522
2949  011472  052120     000
```

```
                        011476                          .EVEN
                                                        .SBTTL  ERROR DATA POINTERS
011476  001116  001162  000000  DT1:    .WORD   $ERRPC,$REG0,0
011504  001116  001162  001164  DT2:    .WORD   $ERRPC,$REG0,$REG1,0
011512  000000
011514  001116  001162  001164  DT20:   .WORD   $ERRPC,$REG0,$REG1,$REG2,$REG3,0
011522  001166  001170  000000
011530  001116  000000          DT21:   .WORD   $ERRPC,0
011534  001116  001162  001164  DT25:   .WORD   $ERRPC,$REG0,$REG1,$REG2,0
011542  001166  000000


                                                        .SBTTL  ERROR HEADERS
011546  020040  041520  020040  DH1:    .ASCIZ  /  PC   REG-ADDR
011554  051040  043505  040455
011562  042104  000122
011566  020040  041520  020040  DH2:    .ASCIZ     PC   REGADD    RECVD
011574  051040  043505  042101
011602  020104  020040  051040
011610  041505  042126     000
011615     040  050040  020103  DH4:    .ASCIZ     PC    EXPCT   RECVD
011622  020040  042440  050130
011630  052103  020040  051040
011636  041505  042126     000
011643     040  050040  020103  DH3:    .ASCIZ     PC    WROTE   READ
011650  020040  053440  047522
011656  042524  020040  051040
011664  040505  000104
011670  020040  041520  020040  DH5:    .ASCIZ     PC    RECVD/
011676  020040  042522  053103
011704  000104
011706  020040  041520  020040  DH11:   .ASCIZ  /  PC    WROTE   READ
011714  020040  051127  052117
011722  020105  020040  042522
011730  042101     000
011733     040  050040  000103  DH21:   .ASCIZ  /  PC/
011740  020040  041523  020040  DH20:   .ASCIZ     PC    REG1     REG2    (REG1)  (REG2
011746  020040  042522  030507
011754  020040  020040  051040
011762  043505  020062  020040
```

```
3006  011770  051050  043505  024461
3007  011776  020040  051050  043505
3008  012004  024462     000
3009
3010  012007     040  050040  020103  DH24:   .ASCIZ    PC     BYTE   REGIS (REG)EXP (REG)RECVD)
3011  012014  020040  020040  054502
3012  012022  042524  020040  051040
3013  012030  043505  051511  024040
3014  012036  042522  024507  054105
3015  012044  020120  051050  043505
3016  012052  051051  041505  042126
3017  012060     000
3018
3019  012061     040  050040  020103  DH25:   .ASCIZ    PC   REG-BYTE RECVD)
3020  012066  020040  042522  026507
3021  012074  054502  042524  051040
3022  012102  041505  042126     000
3023
3024  012107     040  050040  020103  DH26:   .ASCIZ    PC   REG-BYT  (CS)EXP (CS)RECVD)
3025  012114  020040  042522  026507
3026  012122  054502  020124  024040
3027  012130  051503  042451  050130
3028  012136  024040  051503  051051
3029  012144  041505  042126     000
3030
3031  012151     040  050040  020103  DH27:   .ASCIZ    PC    R-BYT1  R-BYT2  2-EXPCT 2-RECVD)
3032  012156  020040  051040  041055
3033  012164  052131  020061  051040
3034  012172  041055  052131  020062
3035  012200  031040  042455  050130
3036  012206  052103  031040  051055
3037  012214  041505  042126     000
3038
3039  012221     040  050040  020103  DH3C:   .ASCIZ    PC     RKCS    RKER    RKDS)
3040  012226  020040  020040  045522
3041  012234  051503  020040  020040
3042  012242  045522  051105  020040
3043  012250  020040  045522  051504
3044  012256     000
3045
3046
3047
3048          000001:                    .END
```

