

# LPA/LPS

DIAGNOSTIC TEST  
MD-11-DRLPH-A

EP-DRLPH-A-DL

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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DRLPH-A-D  
PRODUCT NAME: LPA/LPS DIAGNOSTIC TEST  
DATE: JANUARY 1978  
MAINTAINER: DIAGNOSTIC GROUP

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## 1. ABSTRACT

THIS DIAGNOSTIC TESTS AND EXERCISES THE "LPS11".  
 WHEN LOADED WILL TYPE OUT THE PROGRAM TITLE.  
 A MESSAGE IS THEN PRINTED GIVING THE LETTER DESIGNATORS  
 TO BE TYPED TO RUN ANY ONE OF THE FIVE (5) SEPERATE TESTS OF WHICH  
 THIS PROGRAM IS COMPRISED. THE PROGRAM THEN TYPES A 'CR .' AND  
 THEN WAITS IN A KEYBOARD MONITOR MODE FOR A LETTER TO BE TYPED.  
 ALTHOUGH THESE TESTS MAY BE RUN IN ANY ORDER IT IS IMPERATIVE  
 THAT THE 'LOGIC' TESTS ARE RUN FIRST AND PROVED FULLY OPERATIONAL.

THE PROGRAM IS SET UP TO GIVE THE OPERATOR AS MUCH CONTROL  
 OVER THE PROGRAM AS POSSIBLE VIA THE TELETYPE. TYPING A 'IC'  
 (OBTAINED VIA TYPING THE 'CNTR' AND 'C' KEYS SIMULTANEOUSLY)  
 WHILE RUNNING ANY TEST WILL ENABLE THE PROGRAM TO RETURN TO  
 THE KEYBOARD MONITOR AND AWAIT A NEW LETTER DESIGNATOR TO BE  
 TYPED. TYPING A 'IA' WHILE IN MONITOR MODE WILL ENABLE THE LETTER  
 DESIGNATORS TO BE RETYPED. IF RUNNING ON A NON-SWITCH REGISTER CPU,  
 TYPING A 'CTRL G' WILL ALLOW THE CHANGING OF A SOFTWARE SWITCH REGISTER.

THIS PROGRAM IS A MODIFIED VERSION OF "MD-11-DZLPC-C".  
 IT WAS MODIFIED TO ENABLE THE OPERATOR TO CHECK OUT THE LPS11  
 OPTION WHEN IT IS ON THE LPA11-KX I/O BUS. NO RECABLING IS  
 NEEDED. SOME TEST DONE IN THE ORIGINAL DIAGNOSTIC SUCH AS  
 ARBITRATION TEST, WERE DELETED AS THEY COULD NOT BE CHECKED.  
 IF THIS DIAGNOSTIC DOESN'T FIND A SUSPECTED PROBLEM, YOU MAY  
 HAVE TO RUN "DZLPC". YOU SHOULD RUN "MD-11-DRLPA" BEFORE  
 RUNNING THIS DIAGNOSTIC. PLEASE READ SECTION 15.

## 2. REQUIREMENTS (EQUIPMENT)

- A. PDP-11 COMPUTER WITH 16K OF MEMORY
- B. TELETYPE (OR EQUIVALENT)
- C. LPS11 OPTION BOX WITH:
  - LPSAD12 SIMPLE A TO D CONTROL AND
  - LPSADNP DMA A TO D CONTROL AND/OR
  - LPSSH DUAL SAMPLE AND HOLD CONTROL.

## 3. LOADING PROCEDURE

- A. USE STANDARD PROCEDURE FOR LOADING BINARY TAPES.

## 4. STARTING PROCEDURE

THE STARTING ADDRESS OF THIS DIAGNOSTIC IS 200



5. CONSOLE SWITCH SETTINGS

- A. ALL SWITCHES SHOULD BE DOWN (0) WHEN THE PROGRAM IS STARTED.
- B. REFER TO THE INDIVIDUAL TEST DESCRIPTIONS FOR APPLICABLE CONSOLE SWITCH SETTINGS
- C. REFER TO 14. FOR SOFTWARE SWITCH REGISTER OPERATION.

\* TYPE 'CARRIAGE RETURN' (CR) TO TERMINATE ALL INPUT DATA.

6. A TO D LOGIC TEST

- A. THE LOGIC TEST CONSISTS OF 26 SUBTESTS WHICH CHECK OUT THE 'LPS A TO D' LOGIC. EACH TEST IS LOOPED '2048' TIMES TO TEST LOGIC RELIABILITY.

B. STARTING SEQUENCE

- 1. TYPE 'A' TO RUN THE A TO D LOGIC' TEST.
- 2. THE PROGRAM WILL THEN EXECUTE THE A TO d LOGIC TEST.

C. CONTROL SWITCHES1. ↑C (CONTROL C)

TYPING A ↑C AT ANY TIME WILL ENABLE THE PROGRAM TO EXIT THE 'A TO D LOGIC' TEST AND RETURN TO THE MONITOR.

2. CONSOLE SWITCHFUNCTION

|                |                                |
|----------------|--------------------------------|
| CONSOLE SW11=0 | NORMAL RUN (2048 PASSES/TEST)  |
| CONSOLE SW11=1 | SUPPRESS SUBPROGRAM ITERATIONS |
| CONSOLE SW13=0 | PRINT ERROR MESSAGE            |
| CONSOLE SW13=1 | INHIBIT ERROR MESSAGES         |
| CONSOLE SW14=1 | RUN SCOPE MODE                 |
| CONSOLE SW14=0 | INHIBIT SCOPE MODE             |
| CONSOLE SW15=0 | CONTINUE AFTER ERROR           |
| CONSOLE SW15=1 | HALT ON ERROR                  |

D. LOGIC ERRORS

ON ENCOUNTERING AN ERROR (DATA SWITCHES DOWN) THE ERROR ADDRESS AND THE CONTENTS OF THE A/D STATUS REGISTER AND A/D BUFFER AND DMA STATUS REGISTER ARE TYPED OUT.



E. RESTRICTIONS

DO 'NOT' CONNECT EXTERNAL SYNC FOR THE LOGIC TEST.

F. TEST TIME

IT TAKES APPROXIMATELY 5 SEC. TO RUN THE LOGIC TEST AND TYPE "END PASS". FURTHER ITERATIONS TAKE APPROXIMATELY 5 MINUTES.

7. A TO D CALIBRATION TEST

A. THE 'A/D CALIBRATION' TEST IS DESIGNED TO ACCEPT AN INPUT FROM THE TELETYPE TO INDICATE THE TYPE OF SYNC (EXTERNAL, INTERNAL OR LPS CLOCK TO BE USED AND THEN TAKES CONTINUOUS CONVERSIONS USING THE 'CH.' SELECTED VIA THE CONSOLE SWITCHES. THESE SETTINGS MAY BE CHANGED AT ANY TIME.

B. STARTING SEQUENCE

1. TYPE 'C' TO RUN THE A/D CALIBRATION TEST.
2. THE TEST HEADER PLUS A REQUEST FOR A SYNC TYPE WILL THEN BE TYPED.
3. TYPE IN THE DESIRED SYNC, 'I' FOR INTERNAL, 'E' FOR EXTERNAL 'C' FOR LPS CLOCK (IF INSTALLED) FOLLOWED BY 'CR'.
4. THE TEST WILL START.

C. CONTROL SWITCHES1. ↑A (CONTROL A)

TYPING ↑A WILL ENABLE A NEW SYNC TYPE TO BE ENTERED.

2. ↑C (CONTROL C)

TYPING ↑C WILL CAUSE THE PROGRAM TO EXIT THE CALIBRATION TEST AND RETURN TO THE MONITOR.

3. CONSOLE SWITCH                      FUNCTION

|                   |                              |
|-------------------|------------------------------|
| CONSOLE SW '0-5'  | CHANNEL SELECT               |
| CONSOLE SW '10=0' | DISPLAY VALUE IN LED DISPLAY |
| CONSOLE SW '10=1' | PRINT CONVERSION VALUE       |

D. CALIBRATION ERRORS

THE PRINTOUT 'ERROR BIT SET' WILL OCCUR WHILE RUNNING WITH EXTERNAL SYNC IF THE SYNC FREQUENCY IS TOO FAST.

8. A TO D REPEATABILITY TEST

A. THIS TEST REQUESTS A CH.(S) AND A COUNT SPREAD OF '1-4' AND MODE OF OPERATION TO BE TYPED IN BY THE OPERATOR. A SERIES OF '512' CONVERSIONS ARE THEN TAKEN ON THE INPUT CH.(S) CONVERSIONS ARE THEN AVERAGED OUT AND IF THE COUNT SPREAD IS FOUND TO BE GREATER THAN REQUEST, THE RESULTS OF THE CONVERSIONS ARE TYPED OUT. A SINGLE CHANNEL OR A SERIES OF CHANNELS MAY BE TESTED VIA TYPING EITHER 'N(CR)' TO SELECT A SINGLE CHANNEL OR 'N,N(CR)' TO TEST A SERIES OF CHANNELS.

B. STARTING SEQUENCE

F01

1. TYPE 'D' TO RUN THE 'REPEATIBILITY' TEST.
2. A REQUEST IS THEN MADE FOR CH.(S) TO BE TESTED AND COUNT SPREAD (RANGE IN WHICH ALL 512 COUNTS MUST FALL FOR THE CH. TO BE CONSIDERED ACCEPTABLE).
3. A REQUEST IS THEN MADE FOR MODE OF OPERATION (NPR OR BR) TYPE 'I' FOR PROGRAM SAMPLING OR TYPE 'B' FOR BURST NPR OR 'D' FOR DUAL MODE SAMPLING IF INSTALLED.
4. IF THE CHANNEL IS FOUND TO BE WITHIN THE SELECTED COUNT SPREAD, THE PROGRAM WILL EITHER CONTINUE TO THE NEXT CHANNEL IF SELECTED OR RETEST THE CURRENT CHANNEL.

C. CONTROL SWITCHES

1. ↑A (CONTROL A)

TYPING A ↑A WHILE THE PROGRAM IS RUNNING WILL ENABLE A NEW CH.(S) AND COUNT SPREAD TO BE SELECTED.

2. ↑C (CONTROL)

TYPING ↑C WILL CAUSE THE PROGRAM TO EXIT THE 'REPEATIBILITY' TEST AND RETURN TO THE MONITOR.

3. CONSOLE SWITCHES

FUNCTION

|                 |                                       |
|-----------------|---------------------------------------|
| CONSOLE SW 10=0 | PRINT ERRORS ONLY                     |
| CONSOLE SW 10=1 | PRINT OUT ALL CONVERSIONS             |
| CONSOLE SW 13=0 | PRINT ERRORS                          |
| CONSOLE SW 13=1 | INHIBIT ERROR PRINTOUTS               |
| CONSOLE SW 15=0 | DO NOT HALT UPON REPEATIBILITY REPORT |
| CONSOLE SW 15=1 | HALT UPON REPEATIBILITY REPORT        |



D. REPEATIBILITY ERRORS

ON ENCOUNTERING AN ERROR (CONSOLE SWITCHES DOWN) THE ERROR DATA IS TYPED OUT.

1. ERROR FORMAT

|     |    |    |    |    |    |    |    |    |    |    |    |    |  |  |
|-----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|
| CH. |    | HI |    | AV |    | LO |    |    |    |    |    |    |  |  |
| A   |    | B  |    | C  |    | D  |    |    |    |    |    |    |  |  |
| LO  | -5 | -4 | -3 | -2 | -1 | 0  | +1 | +2 | +3 | +4 | +5 | HI |  |  |
| E   | F  | G  | H  | I  | J  | K  | L  | M  | N  | O  | P  | Q  |  |  |

## WHERE:

A=CHANNEL BEING TESTED  
 B=THE HIGHEST READING OF THE '512' CONVERSIONS  
 C=THE AVERAGE READING OF THE '512' CONVERSIONS  
 D=THE LOWEST READING OF THE '512' CONVERSIONS  
 E=NUMBER OF COUNTS 'OUT OF RANGE' LOWER THAN 5 COUNTS  
 F-J=NUMBER OF COUNTS IN EACH PART LOWER THAN AVERAGE.  
 K=NUMBER OF COUNTS AT AVERAGE OF THE '512'  
 L-P=NUMBER OF COUNTS IN EACH PART HIGHER THAN AVERAGE.  
 Q=NUMBER OF COUNTS 'OUT OF RANGE' HIGHER THAN 5 COUNTS

E. RESTRICTIONS

1. IF A SECOND CH. IS ENTERED, IT MUST BE LARGER THAN THE FIRST CH. OR THE INPUT WILL NOT BE ACCEPTED.

## 9. A TO D RECOVERY TEST

- A. THE "RECOVERY TEST" IS DESIGNED TO DETERMINE THE RECOVERY CAPABILITY OF THE 'LPS A TO D'. THE TEST REQUESTS FOR TWO (2) CH. INPUTS TO BE TYPED IN. THE TEST THEN TAKES A SERIES OF SIXTEEN (16) CONVERSIONS (8 ON EACH CH.) AND THEN TYPES OUT THE 'B' CONVERSION VALUES IN THE ORDER THEY WERE TAKEN ON THE SECOND CH.

## B. STARTING SEQUENCE

1. TYPE 'E' TO RUN THE RECOVERY TEST.
2. A REQUEST IS THEN MADE FOR THE CH.S TO BE TESTED.
3. TYPE 'N,N (CR)' WHERE 'N' IS ANY CH.
4. THE PROGRAM WILL THEN TAKE CONTINUOUS CONVERSIONS TYPING OUT THE CONVERSION VALUES FOR THE SECOND CH.

## EXAMPLE:

CH. A    XXXXXX    XXXXXX    XXXXXX    XXXXXX    XXXXXX    XXXXXX    XXXXXX    XXXXXX

## WHERE:

A=TO THE SECOND CH.

X=TO THE 'B' CONVERSIONS TAKEN ON THAT CH.

## C. CONTROL SWITCHES

1. ↑A (CONTROL A)

TYPING A '↑A' WILL ENABLE A NEW SET OF CH.S BE ENTERED.

2. ↑C (CONTROL C)

TYPING A '↑C' WILL ENABLE THE PROGRAM TO RETURN TO THE MONITOR.

3. 

| CONSOLE SWITCHES  | FUNCTION                            |
|-------------------|-------------------------------------|
| CONSOLE SW 10 = 0 | PRINT RECOVERY REPORT               |
| CONSOLE SW 10 = 1 | INHIBIT PRINTING OF RECOVERY REPORT |

## D. RESTRICTIONS

DO NOT EXECUTE THIS TEST IF THE WIDE BAND JUMPERS HAVE BEEN REMOVED.



10. DUAL MODE DYNAMIC LOGIC TEST

A. THE 'DUAL MODE' TEST IS DESIGNED TO TEST THE DYNAMIC DUAL SAMPLE AND HOLD LOGIC OF THE LPS. A SAMPLE IS TAKEN FROM A CHANNEL PAIR (IE. CHANNEL 0 AND 10) NOT IN DUAL MODE. ANOTHER SAMPLE IS TAKEN FROM A CHANNEL PAIR USING 'DUAL MODE'. THE RESULTING CONVERSIONS ARE THEN COMPARED FOR VALUE AND SIMILARITY.

B. STARTING SEQUENCE

1. TYPE 'F' TO RUN THE 'DUAL MODE LOGIC TEST'.
2. THE PROGRAM WILL THEN EXECUTE THE DUAL MODE TEST ON CHANNEL PAIRS 0-3.

C. CONTROL SWITCHES1. ↑C (CONTROL C)

TYPING ↑C WILL CAUSE THE PROGRAM TO EXIT TO THE MONITOR.

2. ↑A (CONTROL A)

TYPING ↑A WILL CAUSE THE RESTARTING OF THE DUAL MODE LOGIC TEST.

3. CONSOLE SWITCHESFUNCTION

CONSOLE SW13=0  
 CONSOLE SW13=1  
 CONSOLE SW15=0  
 CONSOLE SW15=1

PRINT ERROR MESSAGES  
 INHIBIT ERROR MESSAGES  
 CONTINUE AFTER ERROR  
 HALT ON ERROR

11. MANUAL STARTING ADDRESSES

EXTERNAL STARTING ADDRESSES OF THE BASIC TEST HAVE BEEN PROVIDED FOR THE USER TO MANUAL START THESE TESTS.

| <u>STARTING ADDRESS</u> | <u>BASIC TEST</u>       |
|-------------------------|-------------------------|
| 204                     | A TO D LOGIC TEST       |
| 210                     | DMA LOGIC TEST          |
| 214                     | DUAL SAMPLE LOGIC TEST  |
| 220                     | A TO D CALIBRATION TEST |

12. MISC. INFORMATION

THE PROGRAM CAN BE CHAINED UNDER XXDP/ACT-11  
IF THE PROGRAM WAS LOADED FROM ACT-11 OR DDP, THE A TO D LOGIC TEST  
AND (IF INSTALLED) DMA LOGIC TEST WILL BE RUN.  
THIS PROGRAM DOES NOT HAVE THE "APT" HOOKS.

13. OPERATOR VARIABLE LOCATIONS

LOCATION 1000 CONTAINS THE LPS STARTING DEVICE ADDRESS <170400>  
LOCATION 1002 CONTAINS THE LPS STARTING VECTOR <340>  
LOCATION 1004 CONTAINS THE LPS A TO D BR LEVEL <6><300>  
LOCATION 1010 CONTAINS THE + OR - 37 COUNT SPREAD FOR THE DUAL SAMPLE TEST.  
LOCATION 1012 CONTAINS THE TTY FILLER CHARACTER COUNT  
LOCATION 1014 CONTAINS THE TTY FILLER CHARACTER  
LOCATION 170 CONTAINS THE SOFTWARE SWITCH REGISTER VALUE  
LOCATION 172 CONTAINS THE SOFTWARE DISPLAY REGISTER VALUE.

NOTE: IF LOCATIONS 1000 OR 1002 ARE CHANGED, THE TEST  
MUST BE RE-INITIALIZED AT 200.

14. SOFTWARE SWITCH REGISTER OPERATION

THE PROGRAM SUPPORTS NON-SWITCH REGISTER CPU TYPES.  
THIS IS ACCOMPLISHED BY TYPING A "CTRL G". THE RESPONSE WILL REPORT  
THE VALUE OF THE OLD SOFTWARE SWITCH REGISTER AND WAIT FOR A NEW VALUE.  
THE OPERATOR NOW INPUTS THE NEW VALUE AND TERMINATES IT WITH A "CR".  
IF THE OPERATOR TYPES A "CR" WITH NO INPUT, THE SWITCH REGISTER IS SET TO 0.  
UPON TERMINATING, THE PROGRAM WILL RESUME RUNNING THE APPROPATE TEST.



## 15. LPA11 (SYSTEM) DIAGNOSTIC SUMMARY

SEQ 0010

DIAGNOSTICS FOR THE LPA11 ARE WRITTEN AT THREE LEVELS: (1) TOTAL PDP-11 SYSTEM, (2) LPA11 SYSTEM; AND, (3) LPA11 OPTIONS.

LEVEL 1, IS DESIGNED TO ISOLATE A FAILURE TO THE LPA11 SYSTEM. ALL OPTIONS ON THE PDP-11 ARE EXERCISED.

LEVEL 2 DIAGNOSTICS ISOLATE A FAILURE TO THE INDIVIDUAL OPTION WITHIN THE LPA11. THE LEVEL 2 DIAGNOSTIC IS MD-11-DRLPA. WHEN THE USER RUNS DRLPA HE CAN GENERALLY TELL WHICH OPTION DIAGNOSTIC (LEVEL 3) TO RUN NEXT. M8254 AND M8200-YC ERRORS MAY "LOOK" ALIKE AND DRLPA MAY NOT BE ABLE TO DISTINGUISH BETWEEN THEM. ARBITRATION ERRORS WILL NOT BE DETECTED BY THIS DIAGNOSTIC.

LEVEL THREE DIAGNOSTICS AID IN DETERMINING IF THE ERROR WAS IN FACT ON THE OPTION THE DRLPA SPECIFIED. THE USER MAY "LOOP" ON THE ERROR. WITHIN LEVEL THREE, THERE ARE TWO GROUPS OF DIAGNOSTICS. THE FIRST GROUP REQUIRES NO "EXTRA" WORK BY THE USER IN ORDER TO RUN. GROUP "A" DIAGNOSTICS DO NOT CHECK ARBITRATION, AND REQUIRE EXTRA TIME FOR EXECUTION. THE SECOND GROUP (GROUP "B") REQUIRES THAT THE USER RECONFIGURE THE PDP-11 SYSTEM. THIS RECONFIGURATION INVOLVES CABLING THE UNIBUS TO THE LPA'S I/O BUS.

THE DIAGNOSTIC FOR THE M8254 FALLS INTO THE GROUP "B" CATEGORY.