```
$ADDIN  002212
$ADTMC  002126
$$$$    = 000001
$$IT00  = 000001
$$IT01  = 000002
$$IT02  = 000004
$$IT03  = 000010
$$IT04  = 000020
$$IT05  = 000040
$$IT06  = 000100
$$IT07  = 000200
$$IT08  = 000400
$$IT09  = 001000
$$IT1   = 000002
$$IT10  = 002000
$$IT11  = 004000
$$IT12  = 010000
$$IT13  = 020000
$$IT14  = 040000
$$IT15  = 100000
$$IT2   = 000004
$$IT3   = 000010
$$IT4   = 000020
$$IT5   = 000040
$$IT6   = 000100
$$IT7   = 000200
$$IT8   = 000400
$$IT9   = 001000
$BPTVEC= 000014
$CKSWR  = 104407
$CNT.RD= 104413
$CNT.RE= 104412
$CN.RDY  005534
$CN.RST  005516
$CR     = 000015
$CRLF   = 000200
$DCISP  = 177570
$DELAY  = 104414
$DELA.Y  005474
$DH1     011546
$DH11    011706
$DH2     011566
$DH20    011740
$DH21    011733
$DH24    012007
$DH25    012061
$DH26    012107
$DH27    012151
$DH3     011643
$DH3C    012222
$DH4     011615
$DH5     011670
$DISP_A  001142
$DISPRE  000174
$DSWR   = 177570
$DT1     011476
$DT2     011504
$DT20    011514
$DT21    011530
$DT26    011534
$EMTVEC= 000030
$EM1     010336
$EM10    010656
$EM11    010703
$EM13    010716
$EM14    010731
$EM15    010773
$EM17    011006
$EM2     010370
$EM20    011042
$EM22    011123
$EM23    011156
$EM24    011212
$EM25    011266
$EM26    011321
$EM27    011355
$EM3     010415
$EM4     010430
$EM43    011443
$EM5     010475
$EM6     010531
$EM7     010607
$ERRVEC= 000004
$FTITLE  001262
$GTSWR  = 104406
$GT3RG   005434
$GT4RG   005460
$HT     = 000011
$IOTVEC= 000020
$LF     = 000012
$MSG3    001216
$PFSTRT  002316
$PIRQ   = 177772
$PIRQVE= 000240
$PR0    = 000000
$PR1    = 000040
$PR2    = 000100
$PR3    = 000140
$PR4    = 000200
$PR5    = 000240
$PR6    = 000300
$PR7    = 000340
$PS     = 177776
$PSW    = 177776
$PWRVEC= 000024
$RDCHR  = 104410
$RD_IN  = 104411
$RESVEC= 000010
$RKBA    001254
$RKCS    001250
$RKDA    001256
$RKDB    001260
$RKDS    001244
$RKER    001246
$RKPRI   001266
$RKVEC   001270
$RKWC    001252
$R6     =%000006
$R7     =%000007
$STACK  = 001100
$START   001542
$START1  002110
$STKLMT= 177774
$SWR     001140
$SWREG   000176
$SW0    = 000001
$SW00   = 000001
$SW01   = 000002
$SW02   = 000004
$SW03   = 000010
$SW04   = 000020
$SW05   = 000040
$SW06   = 000100
$SW07   = 000200
$SW08   = 000400
$SW09   = 001000
$SW1    = 000002
$SW10   = 002000
$SW11   = 004000
$SW12   = 010000
$SW13   = 020000
$SW14   = 040000
$SW15   = 100000
$SW2    = 000004
$SW3    = 000010
$SW4    = 000020
$SW5    = 000040
$SW6    = 000100
$SW7    = 000200
$SW8    = 000400
$SW9    = 001000
$TBITVE= 000014
$TIMER   001264
$TIMOUT  002466
$TKVEC  = 000060
$TPVEC  = 000064
$TRAPVE= 000034
$TRTVEC= 000014
$ST1     002362
$ST10    003214
$ST11    003324
$ST12    003464
$ST13    003532
$ST14    003640
$ST15    003706
$ST16    004014
$ST17    004066
$ST2     002504
$ST20    004174
$ST21    004250
$ST22    004410
$ST23    004600
$ST24    005014
$ST3     002570
$ST4     002650
$ST5     002730
$ST6     003102
$ST7     003152
$TYPDS  = 104405
$TYPE   = 104401
$TYPOC  = 104402
$TYPON  = 104404
$TYPOS  = 104403
$T1      002412
$AUTOB   001134
$BDADR   001122
$BDDAT   001126
$CHARC   007410
$CKSWR   006420
$CMTAG   001100
$CM1    = 000012
$CM2    = 000024
$CM3    = 000012
$CNTLG   007145
$CNTLU   007140
$CRLF    001213
$DBLK    007630
$DOAGN   005410
$DTBL    007620
$ENDAD   005400
$ENDCT   005346
$ENDMG   005417
$ENULL   005414
$EOP     005312
$EOPCT   005340
$ERFLG   001103
$ERMAX   001115
$ERROR   006114
$ERRPC   001116
$ERRTB   001272
$ERRTY   006264
$ERTTL   001113
$ESCAP   002210
$FILEC   001156
$FILES   001155
$GCADR   001120
$GCDAT   001124
$GET42   005370
$GTSWR   006470
$HC     = 000000
$ICNT    001104
$ILLUP   010320
$INTAG   001135
$ITEMB   001114
$LF      001214
$LPADR   001106
$LPERR   001110
$MNEW    007163
$MSWR    007152
$MXCNT   006112
$NULL    001154
$NWTST= 000001
$OCNT    010062
$OMODE   010064
$OVER    006076
$PASS    001100
$POWER   010326
$PWRAC   010314
$PWRDN   010154
$PWRMG   010310
$PWRUP   010226
$QUES    001212
$RDCHR   006702
$RDLIN   007022
$RDSZ   = 000010
$REGAD   001160
$REG0    001162
$REG1    001164
$REG10   001202
$REG11   001204
$REG2    001166
$REG3    001170
$REG4    001172
$REG5    001174
$REG6    001176
$REG7    001200
$RTNAD   005412
$SAVR6   010324
$SCOPE   005642
$SETUP= 000117
$STUP   = 177777
$SVLAD   006050
$SVPC   = 000204
$SWR    = 165400
$SWRMK= 000000
```

```
$TIMES  001206          $TPFLG  001157          $TRPAD  010122          $TYPEC  007344          $XTSTR  005E54
$TKB    001146          $TPS    001150          $TSTNM  001102          $TYPEX  007412          $$GET4= 000000
$TKS    001144          $TRAP   010066          $TTYIN  007130          $TYPOC  007664          $CFILL  010E52
$TN   = 000025          $TRAP2  010110          $TYPDS  007414          $TYPON  007700          .       = 012257
$TPB    001152          $TRP  = 000015          $TYPE   007174          $TYPOS  007640

. ABS.  012257      000


 ERRORS DETECTED:  0

 DSKZ:DZRKJE/SOL=DSKZ:SYSMAC.SML,DSKM:DZRKJE.P11
 RUN-TIME:  11 14  .3 SECONDS
 RUN-TIME RATIO: 430/27=15.8
 CORE USED:  32K  (63 PAGES)


EOF:DZRKJE.ESE;1            00010000      770712            PDP10 411
```