## THE LPA11-KX DIAGNOSTIC KIT WILL INCLUDE:

SEQ 0011

| OPTION<br>----- | GROUP<br>----- | DIAG. #<br>----- | DIAG. TITLE<br>-----                     |
|-----------------|----------------|------------------|------------------------------------------|
| LPA11-KX        | LEVEL 2        | MD-11-DRLPA      | LPA11-K SYSTEM DIAG.                     |
| MB254           | "B"            | MD-11-DRLPN      | MB254 (IPBM) DIAG.                       |
| AA11-K          | A              | MD-11-DRLPB      | AA11-K DIAG.                             |
|                 | B              | MD-11-DZAAC      | AA11-K DIAG.                             |
| AR11            | A              | MD-11-DRLPC      | LPA/AR11 DIAG. #1                        |
|                 | A              | MD-11-DRLPD      | LPA/AR11 DIAG. #2                        |
|                 | A              | MD-11-DRLPE      | LPA/AR11 DIAG. #3                        |
|                 | B              | MD-11-DZARA      | AR11 DIAG. #1                            |
|                 | B              | MD-11-DZARB      | AR11 DIAG. #2                            |
|                 | B              | MD-11-DZARC      | AR11 DIAG. #3                            |
| DR11-K          | A              | MD-11-DRLPF      | LPA/DR11-K DIAG.                         |
|                 | B              | MD-11-DZDRG      | DR11-K DIAG.                             |
| KW11-K          | A              | MD-11-DRLPG      | LPA/KW11-K DIAG.                         |
|                 | B              | MD-11-DZKWK      | KW11-K DIAG.                             |
| LPS11           | A              | MD-11-DRLPH      | LPA/LPS11 DIAG. #1                       |
|                 | A              | MD-11-DRLPI      | LPA/LPS11 DIAG. #2                       |
|                 | A              | MD-11-DRLPJ      | LPA/LPS11 DIAG. #3                       |
|                 | B              | MD-11-DZLPC      | LPS11 DIAG. #1                           |
|                 | B              | MD-11-DZLPD      | LPS11 DIAG. #2                           |
|                 | B              | MD-11-DZLPI      | LPS11 DIAG. #3                           |
| AD11-K          | A              | MD-11-DRLPK      | LPA/AD11-K DIAG.                         |
|                 | B              | MD-11-DZADL      | AD11-K DIAG.                             |
| MB200-YC        | B              | MD-11-DZLPL      | LPA/MB200-YC BASIC<br>MICRO-CPU R/W TEST |
|                 | B              | MD-11-DZLPM      | LPA/MB200-YC<br>JUMP+ROM READ TEST       |



MACY11 27(654) MO1 15-DEC-77 08:34 PAGE 1

MO1

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.REM  (
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LPA.MAC

WELCOME. THIS DIAGNOSTIC IS ONE IN A SERIES OF DIAGNOSTIC  
DESIGNED IN ORDER TO AID YOU IN TESTING THE LPA-11XX OPTION.  
I HOPE THAT YOU HAVE READ THE DOCUMENTATION SECTION OF THIS  
DIAGNOSTIC. IF YOU HAVE, YOU KNOW ABOUT ALL OF THE DIAGNOSTICS  
THAT ARE AVAILABLE FOR TESTING THE LPA SYSTEM.

**GOOD LUCK !**

```

[
.GLOBL  DRLPX2

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[illegible]

.REM !

THIS IS A LIST OF TESTS DELETED FROM THIS DIAGNOSTIC.  
 THESE TESTS COULD NOT BE DONE THROUGH THE LPA-11  
 TEST THAT A TO D INTERRUPT AT LEVEL INDICATED-1  
 TEST THAT A TO D DOES NOT INTERRUPT AT LEVEL INDICATED  
 TEST THAT THE A TO D DOES NOT INTERRUPT AT LEVEL INDICATED +1  
 ALL DMA TEST DELETED

!

100000  
 040000  
 020000  
 010000  
 004000  
 002000  
 001000  
 000400  
 000200  
 000100  
 000040  
 000020  
 000010  
 000004  
 000002  
 000001

BIT15=100000  
 BIT14=40000  
 BIT13=20000  
 BIT12=10000  
 BIT11=4000  
 BIT10=2000  
 BIT9=1000  
 BIT8=400  
 BIT7=200  
 BIT6=100  
 BIT5=40  
 BIT4=20  
 BIT3=10  
 BIT2=4  
 BIT1=2  
 BIT0=1

;SWITCH REGISTER DEFINITIONS AND FUNCTIONS:

100000  
 040000  
 020000  
 010000  
 004000  
 002000  
 001000  
 000400  
 000200  
 000100  
 000040  
 000020  
 000010  
 000004  
 000002  
 000001

SW15=100000  
 SW14=40000  
 SW13=20000  
 SW12=10000  
 SW11=4000  
 SW10=2000  
 SW09=1000  
 SW08=400  
 SW07=200  
 SW06=100  
 SW05=40  
 SW04=20  
 SW03=10  
 SW02=4  
 SW01=2  
 SW00=1

:=1, HALT ON ERROR  
 :=1, LOOP ON CURRENT TEST  
 :=1, SUPPRESS ERROR TYPEOUT  
  
 :=1, SUPPRESS 'SUBPROGRAM' ITERATIONS  
 :=1, FORCE TYPEOUT (REPEATIBILITY)

;REGISTER DEFINITIONS

000000  
 000001  
 000002  
 000003  
 000004

R0=%0  
 R1=%1  
 R2=%2  
 R3=%3  
 R4=%4

30  
 31  
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```
84      000005      RS=%5
85      000006      SP=%6
86      000007      PC=%7
87
88      ;LOAD TRAP CATCHER INTO LOC'S 0-1000
89      .=0
90      000000      HALT
91      000002      HALT
92      .=24
93      000024      PWRFAL      ;POWER FAIL HANDLER
94      000026      340
95      .=60
96      000060      XTTYIN      ;TELEPRINTER KEYBOARD ROUTINE
97      000062      340
98      .=30
99      000030      EMTSRV      ;EMT TRAP, EMT DISPATCH SERVICE
100     000032      340
101     000034      LOGERR      ;TRAP TRAP, LOGIC ERROR TRAP
102     000036      340
103     .=46
104     000046      LOGICAL
105     .=52
106     000052      0
107     .=170
108     000170      SCFTSW: 0      ;SOFTWARE SWITCH VALUE
109     000172      SOFTDI: 0      ;SOFTWARE DISPLAY VALUE
110     000174      000137      001546      JMP      MONITR      ;PROGRAM 'RESTART' ADDRESS
111     000200      000137      001154      JMP      INIT
112     000204      000137      002040      JMP      ADTEST      ;INITIALIZATION ADDRESS
113     000210      000240      NOP
114     000212      000240      NCP
115     000214      000137      006772      JMP      DSHTST      ;MANUAL START OF DUAL SAMPLE
116     000220      000137      005246      JMP      MANCAL      ;MANUAL START OF THE A TO D CALIBRATION
117
118     ;TRAP EQUIVALENCE TABLE:
119
120     104400      ERROR=TRAP      ;LOGIC TEST ERROR ROUTINE
121     104000      PRINT=EMT      ;MESSAGE PRINTER ROUTINE
122     104001      DECCT=EMT+1      ;OCTAL CONVERSION ROUTINE
123     104002      SCOPE=EMT+2      ;LOGIC TEST SCOPE SUBROUTINE (4000)
124     104003      SCOPE1=EMT+3      ;LOGIC TEST SCOPE SUBROUTINE (10)
125     104004      CMPUTE=EMT+4      ;A/D AVERAGING ROUTINE
126     104005      CATORIZ=EMT+5      ;ROUTINE TO CALCULATE THE COUNT SPREAD
127     104006      BINDEC=EMT+6      ;BINARY TO DECIMAL CONVERSION ROUTINE
128     104007      SPACE=EMT+7      ;TYPE 'N' SPACES
129     104010      PRTOCT=EMT+10      ;OCTAL PRINT ROUTINE
130     104011      TTYIN=EMT+11      ;TELETYPE INPUT ROUTINE
131     104012      PRTAVG=EMT+12      ;GAIN AVERAGE PRINT ROUTINE
132     104013      TSTTKS=EMT+13      ;SUBROUTINE TO TEST FOR KEYBOARD FLAG
133     104014      SCOPE0=EMT+14      ;SCOPE SUBROUTINE (1)
134
135     001000      001000      .=1000
136     001002      170400      LPSADD: 170400      ;LPS STARTING DEVICE ADDRESS
137     000340      LPSVCT: 340      ;LPS STARTING DEVICE VECTOR
```

138 001004 000300  
139 001006 000001  
140 001010 000037  
141 001012 000002  
142 001014 000000

ADBR: 300  
PDPDLY: 1  
AMASK: 37  
FILLS: 2  
FILCHR: 0

;LPS A TO D BR LEVEL  
;CHANGED BY THE PROGRAM  
;+ OR - 37 COUNTS FOR DUAL SAMPLE LOGIC TEST  
;NUMBER OF FILLER CHARS AFTER LF  
;FILLER CHARACTER

143  
144 001016 177776  
145 001020 177560  
146 001022 177562  
147 001024 177564  
148 001026 177566  
149 001030 177570  
150 001032 177570  
151 001034 000000  
152 001036 004000

PSW: 177776  
TKS: 177560  
TKB: 177562  
TPS: 177564  
TPB: 177566  
SWR: 177570  
DISPLA: 177570  
PASSCT: 0  
ICOUNT: 4000

;OR 170 IF NO SWR CPU TYPE  
;OR 172 IF NO SWR CPU TYPE

153  
154  
155  
156  
157  
158  
159  
160

;ADDRESS OF KMC-11 OF LPA-11

THE ADDR FOR KMADO MAY BE  
CHANGED BY THE USER TO REFLECT  
A DIFFERENT KMC-11 ADDR. THE  
REST OF THE ADDRESSES WILL  
BE CHANGED BY THE PROGRAM.

161 001040  
162 001040 170460

LPCI:  
KMADO: .WORD 170460

;BASE KMC ADDR. MAY BE PATCHED BY USER.

163  
164 001042  
165 001042 170461  
166 001044  
167 001044 170462  
168 001046  
169 001046 170463  
170 001050  
171 001050 170464  
172 001052  
173 001052 170465  
174 001054  
175 001054 170466  
176 001056  
177 001056 170467

LPMP:  
KMAD1: .WORD 170460+1  
LPCO:  
KMAD2: .WORD 170460+2  
LPSO:  
KMAD3: .WORD 170460+3  
LPADL:  
KMAD4: .WORD 170460+4  
LPADH:  
KMAD5: .WORD 170460+5  
LPMS1:  
KMAD6: .WORD 170460+6  
LPMS2:  
KMAD7: .WORD 170460+7

;DO NOT <;KMC-CSR ADDR  
;>PATCH <;  
;>THIS AREA <  
;  
;>DO NOT <  
;>PATCH <  
;>THIS AREA <

178  
179 001060 000300  
180 001062 000304

VECTOR: .WORD AVECT1&777  
VECTPS: .WORD 4+AVECT1&777

;BASE VECTOR OF KMC  
;VECTR ADDR.+2

181  
182 001064 000004  
183  
184 001066 000000  
185 001070 000020

VERSN: .WORD 4  
;DVLS: .WORD 0  
;BLKW 16.

;CURRENT VERSION NUMBER OF MICROCODE.  
;/DEVICE LIST OF I/O ADDR. DEFINED  
;/BY INIT.

186  
187 001130 170400  
188 001132 170401  
189 001134 170402  
190  
191 001136 170404

ADCS: 170400  
ADCS1: 170401  
ADDBR: 170402  
CSR: 170404

;A TO D STATUS/CONTROL REGISTER  
;A TO D STATUS REGISTER <HIGH BYTE>  
;A TO D CONVERTED VALUE <READ>  
;A TO D LED DISPLAY LIGHTS <WRITE>  
;CLOCK STATUS REGISTER



```

192 001140 170406      CSB: 170406      ;CLOCK PRESET BUFFER
193
194 001142 170436      UADMR: 170436     ;A TO D DIRECT MEMORY ACCESS ADDRESS UNUSED
195
196 001144 000340      ADINT: 340        ;A TO D INTERRUPT VECTOR
197 001146 000342      ADINT1: 342
198 001150 000300      AVECT1= 300
199 001152 000300      $VECT1: .WORD  AVECT1
200 001152 000000      DMK2: 0          ;TEMP STORAGE
201
202
203
204      ;THIS ROUTINE IS EXECUTED ON LOADING THE PROGRAM
205      ; OR RESTARTING AT LOCATION 174
206
207 001154      INIT:
208 001154 013706 014774  MOV     STACK,SP      ;INIT STACK POINTER=1000
209 001160 012777 000340 177630  MOV     #340,$PSW
210
211      ;THIS SECTION OF CODE HANDLES INITIALIZING LPA-11 FUNCTIONS
212
213
214 001166 010046      MOV     R0,-(SP)
215 001170 010146      MOV     R1,-(SP)
216 001172 013700 001040  MOV     KMADO,R0      ;GET KMC-11 ADDRESS.
217 001176 012701 001042  MOV     #KMAD1,R1     ;GET ADDR. OF ADDR. LIST.
218
219 001202 005200      64$: INC     R0          ;UPDATE ADDR.
220 001204 010021      MOV     R0,(1)+        ;WRITE ADDR.
221 001206 020127 001060  CMP     R1,#KMAD7+2  ;DONE ALL ADDRESSES?
222 001212 001373      BNE     64$           ;NO - DO NEXT ADDR.
223 001214 005037 001066  CLR     .DVLS      ;CLR ADDR. LIST.
224 001220 012601      MOV     (SP)+,R1
225 001222 012600      MOV     (SP)+,R0
226
227 001224 004737 021526  JSR     PC,$RESET    ;CLEAR THE WORLD
228 001230 013737 001000 001130  MOV     LPSADD,ADCS ;HOUSEKEEP THE ADDRESS AND VECTOR
229 001236 013737 001000 001132  MOV     LPSADD,ADCS1
230 001244 013737 001000 001134  MOV     LPSADD,ADDBR
231 001252 013737 001000 001136  MOV     LPSADD,CSR
232 001260 013737 001000 001140  MOV     LPSADD,CSB
233 001266 005237 001132      INC     ADCS1
234 001272 062737 000002 001134  ADD     #2,ADDBR
235 001300 062737 000004 001136  ADD     #4,CSR
236 001306 062737 000006 001140  ADD     #6,CSB
237 001314 013737 001002 001144  MOV     LPSVCT,ADINT
238 001322 013737 001002 001146  MOV     LPSVCT,ADINT1
239 001330 062737 000002 001146  ADD     #2,ADINT1
240
241      ;NOW TEST IF A SWITCH REGISTE EXISTS
242
243 001336 012737 001352 000004  MOV     #1$,$#4      ;LOAD BUS TRAP
244 001344 005777 177460      TST     $SWR        ;TEST IF REAL SWITCH REGISTER
245 001350 000407      BR      CPUTYP      ;BR IF NO TRAP

```



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246 001352 022626 000170 001030 1S: CMP (SP)+,(SP)+ ;POP STACK
247 001354 012737 000170 001030 MOV #170,SWR ;CHANGE POINTER TO LOC. 170
248 001362 012737 000172 001032 MOV #172,DISPLA ; AND 172
249 ; DETERMINE CPU TYPE
250 RO=3 IF 11/45
251 RO=2 IF 11/40
252 RO=1 IF 11/20
253 RO=0 IF 11/05
254 PIRQ=177772
255 PS=177776
256 001370 012737 000002 000006 CPUTYP: MOV #RTI, @#6
257 001376 012737 000006 000004 MOV #6, @#4
258 001404 012700 000003 MOV #3, RO ;LOAD RO
259 001410 000261 SEC ;SET C BIT
260 001412 005737 177772 TST @#PIRQ ;TEST PIRQ
261 001416 005600 SBC RO
262 001420 000261 SEC
263 001422 105737 177777 TSTB @#PS+1
264 001426 005600 SBC RO
265 001430 005037 177700 CLR @#177700
266 001434 005037 000006 CLR @#6
267 001440 006300 ASL RO
268 001442 016037 011426 011436 MOV CPDLAY(RO),CPTIME ;GET TIME DELAY
269 001450 010037 001006 MOV RO,PDPDLY ;LOAD CPU DELAY
270 001454 001002 BNE 1S
271 001456 005237 001006 INC PDPDLY ;UPDATE IT
272 ;TRAP CATCHER
273 1S: MOV #242,R2 ;LOAD R2
274 001466 012701 000242 MOV #240,R1 ;LOAD R1
275 001472 010221 000240 SS: MOV R2,(R1)+ ;LOAD .+2
276 001474 005021 CLR (R1)+ ;LOAD HALT
277 001476 010102 MOV R1,R2 ;LOAD R2
278 001500 005722 TST (R2)+ ;BUMP R2
279 001502 020227 001002 CMP R2,#1002 ;TEST FOR LAST
280 001506 001371 000042 BNE SS ;BR UNTIL DONE
281 001510 005737 000042 TST @#42
282 001514 001402 BEQ .+6
283 001516 000137 001576 JMP INIT2
284 001522 012777 000100 177270 MOV #100,@TKS ;ENABLE TTY INTERRUPTS
285 001530 005037 014772 CLR PRINT1 ;CALL MESSAGE PRINTER VIA 'EMT'
286 001534 104000 PRINT ;TYPE PROGRAM HEADER.
287 001536 013374 TITLE
288 001540 104000 INITA: PRINT ;PRINT THE TEST CALL LETTERS.
289 001542 013515 MES4 ;GO AND AWAIT COMMAND.
290 001544 000414 BR INIT2 ;GO AND A RESTART AT LOCATION '200'.
291 ;MONITOR SUBROUTINE. ENTER VIA 'C' OR A RESTART AT LOCATION '200'.
292 001546 004737 021526 MONITR: JSR PC,$RESET ;INITIALIZE ON ENTRY
293 001552 013706 014774 MOV STACK,SP ;RESET STACK POINTER
294 001556 012777 000340 177232 MOV #340,@PSW
295 001564 012777 000100 177226 MOV #100,@TKS ;ENABLE TTY INTERRUPTS
296 001572 104000 PRINT ;CALL MESSAGE PRINTER
297 001574 013762 CNTRLC ;TYPE 'C'
298 001576 012737 011232 000024 INIT2: MOV #PWRFAIL,@#24 ;SET UP POWER FAIL
299 001604 012737 000006 000004 MOV #6,@#4 ;SET UP BUSS ERROR

```

|     |        |        |        |        |       |                |                                      |
|-----|--------|--------|--------|--------|-------|----------------|--------------------------------------|
| 300 | 001612 | 005037 | 000006 |        | CLR   | 2#6            |                                      |
| 301 | 001616 | 013777 | 001146 | 177320 | MOV   | ADINT1, 2ADINT |                                      |
| 302 | 001624 | 005077 | 177316 |        | CLR   | 2ADINT1        |                                      |
| 303 | 001630 | 012737 | 001540 | 014776 | MOV   | 2INITA, AVECTR | ;SET UP 'A' VECTOR ADDRESS.          |
| 304 | 001636 | 004537 | 013244 |        | JSR   | R5, LED5       |                                      |
| 305 | 001642 | 000006 |        |        | 6     |                |                                      |
| 306 | 001644 | 005737 | 000042 |        | TST   | 2#42           |                                      |
| 307 | 001650 | 001402 |        |        | BEQ   | .+6            |                                      |
| 308 | 001652 | 000137 | 002002 |        | JMP   | WHAT           |                                      |
| 309 | 001656 | 012777 | 000100 | 177134 | MOV   | 2100, 2TKS     | ;ENABLE KEYBOARD INTERRUPT           |
| 310 | 001664 | 104000 |        |        | PRINT |                |                                      |
| 311 | 001666 | 014022 |        |        | DOT   |                | ;PRINT '.' TO INDICATE MONITOR READY |
| 312 | 001670 | 104011 |        |        | TTYIN |                | ;WAIT FOR TTY ENTRY                  |
| 313 | 001672 | 042737 | 000040 | 010546 | BIC   | 2BITS, INBUF   | ;CLEAR LOWER CASE BIT                |
| 314 | 001700 | 122737 | 000101 | 010546 | CMPB  | 2'A, INBUF     | ;TEST FOR 'A'                        |
| 315 | 001706 | 001002 |        |        | BNE   | .+6            | ;NOT 'A'                             |
| 316 | 001710 | 000137 | 002040 |        | JMP   | ADTEST         | ;YES RUN 'A TO D LOGIC' TEST         |
| 317 | 001714 | 122737 | 000103 | 010546 | CMPB  | 2'C, INBUF     | ;TEST FOR 'C'                        |
| 318 | 001722 | 001002 |        |        | BNE   | .+6            | ;NOT 'C'                             |
| 319 | 001724 | 000137 | 005204 |        | JMP   | CALBRT         | ;YES RUN 'A TO D CALIBRATION' TEST   |
| 320 | 001730 | 122737 | 000104 | 010546 | CMPB  | 2'D, INBUF     | ;TEST FOR 'D'                        |
| 321 | 001736 | 001002 |        |        | BNE   | .+6            | ;NOT 'D'                             |
| 322 | 001740 | 000137 | 005540 |        | JMP   | REPTST         | ;YES RUN 'A TO D REPEATABILITY' TEST |
| 323 | 001744 | 122737 | 000105 | 010546 | CMPB  | 2'E, INBUF     | ;TEST FOR 'E'                        |
| 324 | 001752 | 001002 |        |        | BNE   | .+6            | ;NOT 'E'                             |
| 325 | 001754 | 000137 | 006356 |        | JMP   | RECVRY         | ;YES RUN 'A TO D RECOVERY TEST       |
| 326 | 001760 | 122737 | 000106 | 010546 | CMPB  | 2'F, INBUF     | ;TEST FOR 'F'                        |
| 327 | 001766 | 001002 |        |        | BNE   | .+6            | ;NOT 'F'                             |
| 328 | 001770 | 000137 | 006772 |        | JMP   | DSHTST         | ;YES RUN 'DUAL MODE' TEST            |
| 329 | 001774 | 104000 |        |        | PRINT |                | ;ILLEGAL ENTRY                       |
| 330 | 001776 | 014025 |        |        | QMARK |                | ;TYPE '?'                            |
| 331 | 002000 | 000676 |        |        | BR    | INIT2          | ;WAIT AGAIN                          |
| 332 | 002002 | 005037 | 002036 |        | CLR   | NODMA          | ;CLEAR DMA POINTER                   |
| 333 | 002006 | 000137 | 002044 |        | JMP   | ADTST1         | ;RUN A TO D TEST                     |
| 334 | 002012 |        |        |        |       |                |                                      |
| 335 | 002012 | 004737 | 021526 |        | JSR   | PC, \$RESET    |                                      |
| 336 | 002016 | 013700 | 000042 |        | MOV   | 2#42, R0       |                                      |
| 337 | 002022 | 004710 |        |        | JSR   | PC, (0)        |                                      |
| 338 | 002024 | 000240 |        |        | NOP   |                |                                      |
| 339 | 002026 | 000240 |        |        | NOP   |                |                                      |
| 340 | 002030 | 000240 |        |        | NOP   |                |                                      |
| 341 | 002032 | 000137 | 002002 |        | JMP   | WHAT           |                                      |
| 342 | 002036 | 000000 |        |        |       |                |                                      |

INIT3:

WHAT:

WHATA:

WHATB:

LOGICAL:

NODMA:

```

343 ;*****
344 ; A TO D LOGIC TEST
345 ;*****
346
347 002040 104000 ADTEST: PRINT
348 002042 014030 MESS
349 002044 004737 021526 ADTST1: JSR PC,$RESET
350 002050 005037 001034 CLR PASSCT
351 002054 012737 002162 013160 ADTST0: MOV #ADT1+2, RETURN
352 002062 013777 001034 176742 MOV PASSCT, @DISPLA
353 002070 013706 014774 MOV STACK, SP
354 002074 005077 176716 CLR @PSW
355 002100 052777 000100 176712 BIS #BIT6, @TKS
356 002106 005037 001066 CLR .DVLS
357
358 ;TEST FOR NO BUSS ERRORS
359
360
361 ;* MOV $ZERO, @ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
362
363 ;* MOV $ZERO, @ADDR ;/ PUT DATA FROM $ZERO TO DEVICE REG ADDR
364 002132 012737 000002 015072 MOV #BIT1, $TMDAT
365
366 ;* MOV $TMDAT, @ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
367 002150 005737 020554 TST $AERR
368 002154 001401 BEQ .+4
369 002156 104400 ERROR
370
371 ;DOES (BIT 1) SET AND CLEAR
372
373 002160 104003 ADT1: SCOPE1
374 002162 012737 000002 015072 MOV #BIT1, $TMDAT ;SET BIT 1
375
376 ;* MOV $TMDAT, @ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
377
378 ;* MOV @ADCS, $BDDAT ;/ READ DEVICE REG ADCS, PUT DATA IN $BDDAT.
379 002210 022737 000002 015074 CMP #BIT1, $BDDAT
380 002216 001401 BEQ .+4
381 002220 104400 ERROR ;ERROR, ADCS NOT = 2
382
383 ;* MOV $ZERO, @ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
384
385 ;* MOV @ADCS, $BDDAT ;/ READ DEVICE REG ADCS, PUT DATA IN $BDDAT.
386 002242 005737 015074 TST $BDDAT
387 002246 001401 BEQ .+4
388 002250 104400 ERROR ;ERROR, ADCS NOT = 0
389
390 ;DOES (BIT 2) SET AND CLEAR
391
392 002252 104002 ADT2: SCOPE
393 002254 012737 000004 015072 MOV #BIT2, $TMDAT ;SET BIT 2
394
395 ;* MOV $TMDAT, @ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
396

```



H02

LPS-11 DIAGNOSTIC TEST I MAINDEC-11-DRLPH-A  
DRLPH.P11

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SEQ 0020

```

397      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
398 002302 022737 000004 015074      CMP      @BIT2,$BDDAT
399 002310 001401      BEQ      .+4
400 002312 104400      ERROR      ;ERROR, ADCS NOT = 4
401
402      ;*      MOV      $ZERO,@ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
403
404      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
405 002334 005737 015074      TST      $BDDAT
406 002340 001401      BEQ      .+4
407 002342 104400      ERROR      ;ERROR, ADCS NOT = 0
408
409      ;DOES BURST (BIT 3) SET AND CLEAR
410
411 002344 104002      ADT3:  SCOPE
412 002346 012737 000010 015072      MOV      @BIT3,$TMDAT      ;SET BIT 3
413
414      ;*      MOV      $TMDAT,@ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
415
416      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
417 002374 022737 000010 015074      CMP      @BIT3,$BDDAT
418 002402 001401      BEQ      .+4
419 002404 104400      ERROR      ;ERROR, ADCS NOT = 10
420
421      ;*      MOV      $ZERO,@ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
422
423      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
424 002426 005737 015074      TST      $BDDAT
425 002432 001401      BEQ      .+4
426 002434 104400      ERROR      ;ERROR, ADCS NOT = 0

```

```

427
428
429
430 ;DOES SCHMITT TRIGGER (BIT 4) SET AND CLEAR
431 002436 104003 ADT4: SCOPE1
432 002440 012737 000020 015072 MOV #BIT4,$TMDAT ;SET BIT 4
433
434 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
435
436 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
437 002466 022737 000020 015072 CMP #BIT4,$TMDAT
438 002474 001401 BEQ .+4
439 002476 104400 ERROR ;ERROR ADCS NOT = 20
440
441 ;* MOV $ZERO,$ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
442
443 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
444 002520 005737 015074 TST $BDDAT
445 002524 001401 BEQ .+4
446 002526 104400 ERROR ;ERROR ADCS NOT = 0
447
448 ;DOES CLOCK OVERFLOW (BIT 5) SET AND CLEAR
449
450 002530 104002 ADT5: SCOPE
451 002532 012737 000040 015072 MOV #BIT5,$TMDAT ;SET BIT 5
452
453 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
454
455 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
456 002560 022737 000040 015074 CMP #BIT5,$BDDAT
457 002566 001401 BEQ .+4
458 002570 104400 ERROR ;ERROR ADCS NOT = 40
459
460 ;* MOV $ZERO,$ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
461
462 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
463 002612 005737 015074 TST $BDDAT
464 002616 105037 015072 CLRB $TMDAT
465
466 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
467
468 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
469 002642 005737 015074 TST $BDDAT
470 002646 001401 BEQ .+4
471 002650 104400 ERROR ;ERROR ADCS NOT = 0
472
473 ;DOES INTERRUPT ENABLE (BIT 6) SET AND CLEAR
474
475 002652 104002 ADT6: SCOPE
476 002654 012737 000100 015072 MOV #BIT6,$TMDAT ;SET BIT 6
477
478 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
479
480

```

```

481
482 002702 022737 000100 015074 ;* MOV 2ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
483 002710 001401 CMP #BIT6,$BDDAT
484 002712 104400 BEQ .+4 ;ERROR ADCS NOT = 100
485
486 ;* MOV $ZERO,2ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
487
488 ;* MOV 2ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
489 002734 005737 015074 TST $BDDAT
490 002740 001401 BEQ .+4
491 002742 104400 ERROR ;ERROR ADCS NOT = 100
492
493 ;DOES MUX CHANNEL (BIT 8) SET AND CLEAR
494
495 002744 104002 ADT7: SCOPE
496 002746 012737 000400 015072 MOV #BIT8,$TMDAT ;SET BIT 8
497
498 ;* MOV $TMDAT,2ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
499
500 ;* MOV 2ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
501 002774 022737 000400 015074 CMP #BIT8,$BDDAT
502 003002 001401 BEQ .+4
503 003004 104400 ERROR ;ERROR ADCS NOT = 400
504
505 ;* MOV $ZERO,2ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
506
507 ;* MOV 2ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
508 003026 005737 015074 TST $BDDAT
509 003032 001401 BEQ .+4
510 003034 104400 ERROR ;ERROR ADCS NOT = 0

```



```
511                                     ;DOES MUX CHANNEL (BIT 9) SET AND CLEAR
512
513
514 003036 104002 001000 015072 ADT10: SCOPE
515 003040 012737                                MOV      #BIT9,$TMDAT          ;SET BIT 9
516
517                                     ;*      MOV      $TMDAT,$ADCS          ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
518
519                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
520 003066 022737 001000 015074
521 003074 001401
522 003076 104400
523                                     CMP      #BIT9,$BDDAT
524                                     BEQ      .+4
525                                     ERROR
526                                     ;ERROR ADCS NOT = 10000
527
528                                     ;*      MOV      $ZERO,$ADCS          ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
529
530                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
531 003120 005737 015074
532 003124 001401
533 003126 104400
534                                     TST      $BDDAT
535                                     BEQ      .+4
536                                     ERROR
537                                     ;ERROR ADCS NOT = 0
538
539                                     ;DOES MUX CHANNEL (BIT 10) SET AND CLEAR
540
541
542 003130 104002 002000 015072 ADT11: SCOPE
543 003132 012737                                MOV      #BIT10,$TMDAT          ;SET BIT 10
544
545                                     ;*      MOV      $TMDAT,$ADCS          ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
546
547                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
548 003160 022737 002000 015074
549 003166 001401
550 003170 104400
551                                     CMP      #BIT10,$BDDAT
552                                     BEQ      .+4
553                                     ERROR
554                                     ;ERROR ADCS NOT 2000
555
556                                     ;*      MOV      $ZERO,$ADCS          ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
557
558                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
559 003212 005737 015074
560 003216 001401
561 003220 104400
562                                     TST      $BDDAT
563                                     BEQ      .+4
564                                     ERROR
565                                     ;ERROR ADCS NOT = 0
566
567                                     ;DOES MUX CHANNEL (BIT 11) SET AND CLEAR
568
569
570 003222 104002 004000 015072 ADT12: SCOPE
571 003224 012737                                MOV      #BIT11,$TMDAT          ;SET BIT 11
572
573                                     ;*      MOV      $TMDAT,$ADCS          ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
574
575                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
576 003252 022737 004000 015074
577 003260 001401
578 003262 104400
579                                     CMP      #BIT11,$BDDAT
580                                     BEQ      .+4
581                                     ERROR
582                                     ;ERROR ADCST NOT = 4000
583
584                                     ;*      MOV      $ZERO,$ADCS          ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
585
586                                     ;*      MOV      $ADCS,$BDDAT          ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
```

```

565 003304 005737 015074      TST      $BDDAT
566 003310 001401              BEQ      .+4
567 003312 104400              ERROR      ;ERROR ADCST NOT = 0
568
569      ;DOES MUX CHANNEL (BIT 12) SET AND CLEAR
570
571 003314 104002      ADT13:  SCOPE
572 003316 012737      MOV      #BIT12,$TMDAT
573
574      ;*      MOV      $TMDAT,$ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
575
576      ;*      MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
577 003344 022737      CMP      #BIT12,$BDDAT
578 003352 001401      BEQ      .+4
579 003354 104400      ERROR      ;ERROR ADCS NOT = 10000
580
581      ;*      MOV      $ZERO,$ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
582
583      ;*      MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
584 003376 005737 015074      TST      $BDDAT
585 003402 001401              BEQ      .+4
586 003404 104400              ERROR      ;ERROR ADCS NOT = 0
587

```

```
588                                     ;DOES MUX CHANNEL (BIT 13) SET AND CLEAR
589
590 003406 104002 ADT14: SCOPE
591 003410 012737 020000 015072 MOV      #BIT13,$TMDAT          ;SET BIT 13
592                                     ;
593                                     ;*   MOV      $TMDAT,$ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
594                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
595                                     ;*   CMP      $ADCS,$BDDAT      ;
596 003436 022737 020000 015074 BEQ      #BIT13,$BDDAT      ;
597 003444 001401      .+4                                     ;ERROR ADCS NOT = 20000
598 003446 104400      ERROR                                     ;
599                                     ;*   MOV      $ZERO,$ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
600                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
601                                     ;*   TST      $BDDAT
602 003470 005737 015074 BEQ      .+4
603 003474 001401      ERROR                                     ;ERROR ADCS NOT = 0
604 003476 104400
605
606                                     ;DOES DUAL MODE (BIT14) SET AND CLEAR
607
608 ADT15: SCOPE
609 003500 104002 MOV      #BIT14,$TMDAT          ;SET BIT 14
610 003502 012737 040000 015072
611                                     ;*   MOV      $TMDAT,$ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
612                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
613                                     ;*   CMP      $ADCS,$BDDAT      ;
614 003530 022737 040000 015074 BEQ      #BIT14,$BDDAT      ;
615 003536 001401      .+4                                     ;ERROR, ADCS NOT 40000
616 003540 104400      ERROR                                     ;
617                                     ;*   MOV      $ZERO,$ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
618                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
619 003562 005737 015074 TST      $BDDAT
620 003566 001401      .+4
621 003570 104400      ERROR                                     ;ERROR, ADCS NOT = 0
622
623                                     ;DOES ERROR (BIT 15) SET AND CLEAR
624
625 ADT16: SCOPE
626 003572 104002 MOV      #BIT15,$TMDAT
627 003574 012737 100000 015072
628                                     ;*   MOV      $TMDAT,$ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
629                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
630                                     ;*   CMP      $ADCS,$BDDAT      ;
631 003622 022737 100000 015074 BEQ      #BIT15,$BDDAT      ;
632 003630 001401      .+4                                     ;ERROR , ERROR BIT FAILED TO SET
633 003632 104400      ERROR                                     ;
634                                     ;*   MOV      $ZERO,$ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
635                                     ;*   MOV      $ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
636 003654 005737 015074 TST      $BDDAT
```



```

642 003660 001401      BEQ      .+4
643 003662 104400      ERROR      ;ERROR, ERROR BIT FAILED TO CLEAR
644
645      ;DOES DONE (BIT 7) SET AND CLEAR
646
647 003664 104003      ADT20:  SCOPE1
648
649      ;*      MOV      @ADDBR,$BDDAT      ;/READ DEVICE REG ADDBR,PUT DATA IN $BDDAT.
650 003676 013700 015074      MOV      $BDDAT,R0
651 003702 005037 015014      CLR      KSTOR4
652 003706 012737 000001 015072      MOV      #BIT0,$TMDAT
653
654      ;*      MOV      $TMDAT,@ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
655
656      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
657 003734 105737 015074      ADT20A: TSTB      $BDDAT
658 003740 100404      BMI      ADT20B
659 003742 005237 015014      INC      KSTOR4
660 003746 001372      BNE      ADT20A
661 003750 104400      ERROR      ;ERROR, ADCS NOT = 200
662 003752      ADT20B:
663
664      ;*      MOV      @ADDBR,$BDDAT      ;/READ DEVICE REG ADDBR,PUT DATA IN $BDDAT.
665 003762 013700 015074      MOV      $BDDAT,R0
666
667      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
668 003776 105737 015074      TSTB      $BDDAT
669 004002 100001      BPL      .+4
670 004004 104400      ERROR      ;ERROR, DONE FAILED TO CLEAR
671
672      ;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
673 004016 032737 000001 015074      BIT      #BIT0,$BDDAT
674 004024 001401      BEQ      .+4
675 004026 104400      ERROR      ;ERROR, AD TO FAILED TO cLEAR

```

```

676
677
678
679 004030 104003
680
681
682 004042 013700 015074
683 004046 012737 000001 015072
684
685
686 004064 105737 015074
687 004070 100375
688 004072 013737 011436 015032
689 004100 006237 015032
690 004104 006237 015032
691 004110 006237 015032
692 004114 012737 000001 015072
693
694
695 004132 005337 015032
696 004136 100375
697
698
699 004150 005737 015074
700 004154 100401
701 004156 104400
702
703
704 004170 013737 011436 015032
705 004176 005337 015032
706 004202 100375
707 004204 000240
708 004206 000240
709 004210 000240
710
711
712 004222 005737 015074
713 004226 100001
714 004230 104400
715
716
717
718 004232 104003
719
720
721
722
723 004254 013700 015074
724
725
726 004270 052737 000020 015072
727
728
729 004306 005000

```

```

;DOES ERROR (BIT 15) SET
ADT21: SCOPE1
;*      MOV      @ADDBR,$BDDAT      ;/READ DEVICE REG ADDBR,PUT DATA IN $BDDAT.
        MOV      $BDDAT,R0
        MOV      @BIT0,$TMDAT
;*      MOV      $TMDAT,@ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
1$:      TSTB     $BDDAT            ;WAIT FOR FLAG
        BPL      1$
        MOV      CPTIME,DELAY1
        ASR      DELAY1
        ASR      DELAY1
        ASR      DELAY1
        MOV      @BIT0,$TMDAT
;*      MOV      $TMDAT,@ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
2$:      DEC      DELAY1
        BPL      2$
;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
        TST      $BDDAT
        BMI      .+4
                                ;ERROR ADCS NOT = 100000
;*      MOV      $ZERO,@ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
3$:      MOV      CPTIME,DELAY1
        DEC      DELAY1
        BPL      3$
        NOP
        NOP
        NOP
;*      MOV      @ADCS,$BDDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
        TST      $BDDAT
        BPL      .+4
                                ;ERROR ADCS NOT = 0
;TEST THAT NO EXTERNAL CONVERSIONS INPUT
ADT22: SCOPE1
;*      MOV      $ZERO,@ADCS      ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
;*      MOV      @ADDBR,$BDDAT      ;/READ DEVICE REG ADDBR,PUT DATA IN $BDDAT.
        MOV      $BDDAT,R0
;*      MOV      @ADCS,$TMDAT      ;/READ DEVICE REG ADCS,PUT DATA IN $TMDAT.
        BIS      @BIT4,$TMDAT
;*      MOV      $TMDAT,@ADCS      ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
        CLR      R0

```

|     |        |        |        |        |                                                  |              |                                                            |
|-----|--------|--------|--------|--------|--------------------------------------------------|--------------|------------------------------------------------------------|
| 730 | 004310 | 005200 |        |        | INC                                              | RO           |                                                            |
| 731 | 004312 | 001376 |        |        | BNE                                              | . -2         |                                                            |
| 732 |        |        |        |        |                                                  |              |                                                            |
| 733 |        |        |        |        | ;*                                               | MOV          | %ADCS,%SDDAT ; / READ DEVICE REG ADCS, PUT DATA IN %SDDAT. |
| 734 | 004324 | 105737 | 015074 |        | TSTB                                             | %SDDAT       |                                                            |
| 735 | 004330 | 100001 |        |        | BPL                                              | . +4         |                                                            |
| 736 | 004332 | 104400 |        |        | ERROR                                            |              | ; ERROR EXTERNAL CONVERSION                                |
| 737 |        |        |        |        |                                                  |              |                                                            |
| 738 |        |        |        |        | ; TEST THAT NO CLOCK OVERFLOWS START CONVERSIONS |              |                                                            |
| 739 |        |        |        |        |                                                  |              |                                                            |
| 740 | 004334 | 104003 |        |        | ADT23:                                           | SCOPE1       |                                                            |
| 741 |        |        |        |        |                                                  |              |                                                            |
| 742 |        |        |        |        | ;*                                               | MOV          | \$ZERO,%ADCS ; / PUT DATA FROM \$ZERO TO DEVICE REG ADCS   |
| 743 |        |        |        |        |                                                  |              |                                                            |
| 744 |        |        |        |        | ;*                                               | MOV          | %ADDR,%SDDAT ; / READ DEVICE REG ADDR, PUT DATA IN %SDDAT. |
| 745 | 004356 | 013700 | 015074 |        | MOV                                              | %SDDAT,%R0   |                                                            |
| 746 |        |        |        |        |                                                  |              |                                                            |
| 747 |        |        |        |        | ;*                                               | MOV          | %ADCS,%TMDAT ; / READ DEVICE REG ADCS, PUT DATA IN %TMDAT. |
| 748 | 004372 | 052737 | 000040 | 015072 | BIS                                              | #BITS,%TMDAT |                                                            |
| 749 |        |        |        |        |                                                  |              |                                                            |
| 750 |        |        |        |        | ;*                                               | MOV          | %TMDAT,%ADCS ; / PUT DATA FROM %TMDAT TO DEVICE REG ADCS   |
| 751 | 004410 | 005037 | 015014 |        | CLR                                              | KSTOR4       |                                                            |
| 752 | 004414 | 005237 | 015014 |        | 1\$:                                             | INC          | KSTOR4                                                     |
| 753 | 004420 | 001375 |        |        | BNE                                              | 1\$          |                                                            |
| 754 |        |        |        |        |                                                  |              |                                                            |
| 755 |        |        |        |        | ;*                                               | MOV          | %ADCS,%SDDAT ; / READ DEVICE REG ADCS, PUT DATA IN %SDDAT. |
| 756 | 004432 | 105737 | 015074 |        | TSTB                                             | %SDDAT       |                                                            |
| 757 | 004436 | 100001 |        |        | BPL                                              | . +4         |                                                            |
| 758 | 004440 | 104400 |        |        | ERROR                                            |              | ; ERROR OVERFLOW STARTED A CONVERSION                      |



## ;PRE INTERRUPT SETUP

|     |        |        |        |        |      |               |                          |
|-----|--------|--------|--------|--------|------|---------------|--------------------------|
| 759 |        |        |        |        |      |               |                          |
| 760 |        |        |        |        |      |               |                          |
| 761 | 004442 | 042737 | 177437 | 001004 | BIC  | #177437,ADBRL | ;MASK TO BITS            |
| 762 | 004450 | 001001 |        |        | BNE  | .+4           |                          |
| 763 | 004452 | 000000 |        |        | HALT |               | ;BR LEVEL INDICATED IS 0 |
| 764 | 004454 | 022737 | 000340 | 001004 | CMP  | #340,ADBRL    | ;IS IT BR LEVEL 7        |
| 765 | 004462 | 001001 |        |        | BNE  | .+4           |                          |
| 766 | 004464 | 000000 |        |        | HALT |               | ;BR LEVEL INDICATED IS 7 |
| 767 |        |        |        |        |      |               |                          |
| 768 | 004466 | 013737 | 001004 | 015054 | MOV  | ADBRL,BRLEV1  |                          |
| 769 | 004474 | 162737 | 000040 | 015054 | SUB  | #40,BRLEV1    |                          |
| 770 | 004502 | 013737 | 001004 | 015056 | MOV  | ADBRL,BRLEV2  |                          |
| 771 | 004510 | 013737 | 001004 | 015060 | MOV  | ADBRL,BRLEV3  |                          |
| 772 | 004516 | 062737 | 000040 | 015060 | ADD  | #40,BRLEV3    |                          |

```

773
774 ;TEST THAT RESET CLEARS MUX BITS
775
776 004524 104003 ADT27: SCOPE1
777 004526 012737 037400 015072 MOV #BIT13!BIT12!BIT11!BIT10!BIT9!BIT8,$TMDAT
778
779 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
780 004544 004737 021526 JSR PC,$RESET
781
782 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
783 004560 005737 015074 TST $BDDAT
784 004564 001401 BEQ .+4
785 004566 104400 ERROR ;ERROR, RESET FAILED TO CLEAR MUX BITS
786
787 ;TEST THAT RESET CLEARS ST, CLOCK OVERFLOW AND INTERRUPT ENABLE BITS
788
789 004570 104003 ADT30: SCOPE1
790 004572 012737 000160 015072 MOV #BIT6!BIT5!BIT4,$TMDAT
791
792 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
793 004610 004737 021526 JSR PC,$RESET
794
795 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
796 004624 005737 015074 TST $BDDAT
797 004630 001401 BEQ .+4
798 004632 104400 ERROR ;ERROR, RESET FAILED TO CLEAR ENABLES
799
800 ;TEST THAT RESET CLEARS DONE AND ERROR BITS
801
802 004634 104003 ADT31: SCOPE1
803 004636 012737 000001 015072 MOV #BIT0,$TMDAT
804
805 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
806
807 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
808 004664 105737 015074 TSTB $BDDAT
809 004670 100375 BPL .-4
810 004672 012737 100000 015072 MOV #BIT15,$TMDAT ;SET ERROR BIT
811
812 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
813 004710 004737 021526 JSR PC,$RESET
814
815 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
816 004724 005737 015074 TST $BDDAT
817 004730 001401 BEQ .+4
818 004732 104400 ERROR ;ERROR, RESET FAILED TO CLEAR ERROR OR DONE FLAG

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819
820 ;TEST THAT RESET CLEARS BURST AND MODE BITS
821
822 004734 104003 ADT32: SCOPE1
823 004736 012737 000016 015072 MOV #BIT3!BIT2!BIT1,$TMDAT ;SET BITS 1-3
824
825 ;* MOV $TMDAT,$ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
826 004754 004737 021526 JSR PC,$RESET
827
828 ;* MOV $ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
829 004770 005737 015074 TST $BDDAT
830 004774 001401 BEQ .+4
831 004776 104400 ERROR ;ERROR, ADCS NOT = 0
832
833 ;LED TEST
834
835 TEST15: SCOPE1
836 005000 104003 TST #42
837 005002 005737 000042 BNE TEST16
838 005006 001060 TST PASSCT ;TEST IF FIRST PASS
839 005010 005737 001034 BEQ TEST16 ;BR IF YES
840 005014 001455 CLR $PSW
841 005016 005077 173774 BIS #BIT6,$TKS
842 005022 052777 000100 173770 CLR TEMP1
843 005030 005037 015046 TST15A: MOV TEMP1,TEMP2
844 005034 013737 015046 015050 MOV #6,TEMP3
845 005042 012737 000006 015052 TST15B: MOV TEMP2,$TMDAT
846 005050 013737 015050 015072 ;* MOV $TMDAT,$ADDBR ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADDBR
847
848 005066 013737 001006 015012 MOV PDPOLY,KSTOR3
849 005074 012700 000000 MOV #0,RO
850 005100 032777 004000 173722 BIT #BIT11,$SWR ;TEST IF NO INTERACTIONS
851 005106 001020 BNE TEST16 ;BR IF NO INTERACTIONS
852 005110 005300 TST15C: DEC RO
853 005112 001376 BNE TST15C
854 005114 005337 015012 DEC KSTOR3
855 005120 001373 BNE TST15C
856 005122 105237 015051 INCB TEMP2+1
857 005126 005337 015052 DEC TEMP3
858 005132 001346 BNE TST15B
859 005134 005237 015046 INC TEMP1
860 005140 022737 000040 015046 CMP #40,TEMP1
861 005146 001332 BNE TST15A
862
863 TEST16: SCOPE0 ;LOGICAL END OF A TO d LOGIC TEST
864 005150 104014 JSR PC,$RESET
865 005152 004737 021526 TST #42
866 005156 005737 000042 BEQ .+6
867 005162 001402 JMP WHATA
868 005164 000137 002012 JSR PC,BELL ;REPORT END OF PASS
869 005170 004737 013236 INC PASSCT
870 005174 005237 001034 JMP ADTSTO
871 005200 000137 002054

```



```

872 *****
873 ;CALIBRATION ROUTINE
874 *****
875
876 ;ROUTINE REQUESTS THE TYPE OF 'SYNC' TO BE USED ('I' INTERNAL OR 'E' EXTERNAL).
877 ;OR 'C' LPS CLOCK)
878 ;THE PROGRAM THEN TAKES CONTINUOUS CONVERSIONS USING DATA SW'S 5-0
879 ;TO SELECT THE CH.
880 ;OR SW '10' TO PRINT THE CONVERSION VALUE.
881
882 005204 012737 005216 014776 CALBRT: MOV #CALBT1,AVECTR ;SET UP 'A' RESTART ADDRESS
883 005212 104000 PRINT ;TYPE TEST HEADER
884 005214 014057 MES7
885 005216 104000 CALBT1: PRINT
886 005220 014136 MES10 ;TEXT 'SYNC I OR E OR C'
887 005222 104011 CALB1A: TTYIN ;WAIT FOR INPUT.
888 005224 042737 000040 010546 BIC #BITS,INBUF ;SAVE IT IN TEMP STORAGE
889 005232 013737 010546 015000 MOV INBUF,PROC
890 005240 104000 PRINT
891 005242 014020 CRLF
892 005244 000402 BR
893 005246 005037 015000 MANCAL: CLR +6
894 005252 005037 015036 PROC
895 005256 005037 015040 USEDMA ;CLEAR DMA FLAG
896 005262 005037 015034 CLRECLK ;CLEAR CLOCK FLAG
897 005266 012737 000001 015004 CLREDSH ;CLEAR DUAL MODE
898 005274 117737 173530 014771 CALBT2: MOV #1,COUNT ;SET UP FOR '1' CONVERSION
899 005302 042737 140377 014770 BIC #140377,ADWRD2 ;GET CH. FROM THE SW REG.
900 005310 017737 173514 015010 MOV #SWR,KSTOR2 ;CLR UNWANTED BITS, A/D WORD COMPLETE
901 005316 022737 000105 015000 CMP #105,PROC ;SAVE ORIGINAL SWITCH SETTING.
902 005324 001004 BNE CALB2 ;TEST SYNC SELECT
903 005326 052737 000020 014770 BIS #20,ADWRD2 ;BRANCH IF NOT 'E'
904 005334 000416 BR CALB2A ;OTHERWISE ADD 'EXT' SYNC BIT TO A/D.
905 005336 122737 000103 015000 CALB2: CMPB #103,PROC
906 005344 001007 BNE CALB2C ;BRANCH IF NOT 'C'
907 005346 052737 000040 014770 BIS #40,ADWRD2 ;OTHERWISE ADD 'CLOCK' SYNC TO A/D
908 005354 012737 177777 015040 MOV #-1,USECLK
909 005362 000403 BR CALB2A
910 005364 052737 000001 014770 CALB2C: BIS #1,ADWRD2
911 005372 005737 015040 CALB2A: TST USECLK ;CHECK CLOCK FLAG
912 005376 001422 BEQ CALB2D ;NOT LPS CLOCK
913
914 ;* MOV $ZERO,ACSR ;/ PUT DATA FROM $ZERO TO DEVICE REG CSR
915 005410 012737 176000 015072 MOV #-2000,$TMDAT ;SET UP PRESET BUFFER
916
917 ;* MOV $TMDAT,ACSB ;/ PUT DATA FROM $TMDAT TO DEVICE REG CSB
918 005426 012737 000403 015072 MOV #403,$TMDAT ;SET UP RATE, START CLOCK
919
920 ;* MOV $TMDAT,ACSR ;/ PUT DATA FROM $TMDAT TO DEVICE REG CSR
921 005444 013706 014774 CALB2D: MOV STACK,SP
922 005450 004737 010726 JSR PC,ADCNVT ;TAKE AND STORE THE CONVERSIONS
923 005454 012737 000001 015052 MOV #1,TEMP3 ;SETUP TO PRINT '1' VALUE
924 005462 004537 013244 JSR R5,LEDS
925 005466 015214 ADBUFF

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```
926 005470 032777 002000 173332 BIT #SW10,ASWR
927 005476 001404 BEQ CALB2B
928 005500 104012 PRTAVG ;PRINT IT
929 005502 104000 PRINT
930 005504 014020 CRLF
931 005506 000406 BR CALBT4 ;TEST FOR LOOP
932 005510 013700 015214 CALB2B: MOV ADBUFF,RO ;SET UP A/D BUFFER.
933 005514 010077 173312 MOV RO,ADISPLA ;LOAD DISPLAY REG. (11/45)
934 005520 104013 TSTTKS ;TEST FOR TTY FLAG
935 005522 000240 ARESET: NOP
936 005524 104013 CALBT4: TSTTKS ;TEST FOR KEYBOARD INTERRUPT
937 005526 023777 015010 173274 CMP KSTOR2,ASWR ;TEST IF SWITCH REGISTER HAS CHANGED
938 005534 001716 BEQ CALB2A ;BRANCH AND TAKE NEXT CONVERSION
939 005536 000656 BR CALBT2 ;YES, COMPUTE NEW INPUT
940 *****
941 ;REPEATABILITY TEST
942 *****
943
944 ;THIS ROUTINE TO DESIGNED TO SHOW REPEATIBILITY BY TAKING A SERIES OF
945 ;'512' CONVERSIONS, AVERAGING THEM AND THEN CATORIZING
946 ;THEM IN BINS FROM THE AVERAGE PLUS & MINUS 6 COUNTS. THE ROUTINE
947 ;REQUESTS FOR A CHANNEL OR CHANNELS, A COUNT SPREAD AND A A/D MODE TO BE TYPED
948 ;IN VIA THE OPERATOR. A CONTINUOUS SERIES OF CONVERSIONS ARE THEN TAKEN
949 ;AND COMPARED AGAINST THE INPUT COUNT SPREAD. IF ALL '512' CONVERSIONS
950 ;ARE FOUND TO BE WITHIN THE SPREAD THE NEXT CH. IS EXERCISED OTHERWISE
951 ;THE COUNTS ARE TYPED OUT. SETTING SWITCH '10' TO A '1' WILL FORCE A PRINTOUT
952 ;OF THE CH (S).
953
954 005540 012737 005552 014776 REPTST: MOV #REPT1,AVECTR ;SET UP CNTR 'A' VECTOR ADDRESS
955 005546 104000 PRINT
956 005550 014256 MES13 ;TEXT 'REPEATIBILITY TEST'
957 005552 005037 015062 REPT1: CLR MESPRT
958 005556 005037 015036 CLR USEDMA
959 005562 005037 015034 CLR USED5H
960 005566 005037 015042 CLR OPS1
961 005572 104000 PRINT
962 005574 014306 MES14 ;REQUEST CHANNEL (S)
963 005576 104011 TTYIN ;WAIT FOR INPUT
964 005600 104001 DECOCT ;CONVERT TO OCTAL
965 005602 013737 010716 015006 MOV BCDTAB,KSTOR1 ;SAVE AS INTIAL CH.
966 005610 013737 015006 015010 MOV KSTOR1,KSTOR2 ;ALSO SAVE AS 2ND CH. ENTRY
967 005616 005737 010720 TST BCDTAB+2 ;TEST FOR SECOND ENTRY
968 005622 001407 BEQ REPT2 ;BRANCH IF NO SECOND ENTRY
969 005624 023737 010720 015006 CMP BCDTAB+2,KSTOR1 ;COMPARE ENTRY 1 TO ENTRY 2
970 005632 100747 BMI REPT1 ;BRANCH AND RESTART IF ILLEGAL
971 005634 013737 010720 015010 MOV BCDTAB+2,KSTOR2 ;OTHERWISE SAVE AS SECOND CH.
972 005642 104000 REPT2: PRINT
973 005644 014346 MES16 ;TEXT 'COUNT SPREAD ?'
974 005646 104011 TTYIN ;WAIT FOR ENTRY
975 005650 104001 DECOCT ;DECODE TO OCTAL
976 005652 013737 010716 015012 MOV BCDTAB,KSTOR3 ;SAVE IT
977 005660 104000 PRINT
978 005662 014365 MES18
979 005664 104011 TTYIN ;REQUEST MODE
```



|      |        |        |        |        |         |         |                   |                                          |
|------|--------|--------|--------|--------|---------|---------|-------------------|------------------------------------------|
| 980  | 005666 | 122737 | 000102 | 010546 |         | CMPB    | #'B, INBUF        | :TEST FOR B                              |
| 981  | 005674 | 001003 |        |        |         | BNE     | REPT2B            | :NOT                                     |
| 982  | 005676 | 005137 | 015036 |        |         | COM     | USEDMA            |                                          |
| 983  | 005702 | 000411 |        |        |         | BR      | REPT2A            |                                          |
| 984  | 005704 | 122737 | 000104 | 010546 | REPT2B: | CMPB    | #'D, INBUF        | :TEST FOR DUAL MODE                      |
| 985  | 005712 | 001005 |        |        |         | BNE     | REPT2A            | :BRANCH IF NOT                           |
| 986  | 005714 | 005137 | 015034 |        |         | COM     | USEDMA            | :SET DUAL MODE                           |
| 987  | 005720 | 052737 | 000100 | 015006 |         | BIS     | #BIT6, KSTOR1     | :BIT                                     |
| 988  | 005726 | 013706 | 014774 |        | REPT2A: | MOV     | STACK, SP         |                                          |
| 989  | 005732 | 013737 | 015006 | 015014 |         | MOV     | KSTOR1, KSTOR4    | :SAVE STARTING CH.                       |
| 990  | 005740 | 104013 |        |        | REPT3:  | TSTTKS  |                   | :TEST FOR KEYBOARD FLAG                  |
| 991  | 005742 | 012737 | 001000 | 015004 |         | MOV     | #1000, COUNT      | :SET FOR '512' CONVERSIONS               |
| 992  | 005750 | 113737 | 015014 | 014771 |         | MOVB    | KSTOR4, ADWORD2+1 | :MOV SELECTED CH. TO HIGH BYTE OF ADWORD |
| 993  | 005756 | 042737 | 100377 | 014770 |         | BIC     | #100377, ADWORD2  | :MASK                                    |
| 994  | 005764 | 052737 | 000001 | 014770 |         | BIS     | #1, ADWORD2       |                                          |
| 995  | 005772 | 004737 | 010726 |        |         | JSR     | PC, ADCNVT        | :TAKE THE CONVERSIONS                    |
| 996  | 005776 | 104004 |        |        |         | CMPTU   |                   | :AVERAGE & COMPUTE DISTRIBUTION          |
| 997  | 006000 | 104005 |        |        |         | CATORIZ |                   |                                          |
| 998  | 006002 | 013777 | 015114 | 173022 |         | MOV     | AVRAGE, DISPLA    | :LOAD DISPLAY REG. (11/45)               |
| 999  | 006010 | 032777 | 002000 | 173012 |         | BIT     | #SW10, SWR        | :TEST DATA SW10                          |
| 1000 | 006016 | 001047 |        |        |         | BNE     | REPT4             | :IF SET, FORCE TYPE OUT                  |
| 1001 | 006020 | 032777 | 020000 | 173002 | TSTCT4: | BIT     | #SW13, SWR        | :TEST FOR INHIBIT TYPEOUT                |
| 1002 | 006026 | 001135 |        |        |         | BNE     | REPT7             | :BRANCH IF SW SET                        |
| 1003 | 006030 | 022737 | 000004 | 015012 |         | CMP     | #4, KSTOR3        | :WAS 4 TYPED                             |
| 1004 | 006036 | 001005 |        |        |         | BNE     | TSTCT3            | :NO, TEST FOR '3'                        |
| 1005 | 006040 | 022737 | 001000 | 015170 |         | CMP     | #1000, XSPRD4     | :TOTAL COUNTS WITHIN 4 COUNTS            |
| 1006 | 006046 | 001033 |        |        |         | BNE     | REPT4             | :BRANCH IF NO.                           |
| 1007 | 006050 | 000524 |        |        |         | BR      | REPT7             | :YES, TEST NEXT CH.                      |
| 1008 | 006052 | 022737 | 000003 | 015012 | TSTCT3: | CMP     | #3, KSTOR3        | :COUNT = TO 3                            |
| 1009 | 006060 | 001005 |        |        |         | BNE     | TSTCT2            | :NO TEST COUNT 2                         |
| 1010 | 006062 | 022737 | 001000 | 015166 |         | CMP     | #1000, XSPRD3     |                                          |
| 1011 | 006070 | 001022 |        |        |         | BNE     | REPT4             | :BRANCH IF COUNT NOT WITHIN 3            |
| 1012 | 006072 | 000513 |        |        |         | BR      | REPT7             | :YES, TEST NEXT CH.                      |
| 1013 |        |        |        |        |         |         |                   |                                          |
| 1014 | 006074 | 022737 | 000002 | 015012 | TSTCT2: | CMP     | #2, KSTOR3        | :COUNT = TO 2                            |
| 1015 | 006102 | 001005 |        |        |         | BNE     | TSTCT1            | :NO, TEST COUNT 1                        |
| 1016 | 006104 | 022737 | 001000 | 015164 |         | CMP     | #1000, XSPRD2     |                                          |
| 1017 | 006112 | 001011 |        |        |         | BNE     | REPT4             | :BRANCH IF NOT WITHIN 2                  |
| 1018 | 006114 | 000502 |        |        |         | BR      | REPT7             | :YES, TEST NEXT CH.                      |
| 1019 | 006116 | 022737 | 000001 | 015012 | TSTCT1: | CMP     | #1, KSTOR3        | :COUNT = TO 1                            |
| 1020 | 006124 | 001004 |        |        |         | BNE     | REPT4             | :NO, REPORT EVEN IF NOT '0'              |
| 1021 | 006126 | 022737 | 001000 | 015162 |         | CMP     | #1000, XSPRD1     |                                          |
| 1022 | 006134 | 001472 |        |        |         | BEQ     | REPT7             | :BRANCH IF TOTAL WITHIN 1 COUNT          |
| 1023 | 006136 | 104000 |        |        | REPT4:  | PRINT   |                   |                                          |
| 1024 | 006140 | 014020 |        |        |         | CRLF    |                   |                                          |
| 1025 | 006142 | 005737 | 015062 |        |         | TST     | MESPRT            | :TEST IF HEADER HAS BEEN TYPED           |
| 1026 | 006146 | 001002 |        |        |         | BNE     | REPT5             | :BRANCH IF YES                           |
| 1027 | 006150 | 104000 |        |        |         | PRINT   |                   |                                          |
| 1028 | 006152 | 014444 |        |        |         | MES19   |                   | :TEXT 'CH. HIGH AVG. LOW'                |
| 1029 | 006154 | 104013 |        |        | REPT5:  | TSTTKS  |                   | :TEST FOR KEYBOARD INTERRUPT             |
| 1030 | 006156 | 104000 |        |        |         | PRINT   |                   |                                          |
| 1031 | 006160 | 014020 |        |        |         | CRLF    |                   | :CARRIAGE RETURN, LINE FEED              |
| 1032 | 006162 | 013737 | 015014 | 006354 |         | MOV     | KSTOR4, REPT8A    | :MOV. CH.                                |
| 1033 | 006170 | 042737 | 177700 | 006354 |         | BIC     | #177700, REPT8A   |                                          |



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SEQ 0035

|      |        |        |        |        |         |               |                                          |
|------|--------|--------|--------|--------|---------|---------------|------------------------------------------|
| 1034 | 006176 | 005737 | 015034 |        | TST     | USED SH       | ; TEST FOR DUAL MODE                     |
| 1035 | 006202 | 001403 |        |        | BEQ     | REPT8         | ; BRANCH IF NOT                          |
| 1036 | 006204 | 062737 | 000010 | 006354 | ADD     | #10, REPT8A   |                                          |
| 1037 | 006212 | 104010 |        |        | REPT8:  |               |                                          |
| 1038 | 006214 | 006354 |        |        | PRTCT   |               |                                          |
| 1039 | 006216 | 104007 |        |        | REPT8A  |               |                                          |
| 1040 | 006220 | 104010 |        |        | SPACE   |               |                                          |
| 1041 | 006222 | 015070 |        |        | PRTCT   |               | ; PRINT LOW VALUE                        |
| 1042 | 006224 | 104007 |        |        | LOW     |               |                                          |
| 1043 | 006226 | 104010 |        |        | SPACE   |               |                                          |
| 1044 | 006230 | 015114 |        |        | PRTCT   |               | ; PRINT AVERAGE VALUE                    |
| 1045 | 006232 | 104007 |        |        | AVRAGE  |               |                                          |
| 1046 | 006234 | 104010 |        |        | SPACE   |               |                                          |
| 1047 | 006236 | 015066 |        |        | PRTCT   |               | ; PRINT HIGH VALUE                       |
| 1048 | 006240 | 005737 | 015062 |        | HIGH    |               |                                          |
| 1049 | 006244 | 001002 |        |        | TST     | MESPRT        |                                          |
| 1050 | 006246 | 104000 |        |        | BNE     | REPT6         |                                          |
| 1051 | 006250 | 014477 |        |        | PRINT   |               |                                          |
| 1052 | 006252 | 052737 | 000007 | 015062 | MES20   |               | ; PRINT 'COUNT SPREAD' HEADER            |
| 1053 | 006260 | 022737 | 001000 | 015144 | BIS     | #7, MESPRT    | ; INHIBIT OTHER HEADERS                  |
| 1054 | 006266 | 000240 |        |        | CMP     | #1000, AVGCNT | ; TEST IF ALL COUNTS WERE AT AVG.        |
| 1055 | 006270 | 104000 |        |        | NOP     |               | ; <BEQ REPT7> BRANCH TO NEXT CH. IF YES. |
| 1056 | 006272 | 014020 |        |        | PRINT   |               |                                          |
| 1057 | 006274 | 012704 | 015130 |        | CRLF    |               |                                          |
| 1058 | 006300 | 012402 |        |        | MOV     | #ORLOW, R4    |                                          |
| 1059 | 006302 | 104006 |        |        | REPT6A: | (R4)+, R2     |                                          |
| 1060 | 006304 | 022704 | 015162 |        | MOV     |               | ; TYPE OUT COUNT SPREAD                  |
| 1061 | 006310 | 001373 |        |        | BINDEC  |               | ; TEST FOR DONE                          |
| 1062 | 006312 | 005777 | 172512 |        | CMP     | #XSPRD1, R4   | ; BRANCH IF NO AND TYPE NEXT COUNT       |
| 1063 | 006316 | 100001 |        |        | BNE     | REPT6A        |                                          |
| 1064 | 006320 | 000000 |        |        | TST     | QSWR          |                                          |
| 1065 | 006322 | 013704 | 015014 |        | BPL     | REPT7         | ; REPEATIBILITY ERROR                    |
| 1066 | 006326 | 042704 | 177700 |        | HALT    |               |                                          |
| 1067 | 006332 | 023704 | 015010 |        | REPT7:  | KSTOR4, R4    |                                          |
| 1068 | 006336 | 001404 |        |        | MOV     | #177700, R4   |                                          |
| 1069 | 006340 | 005237 | 015014 |        | BIC     | KSTOR2, R4    | ; TESTED ALL CH.(S)?                     |
| 1070 | 006344 | 000137 | 005740 |        | CMP     | REPT7A        |                                          |
| 1071 | 006350 | 000137 | 005726 |        | BEQ     | KSTOR4        | ; TEST NEXT CHANNEL                      |
| 1072 |        |        |        |        | INC     | REPT3         |                                          |
| 1073 | 006354 | 000000 |        |        | JMP     | REPT2A        |                                          |
|      |        |        |        |        | REPT7A: |               |                                          |
|      |        |        |        |        | REPT8A: | 0             |                                          |

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SEQ 0036

```

1074
1075
1076
1077
1078
1079
1080
1081 006356 012737 006400 014776
1082 006364 005037 015036
1083 006370 005037 015034
1084 006374 104000
1085 006376 014106
1086 006400 104000
1087 006402 014306
1088 006404 104011
1089 006406 104001
1090 006410 013737 010716 015006
1091 006416 013737 010720 015010
1092 006424 013706 014774
1093 006430 104013
1094 006432 012737 000020 006744
1095 006440 005037 006746
1096 006444 012737 000010 015052
1097 006452 012737 000010 015004
1098 006460 113737 015006 014771
1099 006466 042737 140377 014770
1100 006474 052737 000001 014770
1101 006502 005237 015030
1102 006506 004737 010726
1103 006512 113737 015010 014771
1104 006520 042737 140377 014770
1105 006526 052737 000001 014770
1106 006534 005237 015030
1107 006540 004737 010726

;*****
;RECOVERY TEST
;*****
;THIS TEST IS DESIGNED TO TEST RECOVERY OF THE A/D CONVERTER VIA ACCEPT-
;ING TWO (2) CHANNEL FROM THE TELETYPE AND THEN TAKE A
;SERIES OF EIGHT CONVERSIONS ON EACH CHANNEL AND TYPING OUT THE CON-
;VERSION VALUES OF THE 2ND CHANNEL IN THE ORDER THEY WERE TAKEN.
RECVY: MOV #RECVY1,AVECTR ;SET UP THE 'A' RETURN ADDRESS
      CLR USEDMA
      CLR USED5H
      PRINT
      MES8
RECVY1: PRINT
      MES14
      TTYIN
      DECOCT
      MOV BCDTAB,KSTOR1
      MOV BCDTAB+2,KSTOR2
RECVY2: MOV STACK,SP
      TSTTKS
      MOV #16.,10$
      CLR 11$
      MOV #10,TEMP3
      MOV #10,COUNT
      MOV KSTOR1,ADWRD2+1
      BIC #140377,ADWRD2
      BIS #1,ADWRD2
      INC DELAY
      JSR PC,ADCNVT
      MOV KSTOR2,ADWRD2+1
      BIC #140377,ADWRD2
      BIS #1,ADWRD2
      INC DELAY
      JSR PC,ADCNVT

;TEXT 'RECOVERY TEST'
;REQUEST CHANNELS
;WAIT FOR INPUT
;CONVERT TO OCTAL
;SAVE 1ST CH.
;SAVE 2ND CH.
;CHECK FOR KEYBOARD FLAG
;LOAD COUNT
;CLEAR POINTER
;SET UP TO PRINT 10
;SETUP TO TAKE '8' CONVERSIONS ON 1ST CH.
;LOAD 1ST CH.
;SET FLAG
;TAKE THE CONVERSIONS
;SET UP 2ND CH.
;SET FLAG
;TAKE 2ND SERIES OF CONVERSIONS

```

|      |        |        |        |             |           |                  |                                |
|------|--------|--------|--------|-------------|-----------|------------------|--------------------------------|
| 1108 | 006544 | 013701 | 006746 |             | MOV       | 11\$, R1         | ;LOAD A POINTER                |
| 1109 | 006550 | 012700 | 015214 |             | MOV       | #ADBUFF, R0      | ;LOAD POINTER                  |
| 1110 | 006554 | 012061 | 015256 |             | MOV       | (R0)+, ADTB0(R1) |                                |
| 1111 | 006560 | 012061 | 015320 |             | MOV       | (R0)+, ADTB1(R1) |                                |
| 1112 | 006564 | 012061 | 015362 |             | MOV       | (R0)+, ADTB2(R1) |                                |
| 1113 | 006570 | 012061 | 015424 |             | MOV       | (R0)+, ADTB3(R1) |                                |
| 1114 | 006574 | 012061 | 015466 |             | MOV       | (R0)+, ADTB4(R1) |                                |
| 1115 | 006600 | 012061 | 015530 |             | MOV       | (R0)+, ADTB5(R1) |                                |
| 1116 | 006604 | 012061 | 015572 |             | MOV       | (R0)+, ADTB6(R1) |                                |
| 1117 | 006610 | 012061 | 015634 |             | MOV       | (R0)+, ADTB7(R1) |                                |
| 1118 | 006614 | 062737 | 000002 | 006746      | ADD       | #2, 11\$         | ;UPDATE POINTER                |
| 1119 | 006622 | 005337 | 006744 |             | DEC       | 10\$             |                                |
| 1120 | 006626 | 001314 |        |             | BNE       | 1\$              |                                |
| 1121 |        |        |        |             |           |                  |                                |
| 1122 | 006630 | 012700 | 000010 |             | MOV       | #8, R0           | ;LOAD COUNT                    |
| 1123 | 006634 | 012702 | 015214 |             | MOV       | #ADBUFF, R2      | ;LOAD POINTER                  |
| 1124 | 006640 | 012701 | 000000 |             | MOV       | #0, R1           |                                |
| 1125 | 006644 | 012737 | 000017 | 015046 2\$: | MOV       | #1\$, TEMP1      | ;LOAD TEMP                     |
| 1126 | 006652 | 012737 | 000004 | 012160      | MOV       | #4, CMPCNT       | ;LOAD AVRG. COUNT              |
| 1127 | 006660 | 016104 | 006752 |             | MOV       | LADTB(R1), R4    | ;GET POINTER                   |
| 1128 | 006664 | 012746 | 000340 |             | MOV       | #340, -(SP)      | ;PUSH                          |
| 1129 | 006670 | 004737 | 012014 |             | JSR       | PC, CMPTER       | ;CONVERT AND AVERAGE           |
| 1130 | 006674 | 013722 | 015114 |             | MOV       | AVRAGE, (R2)+    | ;SAVE AVERAGE                  |
| 1131 | 006700 | 005721 |        |             | TST       | (R1)+            | ;UPDATE POINTER                |
| 1132 | 006702 | 005300 |        |             | DEC       | R0               |                                |
| 1133 | 006704 | 001357 |        |             | BNE       | 2\$              | ;BR IF NOT DONE                |
| 1134 |        |        |        |             |           |                  |                                |
| 1135 | 006706 | 032777 | 002000 | 172114      | BIT       | #SW10, ASWR      | ;TEST BIT 10                   |
| 1136 | 006714 | 001243 |        |             | BNE       | RECVY2           |                                |
| 1137 | 006716 | 104000 |        |             | PRINT     |                  |                                |
| 1138 | 006720 | 014131 |        |             | MES9      |                  | ;TEXT 'CH.'                    |
| 1139 | 006722 | 104013 |        |             | TSTTKS    |                  | ;CHECK AGAIN FOR KEYBOARD FLAG |
| 1140 | 006724 | 013737 | 015010 | 006354      | MOV       | KSTOR2, REPTBA   |                                |
| 1141 | 006732 | 104010 |        |             | PRTCT     |                  |                                |
| 1142 | 006734 | 006354 |        |             | REPTBA    |                  |                                |
| 1143 | 006736 | 104007 |        |             | SPACE     |                  |                                |
| 1144 | 006740 | 104012 |        |             | PRTAVG    |                  | ;PRINT VALUES OF 2ND CH.       |
| 1145 | 006742 | 000630 |        |             | BR RECVY2 |                  | ;DO IT AGAIN                   |
| 1146 | 006744 | 000000 |        |             |           |                  |                                |
| 1147 | 006746 | 000000 |        |             |           |                  |                                |
| 1148 | 006750 | 000000 |        |             |           |                  |                                |
| 1149 |        |        |        |             |           |                  |                                |
| 1150 | 006752 | 015256 |        |             | LADTB:    | ADTB0            |                                |
| 1151 | 006754 | 015320 |        |             |           | ADTB1            |                                |
| 1152 | 006756 | 015362 |        |             |           | ADTB2            |                                |
| 1153 | 006760 | 015424 |        |             |           | ADTB3            |                                |
| 1154 | 006762 | 015466 |        |             |           | ADTB4            |                                |
| 1155 | 006764 | 015530 |        |             |           | ADTB5            |                                |
| 1156 | 006766 | 015572 |        |             |           | ADTB6            |                                |
| 1157 | 006770 | 015634 |        |             |           | ADTB7            |                                |



```

1158
1159
1160
1161
1162
1163 006772 012737 007000 014776 DSHTST: MOV      #DSHT0,AVECTR ;SET UP 'A' RETURN
1164 007000 104000 DSHT0: PRINT ;TYPE HEADER
1165 007002 014321 MES15
1166 007004 005037 001034 DSHT1: CLR      PASSCT ;CLEAR PASS COUNT
1167 007010 005037 015024 DSHT2: CLR      STCHAN ;CLEAR STARTING CHANNEL
1168 007014 004537 013244 DSHT3: JSR      RS,LEDS
1169 007020 015024 STCHAN
1170 007022 000240 NOP
1171 007024 052777 000100 171766 BIS      #BIT6,ATKS ;RESET''
1172 007032 013706 014774 MOV      STACK,SP ;ENABLE INTERRUPT
1173 007036 013777 001034 171766 MOV      PASSCT,ADISPLA ;LOAD THE STACK POINTER
1174 007044 113737 015024 015072 MOVB     STCHAN,STMDAT ;LOAD PASS COUNT
1175 007052 005077 171740 CLR      APSW ;LOAD CHANNEL <0-3>
1176
1177
1178 007066 052737 000001 015072 ;* MOV      STMDAT,ADCS ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1179 BIS      #1,STMDAT
1180
1181 007104 ;* MOV      STMDAT,ADCS ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1182 IS:
1183 ;* MOV      ADCS,SBDDAT ;/READ DEVICE REG ADCS,PUT DATA IN SBDDAT.
1184 007114 105737 015074 TSTB     SBDDAT
1185 007120 100371 BPL      IS
1186
1187 ;* MOV      ADDBR,AVERM4 ;/READ DEVICE REG ADDBR,PUT DATA IN AVERM4.
1188 ;*
1189 ;* MOV      ADCS,STMDAT ;/READ DEVICE REG ADCS,PUT DATA IN STMDAT.
1190 007142 152737 000010 015073 BISB     #10,STMDAT+1
1191 ;*
1192 ;* MOV      STMDAT,ADCS ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1193 ;*
1194 ;* MOV      ADCS,STMDAT ;/READ DEVICE REG ADCS,PUT DATA IN STMDAT.
1195 007170 052737 000001 015072 BIS      #1,STMDAT
1196 ;*
1197 ;* MOV      STMDAT,ADCS ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1198 007206 ;*
1199 2S:
1200 ;* MOV      ADCS,SBDDAT ;/READ DEVICE REG ADCS,PUT DATA IN SBDDAT.
1201 007216 105737 015074 TSTB     SBDDAT
1202 007222 100371 BPL      2S
1203 ;*
1204 ;* MOV      ADDBR,AVERM3 ;/READ DEVICE REG ADDBR,PUT DATA IN AVERM3.
1205 ;*
1206 007234 004537 007634 JSR      RS,COMPR ;COMPARE TWO NUMBERS
1207 007240 015104 AVERM4
1208 007242 015106 AVERM3
1209 007244 001014 BNE
1210 007246 032777 020000 171554 BIT      #BIT13,ASWR ;BRANCH IF NOT EQUAL <DIFFERENT INPUT>
1211 007254 001004 BNE     DSHT4

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N03

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SEQ 0039

1212 007256 104000  
1213 007260 014020  
1214 007262 104000  
1215 007264 014605  
1216 007266 005777  
1217 007272 100001  
1218 007274 000000  
1219  
1220

171536

DSHT4:

PRINT  
CRLF  
PRINT  
MES22  
TST  
BPL  
HALT

DSWR  
DSHT6

;PRINT MESSAGE

;ERROR, CHANNEL PAIRS HAVE SAME INPUT VOLTAGE  
;THE FIRST CHANNEL NUMBER OF THE PAIR IS IN THE LEDS

```

1221
1222 ;NOW TEST THAT DUAL SAMPLE REALLY WORKS
1223 ;SET DUAL MODE AND CONVERT A CHANNEL THE FIRST CONVERSION
1224 ;SHOULD NOT EQUAL THE SECOND CONVERSION
1225 ;IF IT DOES THE DUAL SAMPLE AND HOLD IS NOT WORKING CORRECTLY
1226
1227 007276 113737 015024 015073 DSHT6:  MOVB    STCHAN,STMDAT+1 ;LOAD 1ST MUX CHANNEL
1228
1229 ;*      MOV    STMDAT,@ADCS    ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1230 007314 052737 040000 015072    BIS    #BIT14,STMDAT
1231
1232 ;*      MOV    STMDAT,@ADCS    ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1233
1234 ;*      MOV    @ADCS,STMDAT    ;/READ DEVICE REG ADCS,PUT DATA IN STMDAT.
1235 007342 052737 000001 015072    BIS    #1,STMDAT
1236
1237 ;*      MOV    STMDAT,@ADCS    ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1238 007360    1$:
1239
1240 ;*      MOV    @ADCS,$BDDAT    ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
1241 007370 105737 015074    TSTB    $BDDAT    ;WAIT FOR DONE
1242 007374 100371    BPL    1$
1243
1244 ;*      MOV    @ADCS,STMDAT    ;/READ DEVICE REG ADCS,PUT DATA IN STMDAT.
1245 007406 005237 015072    INC    STMDAT
1246
1247 ;*      MOV    STMDAT,@ADCS    ;/ PUT DATA FROM STMDAT TO DEVICE REG ADCS
1248
1249 ;*      MOV    @ADDBR,AVERM2   ;/READ DEVICE REG ADDBR,PUT DATA IN AVERM2.
1250    2$:      SAVE 1ST CHANNEL CONVERSION
1251 007432
1252
1253 ;*      MOV    @ADCS,$BDDAT    ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
1254 007442 105737 015074    TSTB    $BDDAT    ;WAIT FOR DONE
1255 007446 100371    BPL    2$
1256
1257 ;*      MOV    @ADDBR,AVERM1   ;/READ DEVICE REG ADDBR,PUT DATA IN AVERM1.
1258
1259 007460 004537 007634    JSR     R5,COMPR
1260 007464 015110
1261 007466 015112
1262 007470 001015
1263 007472 032777 020000 171330    BNE    DSHT7      ;BRANCH IF NOT EQUAL
1264 007500 001004    BIT     #BIT13,@SWR
1265 007502 104000    BNE    DSHT6A
1266 007504 014020    PRINT
1267 007506 104000    CRLF
1268 007510 014663    PRINT
1269 007512 005777 171312    MES23
1270 007516 100014    DSHT6A:  TST     @SWR
1271 007520 000000    BPL     DSHT7A
1272 007522 000412    HALT
1273    BR      DSHT7A
;ERROR, FIRST CONVERSION ON CHANNEL X (STCHAN) WAS EQUAL
;TO THE SECOND CONVERSION IN DUAL MODE

```



| Address | Op Code | Op 2 | Op 3 | Op 4 | Op 5 | Op 6 | Op 7 | Op 8 | Op 9 | Op 10 | Op 11 | Op 12 | Op 13 | Op 14 | Op 15 | Op 16 | Op 17 | Op 18 | Op 19 | Op 20 | Op 21 | Op 22 | Op 23 | Op 24 | Op 25 | Op 26 | Op 27 | Op 28 | Op 29 | Op 30 | Op 31 | Op 32 | Op 33 | Op 34 | Op 35 | Op 36 | Op 37 | Op 38 | Op 39 | Op 40 | Op 41 | Op 42 | Op 43 | Op 44 | Op 45 | Op 46 | Op 47 | Op 48 | Op 49 | Op 50 | Op 51 | Op 52 | Op 53 | Op 54 | Op 55 | Op 56 | Op 57 | Op 58 | Op 59 | Op 60 | Op 61 | Op 62 | Op 63 | Op 64 | Op 65 | Op 66 | Op 67 | Op 68 | Op 69 | Op 70 | Op 71 | Op 72 | Op 73 | Op 74 | Op 75 | Op 76 | Op 77 | Op 78 | Op 79 | Op 80 | Op 81 | Op 82 | Op 83 | Op 84 | Op 85 | Op 86 | Op 87 | Op 88 | Op 89 | Op 90 | Op 91 | Op 92 | Op 93 | Op 94 | Op 95 | Op 96 | Op 97 | Op 98 | Op 99 | Op 100 | Op 101 | Op 102 | Op 103 | Op 104 | Op 105 | Op 106 | Op 107 | Op 108 | Op 109 | Op 110 | Op 111 | Op 112 | Op 113 | Op 114 | Op 115 | Op 116 | Op 117 | Op 118 | Op 119 | Op 120 | Op 121 | Op 122 | Op 123 | Op 124 | Op 125 | Op 126 | Op 127 | Op 128 | Op 129 | Op 130 | Op 131 | Op 132 | Op 133 | Op 134 | Op 135 | Op 136 | Op 137 | Op 138 | Op 139 | Op 140 | Op 141 | Op 142 | Op 143 | Op 144 | Op 145 | Op 146 | Op 147 | Op 148 | Op 149 | Op 150 | Op 151 | Op 152 | Op 153 | Op 154 | Op 155 | Op 156 | Op 157 | Op 158 | Op 159 | Op 160 | Op 161 | Op 162 | Op 163 | Op 164 | Op 165 | Op 166 | Op 167 | Op 168 | Op 169 | Op 170 | Op 171 | Op 172 | Op 173 | Op 174 | Op 175 | Op 176 | Op 177 | Op 178 | Op 179 | Op 180 | Op 181 | Op 182 | Op 183 | Op 184 | Op 185 | Op 186 | Op 187 | Op 188 | Op 189 | Op 190 | Op 191 | Op 192 | Op 193 | Op 194 | Op 195 | Op 196 | Op 197 | Op 198 | Op 199 | Op 200 | Op 201 | Op 202 | Op 203 | Op 204 | Op 205 | Op 206 | Op 207 | Op 208 | Op 209 | Op 210 | Op 211 | Op 212 | Op 213 | Op 214 | Op 215 | Op 216 | Op 217 | Op 218 | Op 219 | Op 220 | Op 221 | Op 222 | Op 223 | Op 224 | Op 225 | Op 226 | Op 227 | Op 228 | Op 229 | Op 230 | Op 231 | Op 232 | Op 233 | Op 234 | Op 235 | Op 236 | Op 237 | Op 238 | Op 239 | Op 240 | Op 241 | Op 242 | Op 243 | Op 244 | Op 245 | Op 246 | Op 247 | Op 248 | Op 249 | Op 250 | Op 251 | Op 252 | Op 253 | Op 254 | Op 255 | Op 256 | Op 257 | Op 258 | Op 259 | Op 260 | Op 261 | Op 262 | Op 263 | Op 264 | Op 265 | Op 266 | Op 267 | Op 268 | Op 269 | Op 270 | Op 271 | Op 272 | Op 273 | Op 274 | Op 275 | Op 276 | Op 277 | Op 278 | Op 279 | Op 280 | Op 281 | Op 282 | Op 283 | Op 284 | Op 285 | Op 286 | Op 287 | Op 288 | Op 289 | Op 290 | Op 291 | Op 292 | Op 293 | Op 294 | Op 295 | Op 296 | Op 297 | Op 298 | Op 299 | Op 300 | Op 301 | Op 302 | Op 303 | Op 304 | Op 305 | Op 306 | Op 307 | Op 308 | Op 309 | Op 310 | Op 311 | Op 312 | Op 313 | Op 314 | Op 315 | Op 316 | Op 317 | Op 318 | Op 319 | Op 320 | Op 321 | Op 322 | Op 323 | Op 324 | Op 325 | Op 326 | Op 327 | Op 328 | Op 329 | Op 330 | Op 331 | Op 332 | Op 333 | Op 334 | Op 335 | Op 336 | Op 337 | Op 338 | Op 339 | Op 340 | Op 341 | Op 342 | Op 343 | Op 344 | Op 345 | Op 346 | Op 347 | Op 348 | Op 349 | Op 350 | Op 351 | Op 352 | Op 353 | Op 354 | Op 355 | Op 356 | Op 357 | Op 358 | Op 359 | Op 360 | Op 361 | Op 362 | Op 363 | Op 364 | Op 365 | Op 366 | Op 367 | Op 368 | Op 369 | Op 370 | Op 371 | Op 372 | Op 373 | Op 374 | Op 375 | Op 376 | Op 377 | Op 378 | Op 379 | Op 380 | Op 38 |
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1324 ;ROUTINE TO LOOP THUR A SINGLE LOGIC SUBTEST. ENTERED FROM THE 'MONITOR'
1325 ;VIA TYPING 'TNN' WHERE 'NN' IS EQUATED TO THE 'PC' OF A SUBTEST.
1326 ;NOTE THAT 'SW11' MUST BE '0' (DOWN) TO RUN THIS TEST.
1327
1328 007732 012701 010546 TESTX: MOV #INBUF,R1
1329 007736 005037 015006 CLR KSTOR1
1330 007742 042711 177770 TSTA: BIC #177770,(R1) ;MASK TO OCTAL
1331 007746 062137 015006 ADD (R1),KSTOR1 ;ADD TO LAST RESULT
1332 007752 005337 015002 DEC CHRCNT
1333 007756 001407 TSTXB BEQ TSTXB
1334 007760 006337 015006 ASL KSTOR1
1335 007764 006337 015006 ASL KSTOR1
1336 007770 006337 015006 ASL KSTOR1
1337 007774 000762 BR TSTA
1338
1339 007776 022737 005204 015006 TSTXB: CMP #CALBRT,KSTOR1 ;IS NO. WITHIN LIMITS OF THE LOGIC TEST
1340 010004 100002 BPL .+6 ;CONTINUE IF YES
1341 010006 000137 001774 JMP INIT3 ;OTHERWISE RETURN TO MONITOR
1342 010012 062737 000002 015006 ADD #2,KSTOR1 ;ADD '2' TO POINT TO INSTRUCTION AFTER SCOPE
1343 010020 005037 013156 XLOOP: CLR SCOPEF ;KEEP COUNT AT ZERO
1344 010024 012737 010020 013160 MOV #XLOOP,RETURN ;LOAD SCOPE LOOP RETURN POINTER
1345 010032 000177 004750 JMP #KSTOR1 ;JUMP TO TEST
1346
1347 ;SUBROUTINE TO ISSUE N SPACES
1348 ;N IS ONE PLUS VALUE CONTAINED IN SPACEX
1349 ;SPACEX IS CLEARED WITHIN THE SUBROUTINE, SO THAT A CALL ON
1350 ;SPACE WITHOUT LOADING SPACEX ISSUES ONLY ONE SPACE
1351
1352 010036 105777 170762 XSPACE: TSTB #TPS ;WAIT FOR TTY READY
1353 010042 100375 BPL .-4
1354 010044 012777 000240 170754 MOV #240,TPB ;OUTPUT A SPACE
1355 010052 005337 010066 DEC SPACEX ;DECREMENT COUNT
1356 010056 003367 BGT XSPACE ;LOOP IF NOT DONE
1357 010060 005037 010066 CLR XSPACE ;RESET COUNT TO ZERO
1358 010064 000002 RTI ;RETURN
1359 010066 000000 SPACEX: 0
1360
1361 ;SUBROUTINE TO TYPE OUT AVERAGES FOR THE RECOVERY TEST
1362
1363 010070 012737 015214 010100 XPRTAB: MOV #ADBUFF,AVGTAB
1364 010076 104010 XPTA1: PRTCT
1365 010100 015214 AVGTAB: ADBUFF
1366 010102 062737 000002 010100 ADD #2,AVGTAB
1367 010110 012737 000002 010066 MOV #2,SPACEX
1368 010116 104007 SPACE
1369 010120 005337 015052 DEC TEMP3
1370 010124 001364 BNE XPTA1
1371 010126 000002 RTI

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1372 ;KEYBOARD SERVICE ROUTINE
1373
1374 010130 010046 XTTYIN: MOV RO,-(SP)
1375 010132 010146 MOV R1,-(SP)
1376 010134 010246 MOV R2,-(SP)
1377 010136 010346 MOV R3,-(SP)
1378 010140 010446 MOV R4,-(SP)
1379 010142 010546 MOV R5,-(SP)
1380 010144 012704 010546 170642 NEWIN: MOV #INBUF,R4 ;SETUP CHARACTER BUFFER
1381 010150 042777 000100 BIC #BIT6,ATKS ;CLEAR CHARACTER COUNTER
1382 010156 005037 015002 CLR CHRCNT
1383 010162 005037 010546 CLR INBUF
1384 010166 005037 010550 CLR INBUF+2
1385 010172 005037 010552 CLR INBUF+4
1386 010176 005037 010554 CLR INBUF+6
1387 010202 005037 010556 CLR INBUF+10
1388 010206 005037 010560 CLR INBUF+12
1389 010212 005037 010562 CLR INBUF+14
1390 010216 105777 170576 INPUTA: TSTB ATKS ;CHARACTER READY?
1391 010222 100375 BPL INPUTA ;NO, WAIT IT OUT
1392 010224 017701 170572 MOV ATKB,R1 ;SAVE CHARACTER
1393 010230 042701 177600 BIC #177600,R1 ;STRIP PARITY BIT
1394 010234 120127 000060 CMPB R1,#60 ;IS IT A SPECIAL CHARACTER
1395 010240 100420 BMI SPCHR ;YES, TEST IT
1396 010242 122701 000173 CMPB #173,R1
1397 010246 100415 BMI SPCHR
1398 010250 010124 INPUTB: MOV R1,(R4)+ ;SAVE CHARACTER
1399 010252 005237 015002 INC CHRCNT ;INCREMENT THE CHARACTER COUNT.
1400 010256 022737 000006 015002 CMP #6,CHRCNT
1401 010264 100524 BMI SPCHR5
1402 010266 105777 170532 OUTPTA: TSTB ATPS ;ECHO CHARACTER
1403 010272 100375 BPL OUTPTA
1404 010274 110177 170526 MOVB R1,ATPB
1405 010300 000746 BR INPUTA ;WAIT FOR NEXT CHARACTER
1406
1407 ;SUBROUTINE TO TEST FOR SPECIAL CHARACTERS : '↑A', '↑C', '↑G', 'CR', ',', ' OR 'RUBOUT'
1408
1409 010302 122701 000001 SPCHR: CMPB #1,R1 ;CHAR.='↑A'
1410 010306 001016 BNE SPCHR1 ;NO, NOT '↑A'
1411 010310 104000 PRINT ;ECHO '↑A'
1412 010312 013766 CNTRLA ;RESTORE 'SP'
1413 010314 012605 MOV (SP)+,R5
1414 010316 012604 MOV (SP)+,R4
1415 010320 012603 MOV (SP)+,R3
1416 010322 012602 MOV (SP)+,R2
1417 010324 012601 MOV (SP)+,R1
1418 010326 012600 MOV (SP)+,R0
1419 010330 022626 CMP (SP)+,(SP)+
1420 010332 052777 000100 170460 BIS #BIT6,ATKS ;ENABLE KEYBOARD INTR.
1421 010340 000177 004432 JMP @AVECTR ;YES, EXIT VIA '↑A' VECTOR ADDRESS.
1422 010344 122701 000003 SPCHR1: CMPB #3,R1 ;CHAR.='↑C'
1423 010350 001002 BNE 1$ ;NO, NOT '↑C'
1424 010352 000137 001546 JMP MONITR ;YES, EXIT TO MONITOR
1425 010356 122701 000177 1$: CMPB #177,R1 ;CHAR. = 'RUBOUT'

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|      |        |        |               |              |            |  |                                       |
|------|--------|--------|---------------|--------------|------------|--|---------------------------------------|
| 1426 | 010362 | 001011 |               | BNE          | SPCHR3     |  | ; NO TRY ANOTHER CHAR                 |
| 1427 | 010364 | 005737 | 015002        | TST          | CHRCNT     |  | ; IS RUBOUT LEGAL?                    |
| 1428 | 010370 | 001712 |               | BEQ          | INPUTA     |  | ; NO, IGNORE IT                       |
| 1429 | 010372 | 005337 | 015002        | DEC          | CHRCNT     |  |                                       |
| 1430 | 010376 | 012701 | 000134        | MOV          | #134,R1    |  | ; TYPE '\ ' TO INDICATE RUBOUT        |
| 1431 | 010402 | 005744 |               | TST          | -(R4)      |  | ; POP OFF LAST CHARACTER              |
| 1432 | 010404 | 000730 |               | BR           | OUTPTA     |  | ; WAIT FOR NEXT CHARACTER             |
| 1433 | 010406 | 122701 | 000054        | SPCHR3: CMPB | #54,R1     |  | ; TEST FOR ' '                        |
| 1434 | 010412 | 001716 |               | BEQ          | INPUTB     |  | ; LEGAL CHAR., SAVE IT                |
| 1435 | 010414 | 122701 | 000015        | SPCHR4: CMPB | #15,R1     |  | ; =TO 'CARRIAGE RETURN' TO TERMINATE? |
| 1436 | 010420 | 001014 |               | BNE          | 1\$        |  | ; NO, CONTINUE                        |
| 1437 | 010422 | 104000 |               | PRINT        |            |  | ; YES, TYPE 'CR-LF'                   |
| 1438 | 010424 | 014020 |               | CRLF         |            |  |                                       |
| 1439 | 010426 | 012605 |               | 4\$: MOV     | (SP)+,R5   |  |                                       |
| 1440 | 010430 | 012604 |               | MOV          | (SP)+,R4   |  |                                       |
| 1441 | 010432 | 012603 |               | MOV          | (SP)+,R3   |  |                                       |
| 1442 | 010434 | 012602 |               | MOV          | (SP)+,R2   |  |                                       |
| 1443 | 010436 | 012601 |               | MOV          | (SP)+,R1   |  |                                       |
| 1444 | 010440 | 012600 |               | MOV          | (SP)+,R0   |  |                                       |
| 1445 | 010442 | 052777 | 000100 170350 | BIS          | #BIT6,ATKS |  | ; ENABLE KEYBOARD INTR.               |
| 1446 | 010450 | 000002 |               | RTI          |            |  | ; EXIT                                |
| 1447 | 010452 | 122701 | 000007        | 1\$: CMPB    | #7,R1      |  | ; TEST IF CTRL G                      |
| 1448 | 010456 | 001027 |               | BNE          | SPCHRS     |  | ; BR IF NOT                           |
| 1449 | 010460 | 104000 |               | PRINT        |            |  |                                       |
| 1450 | 010462 | 013771 |               | CNTRLG       |            |  |                                       |
| 1451 | 010464 | 104010 |               | PRTCT        |            |  | ; PRINT OLD VALUE                     |
| 1452 | 010466 | 000170 |               | SOFTSW       |            |  |                                       |
| 1453 | 010470 | 104000 |               | PRINT        |            |  |                                       |
| 1454 | 010472 | 014007 |               | NEWSWR       |            |  | ; ASK FOR NEW VALUE                   |
| 1455 | 010474 | 104011 |               | TTYIN        |            |  |                                       |
| 1456 | 010476 | 005001 |               | CLR          | R1         |  |                                       |
| 1457 | 010500 | 012700 | 010546        | MOV          | #INBUF,R0  |  |                                       |
| 1458 | 010504 | 005710 |               | 2\$: TST     | (R0)       |  | ; TEST FOR TERM                       |
| 1459 | 010506 | 001410 |               | BEQ          | 3\$        |  | ; BR IF TERM                          |
| 1460 | 010510 | 012002 |               | MOV          | (R0)+,R2   |  | ; GET CHAR                            |
| 1461 | 010512 | 042702 | 177770        | BIC          | #177770,R2 |  | ; MASK OUT                            |
| 1462 | 010516 | 006301 |               | ASL          | R1         |  |                                       |
| 1463 | 010520 | 006301 |               | ASL          | R1         |  |                                       |
| 1464 | 010522 | 006301 |               | ASL          | R1         |  |                                       |
| 1465 | 010524 | 060201 |               | ADD          | R2,R1      |  |                                       |
| 1466 | 010526 | 000766 |               | BR           | 2\$        |  |                                       |
| 1467 | 010530 | 010137 | 000170        | 3\$: MOV     | R1,SOFTSW  |  | ; SAVE NEW SWITCH VALUE               |
| 1468 | 010534 | 000734 |               | BR           | 4\$        |  |                                       |

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1469 010536 104000 SPCHRS: PRINT ; OTHERWISE TYPE '?'
1470 010540 014025 QMARK
1471 010542 000137 010130 JMP XTTYIN ; WAIT FOR NEW ENTRY
1472 010546 000000 INBUF: 0 ; CHARACTER STORAGE BUFFER
1473
1474
1475 010564 ; SUBROUTINE WILL CONVERT 'N' WORDS (SEPARATED VIA COMMA'S)
1476 ; WHICH WERE STORED IN A TABLE VIA 'TTYIN' TO OCTAL AND STORE THEM.
1477
1478
1479 010564 012704 010546 BCD BIN: MOV #INBUF, R4 ; SETUP ASCII STORAGE TABLE
1480 010570 012703 010716 MOV #BCDTAB, R3 ; TABLE FOR STORAGE OF CONVERTED WORDS
1481 010574 005037 010720 CLR BCDTAB+2
1482 010600 005001 BCD BN1: CLR R1 ; REG. TO STORE RUNNING TOTAL
1483 010602 005002 CLR R2 ; TEMP. STORAGE FOR 'R1'
1484 010604 005737 015002 BCD BN2: TST CHRCNT ; END OF DATA?
1485 010610 003424 BLE BCDEND ; YES, EXIT
1486 010612 005337 015002 DEC CHRCNT ; DECREMENT CHARACTER COUNTER
1487 010616 122714 000054 CMPB #54, (R4) ; IS CHARACTER = TO ' '?
1488 010622 001417 BEQ BCDEND ; YES, DECODE NEW WORD
1489 010624 121427 000060 CMPB (R4), #60 ; TEST FOR LEGAL NO.
1490 010630 002425 BLT BCDERR
1491 010632 021427 000067 CMP (R4), #67
1492 010636 003022 BGT BCDERR
1493 010640 042714 177770 BIC #177770, (R4) ; STRIP NO.
1494 010644 012400 MOV (R4)+, R0 ; SAVE NO. IN R0.
1495 010646 010102 MOV R1, R2 ; SAVE CURRENT TOTAL
1496 010650 006301 ASL R1 ; NX2
1497 010652 006301 ASL R1 ; NX4
1498 010654 006301 ASL R1 ; NX8
1499 010656 060001 ADD R0, R1 ; N+NEW NO.
1500 010660 000751 BR BCD BN2
1501 010662 020127 000077 BCDEND: CMP R1, #77
1502 010666 003006 BGT BCDERR
1503 010670 005724 TST (R4)+ ; UPDATE BUFFER
1504 010672 010123 MOV R1, (R3)+ ; SAVE CONVERTED VALUE & SETUP TO SAVE NEXT
1505 010674 005737 015002 TST CHRCNT ; FINISHED?
1506 010700 001337 BNE BCD BN1 ; NO, CONVERT NEXT WORD
1507 010702 000002 RTI ; YES, EXIT
1508 010704 104000 BCDERR: PRINT
1509 010706 014025 QMARK
1510 010710 104011 TTYIN
1511 010712 000137 010564 JMP BCD BIN
1512 010716 000000 BCDTAB: 0
1513 010720 000000 0
1514 010722 000000 0
1515 010724 000000 0
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1516 ;SUBROUTINE TO TAKE 'N' CONVERSIONS AND STORE THEM IN AN A/D BUFFER. ROUTINE
1517 ;IS ENTERED WITH 'N' IN COUNT AND THE CH TO BE CONVERTED IN 'ADWORD'.
1518
1519 010726 005077 170064 ADCNVT: CLR @PSW
1520 010732 013737 015004 015046 MOV COUNT,TEMP1 ;SET UP # OF CONVERSIONS TO BE TAKEN
1521 010740 012704 015214 MOV @ADBUF,R4 ;LOAD BUFFER ADDRESS
1522 010744 005037 015026 CLR FIRST ;CLEAR TEMP
1523 010750 005737 015030 TST DELAY ;TEST DELAY
1524 010754 001042 BNE 6$ ;IF SET, SKIP
1525
1526 ;* MOV @ADCS,$TMDAT ;/READ DEVICE REG ADCS,PUT DATA IN $TMDAT.
1527 010766 113737 015073 001152 MOVB $TMDAT+1,DMK2
1528 010774 123737 014771 001152 CMPB ADWORD2+1,DMK2 ;TEST
1529 011002 001415 BEQ 1$ ;BR IF SAME
1530 011004 113737 014771 015073 MOVB ADWORD2+1,$TMDAT+1 ;LOAD MUX CHANNELS
1531
1532 ;* MOV $TMDAT,@ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
1533 011022 013737 011436 015032 MOV CPTIME,DELAY1
1534 011030 005337 015032 2$: DEC DELAY1
1535 011034 001375 BNE 2$ ;DELAY
1536 011036 005037 015030 1$: CLR DELAY
1537 011042 113737 014770 015072 4$: MOVB ADWORD2,$TMDAT ;LOAD CONTROL BYTE
1538
1539 ;* MOV $TMDAT,@ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
1540 011060 000407 BR 5$
1541 011062 013737 014770 015072 6$: MOV ADWORD2,$TMDAT ;LOAD CONTROL WORD
1542
1543 ;* MOV $TMDAT,@ADCS ;/ PUT DATA FROM $TMDAT TO DEVICE REG ADCS
1544 ;LOAD CH. & START CONVERT IF NOT 'EXT'
1545 011100 5$:
1546
1547 ;* MOV @ADCS,$BDDAT ;/READ DEVICE REG ADCS,PUT DATA IN $BDDAT.
1548 011110 105737 015074 TSTB $BDDAT
1549 011114 100371 BPL 5$ ;WAIT FOR DONE
1550 011116 005737 015074 TST $BDDAT
1551 011122 100016 BPL 11$ ;BRANCH IF NOT SET
1552
1553 ;* MOV $ZERO,@ADCS ;/ PUT DATA FROM $ZERO TO DEVICE REG ADCS
1554 011134 037727 167670 020000 BIT @SWR,#BIT13
1555 011142 001002 BNE 10$
1556 011144 104000 PRINT
1557 011146 014236 MES12
1558 011150 005777 167654 10$: TST @SWR
1559 011154 100001 BPL 11$
1560 011156 000000 HALT ;ERROR BIT SET
1561
1562 011160 005737 015034 11$: TST USED$H
1563 011164 001410 BEQ 12$ ;BRANCH IF NOT DUAL MODE
1564 011166 005137 015026 COM FIRST
1565 011172 001405 BEQ 12$
1566
1567 ;* MOV @ADDBR,BRLEV1 ;/READ DEVICE REG ADDBR,PUT DATA IN BRLEV1.
1568 011204 000716 BR 4$
1569 011206 12$:
```



|      |        |        |        |     |              |                                            |
|------|--------|--------|--------|-----|--------------|--------------------------------------------|
| 1570 |        |        |        |     |              |                                            |
| 1571 |        |        |        | ;   | *            |                                            |
| 1572 | 011216 | 013724 | 015072 | MOV | 3ADDR,STMDAT | ;/READ DEVICE REG ADDR,PUT DATA IN STMDAT. |
| 1573 | 011222 | 005337 | 015046 | MOV | STMDAT,(4)+  |                                            |
| 1574 | 011226 | 003305 |        | DEC | TEMP1        | ;DECREMENT COUNTER                         |
| 1575 | 011230 | 000207 |        | BGT | 4S           | ;IF NOT '0' TAKE NEXT CONVERSION           |
| 1576 |        |        |        | RTS | PC           |                                            |

```

1577
1578
1579      ;POWER FAIL HANDLER
1580      PWRFAL: MOV      R0,-(SP)
1581             MOV      R1,-(SP)
1582             MOV      R2,-(SP)
1583             MOV      R3,-(SP)
1584             MOV      R4,-(SP)
1585             MOV      R5,-(SP)
1586             MOV      24,-(SP)
1587             MOV      SP,PROC
1588             MOV      #PWRUP,24
1589             HALT
1590
1591      ;POWER UP HANDLER
1592
1593      011266 012777 000340 167522 PWRUP: MOV      #340,2PSW
1594      011274 013706 015000         MOV      PROC,SP
1595      011300 012637 000024         MOV      (SP)+,24
1596      011304 012605         MOV      (SP)+,R5
1597      011306 012604         MOV      (SP)+,R4
1598      011310 012603         MOV      (SP)+,R3
1599      011312 012602         MOV      (SP)+,R2
1600      011314 012601         MOV      (SP)+,R1
1601      011316 012600         MOV      (SP)+,R0
1602      011320 004737 021526         JSR      PC,$RESET
1603      011324 104000         PRINT
1604      011326 014565         MES21
1605      011330 000137 001546         JMP      MONITR

```

```

1606
1607
1608
1609
1610
1611
1612 011334 011646
1613 011336 162716 000002
1614 011342 017616 000000
1615 011346 005716
1616 011350 001001
1617 011352 000000
1618 011354 006316
1619 011356 042716 177001
1620 011362 062716 011374
1621 011366 017616 000000
1622 011372 000136
1623
1624
1625
1626 011374 011440
1627 011376 010564
1628 011400 013066
1629 011402 013162
1630 011404 011774
1631 011406 012162
1632 011410 011576
1633 011412 010036
1634 011414 012522
1635 011416 010130
1636 011420 010070
1637 011422 012652
1638 011424 013222
1639
1640 011426 002000
1641 011430 002400
1642 011432 003500
1643 011434 006000
1644
1645 011436 002000

; EMT DISPATCH SERVICE ROUTINE
; ARGUMENT OF EMT IS EXTRACTED AND USED AS OFFSET TO OBTAIN POINTER
; TO THE SELECTED SUBROUTINE.

EMTSRV: MOV      (SP), -(SP)      ; GET PC FOR TO RETURN
        SUB      #2, (SP)        ; PC OF EMT
        MOV      @ (SP), (SP)    ; GET EMT
        TST      (SP)            ; IS EMT VALID?
        BNE      EMTOK
        HALT
EMTOK:  ASL      (SP)            ; INVALID EMT
        BIC      #177001, (SP)   ; MULTIPLY EMT ARG BY '2'
        ADD      #EMTTAB, (SP)   ; CLEAR UNWANTED BITS
        MOV      @ (SP), (SP)    ; POINTER TO SUBROUTINE ADDRESS
        JMP      @ (SP)+         ; SUBROUTINE ADDRESS
        ; GO TO SUBROUTINE

; EMT DISPATCH TABLE

EMTTAB: TYPMES
        BCD BIN
        SCOPE C
        SCOPE H
        CMPTE
        CATORZ
        DEC RT
        XSPACE
        OCTPRT
        XTTYIN
        XPRTAV
        TKSFLG
        SCOPE I

; MESSAGE PRINT ROUTINE
; BINARY CONVERSION ROUTINE
; LOGIC TEST SCOPE ROUTINE
; LOGIC TEST SCOPE LOOP (10)
; SUBROUTINE TO COMPUTE THE AVG
; SUBROUTINE TO COMPUTE 'COUNT SPREAD'
; SUBROUTINE TO CONVERT OCT TO DEC + PRINT
; SUBROUTINE TO TYPE SPACES
; OCTAL PRINT ROUTINE
; TELEPRINTER SERVICE ROUTINE
; SUBROUTINE TO PRINT OUT THE GAIN AVERAGES
; SUBROUTINE TO TEST FOR KEYBOARD FLAG
; SCOPE ROUTINE

CPDLAY: 2000
        2400
        3500
        6000

CPTIME: 2000

; PDP-11/05
; PDP-11/20
; PDP-11/40
; PDP-11/45

```



```
1646 ;MESSAGE PRINT ROUTINE, ENTERED VIA EMT DISPATCH HANDLER.
1647 ;ROUTINE PICKS UP CONTENTS OF THE 'PC' AND USES THIS AS
1648 ;THE ADDRESS OF MESSAGE TO BE TYPED.
1649
1650 011440 005077 167352 TYPMES: CLR @PSW ;ENABLE KEYBOARD INTR.
1651 011444 010537 012650 MOV R5, SAV5
1652 011450 017605 000000 MOV @($P), R5 ;GET THE MESSAGE ADDRESS FROM START
1653 011454 062716 000002 ADD #2, ($P) ;SET UP STACK TO EXIT
1654 011460 105777 167340 TYPERA: TSTB @TPS
1655 011464 100375 BPL TYPERA ;WAIT FOR TTY DONE
1656 011466 122715 000100 CMPB #100, (R5) ;TEST FOR 'a'
1657 011472 001003 BNE TYPER1 ;BRANCH IF NO EQUAL
1658 011474 013705 012650 MOV SAV5, R5
1659 011500 000002 RTI ;OTHERWISE EXIT
1660 011502 122715 000045 TYPER1: CMPB #45, (R5) ;TEST FOR '%'
1661 011506 001403 BEQ TYPECL ;IF = TYPE 'CR-LF'
1662 011510 112577 167312 TYPER2: MOVB (R5)+, @TPB ;OUTPUT CHAR.
1663 011514 000761 BR TYPERA
1664 011516 012777 000015 167302 TYPECL: MOV #15, @TPB ;TYPE 'CR'
1665 011524 105777 167274 TSTB @TPS
1666 011530 100375 BPL -4
1667 011532 012777 000012 167266 MOV #12, @TPB
1668 011540 013737 001012 011574 MOV FILL5, 2$ ;LOAD FILL COUNT
1669 011546 105777 167252 1$: TSTB @TPS
1670 011552 100375 BPL 1$
1671 011554 113777 001014 167244 MOVB FILCHR, @TPB ;FILL CHAR
1672 011562 005337 011574 DEC 2$
1673 011566 100367 BPL 1$
1674 011570 105725 TSTB (R5)+ ;INCREMENT BUFFER
1675 011572 000732 BR TYPERA
1676 011574 000002 2$: 2
1677
1678 ;PRINT DECIMAL VALUE IN R2
1679
1680 011576 005077 167214 DECPRT: CLR @PSW
1681 011602 012737 177774 011756 MOV #-4, DIGCNT
1682 011610 012737 011764 011762 MOV #DECPNT+2, DECPNT
1683 011616 012737 000240 011760 MOV #240, ZERO
1684 011624 012737 177777 011754 TYPT1: MOV #-1, DIGIT
1685 011632 005237 011754 TYPT2: INC DIGIT
1686 011636 167702 000120 SUB @DECPNT, %2
1687 011642 100373 BPL TYPT2
1688 011644 067702 000112 ADD @DECPNT, %2
1689 011650 004737 011674 JSR PC, DECOU
1690 011654 005237 011756 INC DIGCNT
1691 011660 001001 BNE TYPT3
1692 011662 000002 RTI
1693 011664 062737 000002 011762 TYPT3: ADD #2, DECPNT
1694 011672 000754 BR TYPT1
1695 011674 005737 011754 DECOU: TST DIGIT
1696 011700 001010 BNE DEC1
1697 011702 022737 177777 011756 CMP #-1, DIGCNT
1698 011710 001404 BEQ DEC1
1699 011712 013737 011760 011754 MOV ZERO, DIGIT
```

|      |        |        |        |        |         |       |            |
|------|--------|--------|--------|--------|---------|-------|------------|
| 1700 | 011720 | 000406 |        |        |         | BR    | DEC2       |
| 1701 | 011722 | 012737 | 000260 | 011760 | DEC1:   | MOV   | #260,ZERO  |
| 1702 | 011730 | 052737 | 000260 | 011754 |         | BIS   | #260,DIGIT |
| 1703 | 011736 | 105777 | 167062 |        | DEC2:   | TSTB  | ATPS       |
| 1704 | 011742 | 100375 |        |        |         | BPL   | -4         |
| 1705 | 011744 | 013777 | 011754 | 167054 |         | MOV   | DIGIT,ATPB |
| 1706 | 011752 | 000207 |        |        |         | RTS   | 7          |
| 1707 |        |        |        |        |         |       |            |
| 1708 | 011754 | 000000 |        |        | DIGIT:  | 0     |            |
| 1709 | 011756 | 000000 |        |        | DIGCNT: | 0     |            |
| 1710 | 011760 | 000240 |        |        | ZERO:   | 240   |            |
| 1711 | 011762 | 011764 |        |        | DECPNT: | .+2   |            |
| 1712 | 011764 | 001750 |        |        |         | 1000. |            |
| 1713 | 011766 | 000144 |        |        |         | 100.  |            |
| 1714 | 011770 | 000012 |        |        |         | 10.   |            |
| 1715 | 011772 | 000001 |        |        |         | 1.    |            |
| 1716 |        |        |        |        |         |       |            |
| 1717 |        |        |        |        |         |       |            |
| 1718 |        |        |        |        |         |       |            |

; COMPUTE THE RESULTS OF 512 CONVERSIONS AS HIGH, LOW AND AVERAGE

|      |        |        |        |        |         |        |              |                                   |
|------|--------|--------|--------|--------|---------|--------|--------------|-----------------------------------|
| 1719 | 011774 | 012737 | 000777 | 015046 | CMPTE:  | MOV    | #777,TEMP1   | ; SET UP TO COMPARE '511' NUMBERS |
| 1720 | 012002 | 012704 | 015214 |        |         | MOV    | #ADBUFF,R4   | ; SET UP DATA BUFFER ADDRESS      |
| 1721 | 012006 | 012737 | 000011 | 012160 |         | MOV    | #11,CMPCNT   | ; LOAD AVRG. COUNT                |
| 1722 | 012014 | 005037 | 015064 |        | CMPTEA: | CLR    | HIORDV       |                                   |
| 1723 | 012020 | 012437 | 015114 |        |         | MOV    | (R4)+,AVRAGE | ; STORE 1ST VALUE AS AVERAGE      |
| 1724 | 012024 | 013737 | 015114 | 015066 |         | MOV    | AVRAGE,HIGH  | ; HIGH                            |
| 1725 | 012032 | 013737 | 015114 | 015070 |         | MOV    | AVRAGE,LOW   | ; & LOW                           |
| 1726 | 012040 | 012437 | 015050 |        | GETDAT: | MOV    | (R4)+,TEMP2  |                                   |
| 1727 | 012044 | 023737 | 015050 | 015066 |         | CMP    | TEMP2,HIGH   | ; IS NEW NO. GREATER THAN OLD NO. |
| 1728 | 012052 | 003403 |        |        |         | BLE    | TSLO         | ; BRANCH IF NOT GREATER           |
| 1729 | 012054 | 013737 | 015050 | 015066 |         | MOV    | TEMP2,HIGH   | ; OTHERWISE SAVE AS NEW HIGH      |
| 1730 | 012062 | 023737 | 015050 | 015070 | TSLO:   | CMP    | TEMP2,LOW    |                                   |
| 1731 | 012070 | 003003 |        |        |         | BGT    | TAGA         |                                   |
| 1732 | 012072 | 013737 | 015050 | 015070 |         | MOV    | TEMP2,LOW    | ; OTHERWISE SAVE AS NEW LOW       |
| 1733 | 012100 | 063737 | 015050 | 015114 | TAGA:   | ADD    | TEMP2,AVRAGE | ; ADD LOW ORDER                   |
| 1734 | 012106 | 005537 | 015064 |        |         | ADC    | HIORDV       | ; ADD CARRY TO HI ORDER           |
| 1735 | 012112 | 005337 | 015046 |        |         | DEC    | TEMP1        |                                   |
| 1736 | 012116 | 001350 |        |        |         | BNE    | GETDAT       | ; 512 OR 16 ADDITIONS?            |
| 1737 | 012120 | 013737 | 012160 | 015046 |         | MOV    | CMPCNT,TEMP1 | ; YES, DIVIDE/512 OR 16           |
| 1738 | 012126 | 006237 | 015064 |        | AVGDAT: | ASR    | HIORDV       |                                   |
| 1739 | 012132 | 006037 | 015114 |        |         | ROR    | AVRAGE       | ; SHIFT CARRY BIT INTO LO ORDER   |
| 1740 | 012136 | 005337 | 015046 |        |         | DEC    | TEMP1        |                                   |
| 1741 | 012142 | 001371 |        |        |         | BNE    | AVGDAT       | ; DONE?                           |
| 1742 | 012144 | 005537 | 015114 |        |         | ADC    | AVRAGE       | ; YES, ADD REMAINDER TO LO ORDER  |
| 1743 | 012150 | 004537 | 013244 |        |         | JSR    | 5,LEDS       |                                   |
| 1744 | 012154 | 015114 |        |        |         | AVRAGE |              |                                   |
| 1745 | 012156 | 000002 |        |        |         | RTI    |              |                                   |
| 1746 |        |        |        |        |         |        |              |                                   |
| 1747 | 012160 | 000011 |        |        | CMPCNT: | 11     |              | ; 11 OR 4                         |

;SUBROUTINE TO CALCULATE THE PLUS &amp; MINUS 5 COUNT LIMITS FROM AN AVERAGE

```
1748
1749
1750 012162 012737 000005 015046 CATORZ: MOV #5,TEMP1
1751 012170 013737 015114 015050      MOV AVERAGE,TEMP2      ;MOV AVER. TO WORK AREA
1752 012176 012703 015116      MOV #AVERP1,R3      ;SETUP DISTRIBUTION TABLE (POS.)
1753 012202 005237 015050      FILE1: INC TEMP2      ;A=A+1
1754 012206 013723 015050      MOV TEMP2,(R3)+      ;SAVE A+1
1755 012212 005337 015046      DEC TEMP1      ;SAVED '5' COUNTS?
1756 012216 001371      BNE FILE1      ;BRANCH IF NO
1757
1758 012220 012737 000005 015046 ;SET UP TABLE OF AVG. -1 TO -5
1759 012226 013737 015114 015050      MOV #5,TEMP1
1760 012234 012703 015114      MOV AVERAGE,TEMP2      ;MOV AVG. TO WORK AREA.
1761 012240 005337 015050      FILE2: DEC TEMP2      ;SET UP DISTRIBUTION TABLE NEG.
1762 012244 013743 015050      MOV TEMP2,-(R3)      ;A=A-1
1763 012250 005337 015046      DEC TEMP1      ;SAVE 'A-1'
1764 012254 001371      BNE FILE2      ;SAVED '5' COUNTS?
1765      ;BRANCH IF NO
```

;CATEGORIZE THE COUNT SPREAD AS '+6 &amp; -6' COUNTS FROM THE AVERAGE

```
1766
1767
1768 012256 012703 015130      CATR1: MOV #ORLOW,R3      ;CLEAR COUNTS
1769 012262 005023      CLR (R3)+
1770 012264 022703 015162      CMP #ORHIGH+2,R3      ;FINISHED?
1771 012270 001374      BNE CATR1      ;NO, CLEAR NEXT COUNTER
1772 012272 012737 001001 015046      MOV #1001,TEMP1      ;COMPARE '512' COUNTS
1773 012300 012700 015214      MOV #ADBUFF,R0      ;SET UP A/D BUFFER
1774 012304 005337 015046      CATR2: DEC TEMP1
1775 012310 001437      BEQ CATR5      ;EXIT IF '0'
1776 012312 012037 015050      MOV (R0)+,TEMP2
1777 012316 023737 015126 015050      CMP AVERP5,TEMP2
1778 012324 100423      BMI OVRHI
1779 012326 023737 015050 015102      CMP TEMP2,AVERM5
1780 012334 100422      BMI OVRL0
1781 012336 005001      CLR R1
1782 012340 012702 015102      CATR3: MOV #AVERM5,R2
1783 012344 022237 015050      CMP (R2)+,TEMP2
1784 012350 001405      BEQ CATR4
1785 012352 005201      INC R1
1786 012354 022701 000013      CMP #13,R1
1787 012360 001371      BNE CATR3
1788 012362 000000      HALT
1789 012364 006301      CATR4: ASL R1      ;FATAL ERROR
1790 012366 005261 015132      INC MINUS5(R1)      ;MULTIPLY 'OFFSET' X2
1791 012372 000744      BR CATR2
1792 012374 005237 015160      OVRHI: INC ORHIGH
1793 012400 000741      BR CATR2
1794 012402 005237 015130      OVRL0: INC ORLOW
1795 012406 000736      BR CATR2
```



```

1796
1797
1798
1799 012410 013737 015144 015162 CATRS: MOV AVGCNT,XSPRD1
1800 012416 063737 015146 015162 ADD PLUS1,XSPRD1
1801 012424 063737 015142 015162 ADD MINUS1,XSPRD1 ;=TO NO. COUNTS AT SPREAD OF '1'
1802 012432 013737 015162 015164 MOV XSPRD1,XSPRD2
1803 012440 063737 015150 015164 ADD PLUS2,XSPRD2
1804 012446 063737 015140 015164 ADD MINUS2,XSPRD2 ;=TO NO. COUNTS AT SPREAD OF '2'
1805 012454 013737 015164 015166 MOV XSPRD2,XSPRD3
1806 012462 063737 015152 015166 ADD PLUS3,XSPRD3
1807 012470 063737 015136 015166 ADD MINUS3,XSPRD3 ;=TO NO. COUNTS AT SPREAD OF '3'
1808 012476 013737 015166 015170 MOV XSPRD3,XSPRD4
1809 012504 063737 015154 015170 ADD PLUS4,XSPRD4
1810 012512 063737 015134 015170 ADD MINUS4,XSPRD4 ;=TO NO. COUNTS AT SPREAD OF '4'
1811 012520 000002 RTI ;EXIT
1812
1813 ;SUBROUTINE TO TYPEOUT A '6' DIGIT OCTAL NO. THE 'PC' CONTAINS
1814 ;THE ADDRESS OF 'WORD' TO BE TYPED
1815
1816 012522 010537 012650 OCTPRT: MOV R5,SAVS
1817 012526 017605 000000 MOV @ (SP),R5 ;THE ADDRESS OF WORD TO BE TYPED
1818 012532 062716 000002 ADD #2,(SP) ;SET UP STACK TO EXIT
1819 012536 012737 000006 012642 MOV #6,10$ ;LOAD COUNTER
1820 012544 012737 000376 012646 MOV #376,MASK ;MASK FOR FIRST BIT
1821 012552 000401 BR .+4
1822 012554 006115 1$: ROL (R5)
1823 012556 006115 ROL (R5)
1824 012560 006115 ROL (R5)
1825 012562 111537 012644 MOVB (R5),11$
1826 012566 143737 012646 012644 BICB MASK,11$
1827 012574 052737 000260 012644 BIS #260,11$
1828 012602 132777 000200 166214 BITB #200,@TPS
1829 012610 100374 BPL .-6 ;WAIT FOR PRINTER READY
1830 012612 113777 012644 166206 MOVB 11$,@TPB ;PRINT CHAR.
1831 012620 012737 000370 012646 MOV #370,MASK ;MASK FOR NEXT '5' DIGITS
1832 012626 005337 012642 DEC 10$
1833 012632 001350 BNE 1$
1834 012634 013705 012650 MOV SAV5,R5
1835 012640 000002 RTI
1836 012642 000000 10$: 0
1837 012644 000000 11$: 0
1838 012646 000376 MASK: 376
1839 012650 000000 SAV5: 0
1840
1841 ;SUBROUTINE TO TEST FOR THE KEYBOARD FLAG BEING SET
1842
1843 012652 105777 166142 TKSFLG: TSTB @TKS ;FLAG SET?
1844 012656 100001 BPL .+4 ;NO, EXIT
1845 012660 104011 TTYIN ;YES, INQUIRE
1846
1847
1848 012662 000002 RTI
1849 ;ENTERED WITH SYSTEM TRAP CALL (ERROR)

```

|      |        |        |        |        |        |         |             |              |                                             |
|------|--------|--------|--------|--------|--------|---------|-------------|--------------|---------------------------------------------|
| 1850 |        | 012664 | 104013 |        |        | TSTTKS  |             |              | ;TEST FOR KEYBOARD INTERRUPT                |
| 1851 |        | 012666 | 037727 | 166136 | 020000 | BIT     | QSWR,#20000 |              | ;TEST FOR INHIBIT PRINT OUT                 |
| 1852 |        | 012674 | 001067 |        |        | BNE     | CK          |              | ;INHIBIT CHECK FOR HALT                     |
| 1853 |        | 012676 | 012737 | 000002 | 000006 | MOV     | #RTI,Q#6    |              | ;SET UP FOR BUSS ERROR                      |
| 1854 |        | 012704 | 011637 | 015012 |        | MOV     | (SP),KSTOR3 |              | ;PC OF FAILING ROUTINE                      |
| 1855 |        | 012710 | 162737 | 000002 | 015012 | SUB     | #2,KSTOR3   |              |                                             |
| 1856 |        | 012716 | 004537 | 013244 |        | JSR     | 5,LEDS      |              |                                             |
| 1857 |        | 012722 | 015012 |        |        | KSTOR3  |             |              |                                             |
| 1858 |        |        |        |        |        |         |             |              |                                             |
| 1859 |        |        |        |        |        | ;*      | MOV         | QADCS,KSTOR4 | ; /READ DEVICE REG ADCS,PUT DATA IN KSTOR4. |
| 1860 |        |        |        |        |        |         |             |              |                                             |
| 1861 |        |        |        |        |        | ;*      | MOV         | QADDR,KSTORS | ; /READ DEVICE REG ADDR,PUT DATA IN KSTORS. |
| 1862 | 012744 | 005037 | 015022 |        |        | CLR     | KSTR12      |              | ;SAVE ZERO IN KSTR12                        |
| 1863 | 012750 | 013737 | 015044 | 015020 |        | MOV     | TEMP,KSTR11 |              | ;SAVE TEMP                                  |
| 1864 | 012756 | 012737 | 000000 | 000006 |        | MOV     | #0,Q#6      |              | ;RESET BUSS ERROR                           |
| 1865 | 012764 | 005737 | 014772 |        |        | TST     | PRINT1      |              |                                             |
| 1866 | 012770 | 001006 |        |        |        | BNE     | LGERR1      |              |                                             |
| 1867 | 012772 | 104000 |        |        |        | PRINT   |             |              |                                             |
| 1868 | 012774 | 014020 |        |        |        | CRLF    |             |              |                                             |
| 1869 | 012776 | 104000 |        |        |        | PRINT   |             |              |                                             |
| 1870 | 013000 | 013453 |        |        |        | MES1    |             |              |                                             |
| 1871 | 013002 | 005237 | 014772 |        |        | INC     | PRINT1      |              |                                             |
| 1872 | 013006 | 104000 |        |        |        | PRINT   |             |              | ;OUTPUT CARRIAGE RETURN AND LINE FEED       |
| 1873 | 013010 | 014020 |        |        |        | CRLF    |             |              |                                             |
| 1874 | 013012 | 104010 |        |        |        | PRT OCT |             |              | ;PRINT FAILING PC+2                         |
| 1875 | 013014 | 015012 |        |        |        | KSTOR3  |             |              |                                             |
| 1876 | 013016 | 104007 |        |        |        | SPACE   |             |              | ;OUTPUT A SPACE                             |
| 1877 | 013020 | 104010 |        |        |        | PRT OCT |             |              | ;PRINT                                      |
| 1878 | 013022 | 015014 |        |        |        | KSTOR4  |             |              | ;CONTENTS OF A/D STATUS REG.                |
| 1879 | 013024 | 104007 |        |        |        | SPACE   |             |              |                                             |
| 1880 | 013026 | 104010 |        |        |        | PRT OCT |             |              |                                             |
| 1881 | 013030 | 015016 |        |        |        | KSTORS  |             |              |                                             |
| 1882 | 013032 | 104007 |        |        |        | SPACE   |             |              |                                             |
| 1883 | 013034 | 104010 |        |        |        | PRT OCT |             |              |                                             |
| 1884 | 013036 | 015022 |        |        |        | KSTR12  |             |              |                                             |
| 1885 | 013040 | 104007 |        |        |        | SPACE   |             |              |                                             |
| 1886 | 013042 | 104010 |        |        |        | PRT OCT |             |              |                                             |
| 1887 | 013044 | 015020 |        |        |        | KSTR11  |             |              |                                             |
| 1888 | 013046 | 105777 | 165752 |        |        | TSTB    | QTPS        |              |                                             |
| 1889 | 013052 | 100375 |        |        |        | BPL     | -4          |              |                                             |
| 1890 | 013054 | 005777 | 165750 |        |        | TST     | QSWR        |              | ;CHECK SR FOR HALT SWITCH                   |
| 1891 | 013060 | 100001 |        |        |        | BPL     | +4          |              | ;BRANCH IF NOT SET                          |
| 1892 | 013062 | 000000 |        |        |        | HALT    |             |              | ;HALT ON ERROR UP                           |
| 1893 | 013064 | 000002 |        |        |        | RTI     |             |              | ;RETURN TO MAIN LINE                        |

```

1894
1895
1896
1897 013066 104013
1898 013070 032777 040000 165732
1899 013076 001015
1900 013100 032777 004000 165722
1901 013106 001016
1902 013110 005737 001034
1903 013114 001413
1904 013116 023737 013156 001036
1905 013124 001407
1906 013126 005237 013156
1907 013132 022606
1908 013134 012677 165656
1909 013140 000177 000014
1910 013144 005037 013156
1911 013150 011637 013160
1912 013154 000002
1913 013156 000000
1914 013160 002162
1915
1916
1917
1918 013162 104013
1919 013164 032777 040000 165636
1920 013172 001357
1921 013174 032777 004000 165626
1922 013202 001360
1923 013204 005737 001034
1924 013210 001755
1925 013212 023727 013156 000010
1926 013220 000741
1927
1928
1929
1930 013222 104013
1931 013224 032777 040000 165576
1932 013232 001337
1933 013234 000743

;SCOPE AND/OR ITERATION LOOP FOR SOME TEST 4000 TIMES
SCOPEC: TSTTKS
        BIT #40000, @SWR
        BNE SCOPEB
        BIT #4000, @SWR
        BNE SCOPEB
        TST PASSCT
        BEQ SCOPEJ
        CMP SCOPEF, ICOUNT
        BEQ SCOPEJ
        INC SCOPEF
        CMP (6)+, SP
        MOV (6)+, @PSW
        JMP @RETURN
SCOPEB:
SCOPEJ:
SCOPEG: CLR SCOPEF
        MOV @SP, RETURN
        RTI
SCOPEF: 0
RETURN: ADT1+2

;TEST FOR KEYBOARD INIT
;TEST SR FOR SCOPE
;YES, SCOPE
;NO-TEST FOR ITERATION
;INHIBIT ITERATION
;TEST IF FIRST PASS
;BR IF FIRST PASS -- QUICK PASS
;COMPARE CURRENT COUNT TO MAX NUMBER
;EXIT-DONE
;INCREMENT COUNT
;REPOSITION STACK
;RESTORE PREVIOUS PROCESSOR STATUS
;REPEAT TEST
;CLEAR COUNT
;SAVE SCOPE RETURN POINTER
;RETURN INLINE-NEXT TEST
;COUNT LOCATION FOR ITERATION LOOP
;ADDRESS OF LAST TEST

;SCOPE AND/OR INTERATION LOOP FOR SOME TESTS 10 TIMES
SCOPEH: TSTTKS
        BIT #40000, @SWR
        BNE SCOPEB
        BIT #4000, @SWR
        BNE SCOPEB
        TST PASSCT
        BEQ SCOPEG
        CMP SCOPEF, #10
        BR SCOPEJ
;TEST IF FIRST PASS
;BR IF YES

;SCOPE LOOP FOR SOME TEST 1 TIME
SCOPEI: TSTTKS
        BIT #40000, @SWR
        BNE SCOPEB
        BR SCOPEG
;TEST KEYBOARD

```



```

1934
1935 013236 104000
1936 013240 013354
1937 013242 000207
1938
1939
1940
1941 013244 012737 000006 013344 BELL: PRINT
1942 013252 005037 013352 ENDPAS
1943 013256 013537 013346 RTS PC
1944 013262 013737 013346 013350 ;EXIT
1945 013270 042737 177770 013350 ;LOAD THE LPS DISPLAY LIGHTS
1946 013276 113737 013352 013351 LEDS: MOV #6,CNTLED
1947
1948
1949 013314 006237 013346 LEDSV3
1950 013320 006237 013346 CLR LEDSV3
1951 013324 006237 013346 MOV 2(5)+,LEDSV1
1952 013330 005237 013352 LEDSA: MOV LEDSV1,LEDSV2
1953 013334 005337 013344 BIC #177770,LEDSV2
1954 013340 001350 013352 MOV LEDSV3,LEDSV2+1
1955 013342 000205
1956
1957 013344 000006 ;* MOV LEDSV2,0ADDR ;/ PUT DATA FROM LEDSV2 TO DEVICE REG ADDR
1958 013346 000000 ASR LEDSV1
1959 013350 000000 ASR LEDSV1
1960 013352 000000 ASR LEDSV1
1961 INC LEDSV3
1962 CNTLED: 6
1963 LEDSV1: 0
1964 LEDSV2: 0
1965 LEDSV3: 0
1966
1967 013354 007 007 ENDPAS: .BYTE 7,7
1968 013356 042445 042116 050040 .ASCII '%END PASS 2'
1969 013364 051501 020123 020040
1970 013372 100

```

|      |        |        |        |        |                                                       |
|------|--------|--------|--------|--------|-------------------------------------------------------|
| 1966 |        |        |        |        |                                                       |
| 1967 |        |        |        |        |                                                       |
| 1968 | 013373 | 000    |        |        |                                                       |
| 1969 | 013374 | 022445 | 046045 | 051520 |                                                       |
| 1970 | 013402 | 042040 | 040511 | 047107 |                                                       |
| 1971 | 013410 | 051517 | 044524 | 020103 |                                                       |
| 1972 | 013416 | 042524 | 052123 | 044440 |                                                       |
| 1973 | 013424 | 020054 | 046450 | 044501 |                                                       |
| 1974 | 013432 | 042116 | 041505 | 030455 |                                                       |
| 1975 | 013440 | 026461 | 051104 | 050114 |                                                       |
| 1976 | 013446 | 026510 | 024501 | 100    |                                                       |
| 1977 |        |        |        |        |                                                       |
| 1978 | 013453 | 040    | 050040 | 020103 | MES1: .ASCII " PC "                                   |
| 1979 | 013460 | 020040 |        |        |                                                       |
| 1980 | 013462 | 042101 | 052123 | 052101 | .ASCII "ADSTAT "                                      |
| 1981 | 013470 | 040    |        |        |                                                       |
| 1982 | 013471 | 101    | 041104 | 043125 | .ASCII "ADBUFF "                                      |
| 1983 | 013476 | 020106 |        |        |                                                       |
| 1984 | 013500 | 040440 | 042104 | 040515 | .ASCII " ADDMA "                                      |
| 1985 | 013506 | 040    |        |        |                                                       |
| 1986 |        |        |        |        |                                                       |
| 1987 | 013507 | 040    | 042524 | 050115 | .ASCII " TEMPQ "                                      |
| 1988 | 013514 | 100    |        |        |                                                       |
| 1989 |        |        |        |        |                                                       |
| 1990 | 013515 | 045    | 054524 | 042520 | MES4: .ASCII "%TYPE LETTER ' ' TO RUN DESIRED TEST:%" |
| 1991 | 013522 | 046040 | 052105 | 042524 |                                                       |
| 1992 | 013530 | 020122 | 020047 | 020047 |                                                       |
| 1993 | 013536 | 047524 | 051040 | 047125 |                                                       |
| 1994 | 013544 | 042040 | 051505 | 051111 |                                                       |
| 1995 | 013552 | 042105 | 052040 | 051505 |                                                       |
| 1996 | 013560 | 035124 | 045    |        |                                                       |
| 1997 | 013563 | 047    | 023501 | 040475 | .ASCII "'A'=A TO d LOGIC TEST%"                       |
| 1998 | 013570 | 052040 | 020117 | 020104 |                                                       |
| 1999 | 013576 | 047514 | 044507 | 020103 |                                                       |
| 2000 | 013604 | 042524 | 052123 | 045    |                                                       |
| 2001 | 013611 | 047    | 023503 | 040475 | .ASCII "'C'=A TO D CALIBRATION%"                      |
| 2002 | 013616 | 052040 | 020117 | 020104 |                                                       |
| 2003 | 013624 | 040503 | 044514 | 051102 |                                                       |
| 2004 | 013632 | 052101 | 047511 | 022516 |                                                       |
| 2005 | 013640 | 042047 | 036447 | 020101 | .ASCII "'D'=A TO D REPEATABILITY%"                    |
| 2006 | 013646 | 047524 | 042040 | 051040 |                                                       |
| 2007 | 013654 | 050105 | 040505 | 040524 |                                                       |
| 2008 | 013662 | 044502 | 044514 | 054524 |                                                       |
| 2009 | 013670 | 045    |        |        |                                                       |
| 2010 | 013671 | 047    | 023505 | 040475 | .ASCII "'E'=A TO D RECOVERY%"                         |
| 2011 | 013676 | 052040 | 020117 | 020104 |                                                       |
| 2012 | 013704 | 042522 | 047503 | 042526 |                                                       |
| 2013 | 013712 | 054522 | 045    |        |                                                       |
| 2014 | 013715 | 047    | 023506 | 040475 | .ASCII "'F'=A TO D DUAL MODE DYNAMIC LOGIC %Q"        |
| 2015 | 013722 | 052040 | 020117 | 020104 |                                                       |
| 2016 | 013730 | 052504 | 046101 | 046440 |                                                       |
| 2017 | 013736 | 042117 | 020105 | 054504 |                                                       |
| 2018 | 013744 | 040516 | 044515 | 020103 |                                                       |
| 2019 | 013752 | 047514 | 044507 | 020103 |                                                       |

|      |        |        |        |        |                                                      |
|------|--------|--------|--------|--------|------------------------------------------------------|
| 2020 | 013760 | 040045 |        |        |                                                      |
| 2021 |        |        |        |        |                                                      |
| 2022 | 013762 | 041536 | 040045 |        | CNTRLC: .ASCII 'tC%a'                                |
| 2023 |        |        |        |        |                                                      |
| 2024 | 013766 | 040536 | 100    |        | CNTRLA: .ASCII 'tAa'                                 |
| 2025 | 013771 | 136    | 022507 | 046117 | CNTRLG: .ASCII 'tG%OLD SWR = a'                      |
| 2026 | 013776 | 020104 | 053523 | 020122 |                                                      |
| 2027 | 014004 | 020075 | 100    |        |                                                      |
| 2028 | 014007 | 040    | 047040 | 053505 | NEWSWR: .ASCII ' NEW = a'                            |
| 2029 | 014014 | 036440 | 040040 |        |                                                      |
| 2030 |        |        |        |        |                                                      |
| 2031 | 014020 | 040045 |        |        | CRLF: .ASCII '%a'                                    |
| 2032 |        |        |        |        |                                                      |
| 2033 | 014022 | 027045 | 100    |        | DOT: .ASCII '%.a'                                    |
| 2034 |        |        |        |        |                                                      |
| 2035 | 014025 | 077    | 040040 |        | QMARK: .ASCII '? a'                                  |
| 2036 |        |        |        |        |                                                      |
| 2037 | 014030 | 021045 | 020101 | 047524 | MES5: .ASCII '%A TO D LOGIC TEST"% a'                |
| 2038 | 014036 | 042040 | 046040 | 043517 |                                                      |
| 2039 | 014044 | 041511 | 052040 | 051505 |                                                      |
| 2040 | 014052 | 021124 | 020045 | 100    |                                                      |
| 2041 |        |        |        |        |                                                      |
| 2042 | 014057 | 045    | 040442 | 052040 | MES7: .ASCII '%A TO D CALIBRATION"%a'                |
| 2043 | 014064 | 020117 | 020104 | 040503 |                                                      |
| 2044 | 014072 | 044514 | 051102 | 052101 |                                                      |
| 2045 | 014100 | 047511 | 021116 | 040045 |                                                      |
| 2046 | 014106 | 021045 | 020101 | 047524 | MES8: .ASCII '%A TO D RECOVERY"%a'                   |
| 2047 | 014114 | 042040 | 051040 | 041505 |                                                      |
| 2048 | 014122 | 053117 | 051105 | 021131 |                                                      |
| 2049 | 014130 | 100    |        |        |                                                      |
| 2050 |        |        |        |        |                                                      |
| 2051 | 014131 | 045    | 044103 | 040040 | MES9: .ASCII '%CH a'                                 |
| 2052 |        |        |        |        |                                                      |
| 2053 | 014136 | 023445 | 023505 | 052130 | MES10: .ASCII "%E'XT. OR 'I'NT. OR 'C'LOCK. SYNC? a" |
| 2054 | 014144 | 020056 | 051117 | 023440 |                                                      |
| 2055 | 014152 | 023511 | 052116 | 020056 |                                                      |
| 2056 | 014160 | 051117 | 023440 | 023503 |                                                      |
| 2057 | 014166 | 047514 | 045503 | 020056 |                                                      |
| 2058 | 014174 | 054523 | 041516 | 020077 |                                                      |
| 2059 | 014202 | 100    |        |        |                                                      |
| 2060 |        |        |        |        |                                                      |
| 2061 |        |        |        |        |                                                      |
| 2062 | 014203 | 045    | 040442 | 052040 | MES11: .ASCII '%A TO D DMA LOGIC TEST"% a'           |
| 2063 | 014210 | 020117 | 020104 | 046504 |                                                      |
| 2064 | 014216 | 020101 | 047514 | 044507 |                                                      |
| 2065 | 014224 | 020103 | 042524 | 052123 |                                                      |
| 2066 | 014232 | 022442 | 040040 |        |                                                      |
| 2067 | 014236 | 051105 | 047522 | 020122 | MES12: .ASCII 'ERROR BIT SET!%a'                     |
| 2068 | 014244 | 044502 | 020124 | 042523 |                                                      |
| 2069 | 014252 | 020524 | 040045 |        |                                                      |
| 2070 |        |        |        |        |                                                      |
| 2071 | 014256 | 021045 | 020101 | 047524 | MES13: .ASCII '%A TO D REPEATIBILITY"%a'             |
| 2072 | 014264 | 042040 | 051040 | 050105 |                                                      |
| 2073 | 014272 | 040505 | 044524 | 044502 |                                                      |



| Address | Hex 1  | Hex 2  | Hex 3  | Hex 4  | Label  | Text                                                      |
|---------|--------|--------|--------|--------|--------|-----------------------------------------------------------|
| 2074    | 014300 | 044514 | 054524 | 040042 |        |                                                           |
| 2075    |        |        |        |        |        |                                                           |
| 2076    | 014306 | 022445 | 044103 | 024056 | MES14: | .ASCII '%CH.(S)? @'                                       |
| 2077    | 014314 | 024523 | 020077 | 100    |        |                                                           |
| 2078    | 014321 | 045    | 040442 | 052040 | MES15: | .ASCII '%"A TO D DUAL MODE"%@'                            |
| 2079    | 014326 | 020117 | 020104 | 052504 |        |                                                           |
| 2080    | 014334 | 046101 | 046440 | 042117 |        |                                                           |
| 2081    | 014342 | 021105 | 040045 |        |        |                                                           |
| 2082    |        |        |        |        |        |                                                           |
| 2083    | 014346 | 047503 | 047125 | 020124 | MES16: | .ASCII 'COUNT SPREAD? @'                                  |
| 2084    | 014354 | 050123 | 042522 | 042101 |        |                                                           |
| 2085    | 014362 | 020077 | 100    |        |        |                                                           |
| 2086    | 014365 | 045    | 044447 | 047047 | MES18: | .ASCII '%"I'INTERNAL OR 'B'URST OR 'D'UAL SAMPLE MODE? @' |
| 2087    | 014372 | 042524 | 047122 | 046101 |        |                                                           |
| 2088    | 014400 | 047440 | 020122 | 041047 |        |                                                           |
| 2089    | 014406 | 052447 | 051522 | 020124 |        |                                                           |
| 2090    | 014414 | 051117 | 023440 | 023504 |        |                                                           |
| 2091    | 014422 | 040525 | 020114 | 040523 |        |                                                           |
| 2092    | 014430 | 050115 | 042514 | 046440 |        |                                                           |
| 2093    | 014436 | 042117 | 037505 | 040040 |        |                                                           |
| 2094    | 014444 | 020045 | 041440 | 027110 | MES19: | .ASCII '% CH. LO AV HI@'                                  |
| 2095    | 014452 | 020040 | 020040 | 047514 |        |                                                           |
| 2096    | 014460 | 020040 | 020040 | 040440 |        |                                                           |
| 2097    | 014466 | 020126 | 020040 | 020040 |        |                                                           |
| 2098    | 014474 | 044510 | 100    |        |        |                                                           |
| 2099    |        |        |        |        |        |                                                           |
| 2100    | 014477 | 045    | 020040 | 047514 | MES20: | .ASCII '% LO -5 -4 -3 -2 -1 AV +1 +2 +3 +4 +5 HI@'        |
| 2101    | 014504 | 020040 | 032455 | 020040 |        |                                                           |
| 2102    | 014512 | 032055 | 020040 | 031455 |        |                                                           |
| 2103    | 014520 | 020040 | 031055 | 020040 |        |                                                           |
| 2104    | 014526 | 030455 | 020040 | 053101 |        |                                                           |
| 2105    | 014534 | 020040 | 030453 | 020040 |        |                                                           |
| 2106    | 014542 | 031053 | 020040 | 031453 |        |                                                           |
| 2107    | 014550 | 020040 | 032053 | 020040 |        |                                                           |
| 2108    | 014556 | 032453 | 020040 | 044510 |        |                                                           |
| 2109    | 014564 | 100    |        |        |        |                                                           |
| 2110    |        |        |        |        |        |                                                           |
| 2111    | 014565 | 045    | 047520 | 042527 | MES21: | .ASCII '%POWER FAILURE @'                                 |
| 2112    | 014572 | 020122 | 040506 | 046111 |        |                                                           |
| 2113    | 014600 | 051125 | 020105 | 100    |        |                                                           |
| 2114    | 014605 | 111    | 050116 | 052125 | MES22: | .ASCII 'INPUT CHANNEL PAIR HAVE THE SAME INPUT VALUE%@'   |
| 2115    | 014612 | 041440 | 040510 | 047116 |        |                                                           |
| 2116    | 014620 | 046105 | 050040 | 044501 |        |                                                           |
| 2117    | 014626 | 020122 | 040510 | 042526 |        |                                                           |
| 2118    | 014634 | 052040 | 042510 | 051440 |        |                                                           |
| 2119    | 014642 | 046501 | 020105 | 047111 |        |                                                           |
| 2120    | 014650 | 052520 | 020124 | 040526 |        |                                                           |
| 2121    | 014656 | 052514 | 022505 | 100    |        |                                                           |
| 2122    | 014663 | 105    | 051122 | 051117 | MES23: | .ASCIIZ 'ERROR - FIRST CONVERSION EQUAL TO THE SECOND%@'  |
| 2123    | 014670 | 026440 | 043040 | 051111 |        |                                                           |
| 2124    | 014676 | 052123 | 041440 | 047117 |        |                                                           |
| 2125    | 014704 | 042526 | 051522 | 047511 |        |                                                           |
| 2126    | 014712 | 020116 | 050505 | 040525 |        |                                                           |
| 2127    | 014720 | 020114 | 047524 | 052040 |        |                                                           |

|      |        |        |        |        |
|------|--------|--------|--------|--------|
| 2128 | 014726 | 042510 | 051440 | 041505 |
| 2129 | 014734 | 047117 | 022504 | 000100 |
| 2130 | 014742 | 051461 | 020124 | 047503 |
| 2131 | 014750 | 053116 | 020056 | 047516 |
| 2132 | 014756 | 020124 | 020075 | 047062 |
| 2133 | 014764 | 022504 | 000100 |        |

MES24: .ASCIZ '1ST CONV. NOT = 2ND%3'

.EVEN  
:ADDRESS AND CONSTANTS TABLE

;LOW BYTE OF 'ADWORD'

|      |        |        |
|------|--------|--------|
| 2136 | 014770 | 000000 |
| 2137 | 014772 | 000000 |
| 2138 | 014774 | 001000 |
| 2139 | 014776 | 001540 |
| 2140 | 015000 | 000000 |
| 2141 | 015002 | 000000 |
| 2142 | 015004 | 000000 |
| 2143 | 015006 | 000000 |
| 2144 | 015010 | 000000 |
| 2145 | 015012 | 000000 |
| 2146 | 015014 | 000000 |
| 2147 | 015016 | 000000 |
| 2148 | 015020 | 000000 |
| 2149 | 015022 | 000000 |
| 2150 | 015024 | 000000 |
| 2151 | 015026 | 000000 |
| 2152 | 015030 | 000000 |
| 2153 | 015032 | 000000 |
| 2154 | 015034 | 000000 |
| 2155 | 015036 | 000000 |
| 2156 | 015040 | 000000 |
| 2157 | 015042 | 000000 |
| 2158 | 015044 | 000000 |
| 2159 | 015046 | 000000 |
| 2160 | 015050 | 000000 |
| 2161 | 015052 | 000000 |
| 2162 | 015054 | 000000 |
| 2163 | 015056 | 000000 |
| 2164 | 015060 | 000000 |
| 2165 | 015062 | 000000 |
| 2166 | 015064 | 000000 |
| 2167 | 015066 | 000000 |
| 2168 | 015070 | 000000 |
| 2169 | 015072 | 000000 |
| 2170 | 015074 | 000000 |
| 2171 | 015076 | 000000 |
| 2172 | 015100 | 000000 |
| 2173 | 015102 | 000000 |
| 2174 | 015104 | 000000 |
| 2175 | 015106 | 000000 |
| 2176 | 015110 | 000000 |
| 2177 | 015112 | 000000 |
| 2178 | 015114 | 000000 |
| 2179 | 015116 | 000000 |
| 2180 | 015120 | 000000 |
| 2181 | 015122 | 000000 |

ADWORD2: 0  
PRINT1: 0  
STACK: 1000  
AVECTR: INITA  
PROC: 0  
CHRCNT: 0  
COUNT: 0  
KSTOR1: 0  
KSTOR2: 0  
KSTOR3: 0  
KSTOR4: 0  
KSTOR5: 0  
KSTR11: 0  
KSTR12: 0  
STCHAN: 0  
FIRST: 0  
DELAY: 0  
DELAY1: 0  
USED5H: 0  
USEDMA: 0  
USECLK: 0  
OPS1: 0  
TEMP: 0  
TEMP1: 0  
TEMP2: 0  
TEMP3: 0  
BRLEV1: 0  
BRLEV2: 0  
BRLEV3: 0  
MESPR1: 0  
HIORDV: 0  
HIGH: 0  
LOW: 0  
\$TMDAT: 0  
\$BDDAT: 0  
\$GDDAT: 0  
\$ZERO: 0  
AVERM5: 0  
AVERM4: 0  
AVERM3: 0  
AVERM2: 0  
AVERM1: 0  
AVRAGE: 0  
AVERP1: 0  
AVERP2: 0  
AVERP3: 0

;INITIAL SP. ADDRESS  
; 'IA' VECTOR ADDRESS  
;TEMP STORAGE FOR 'PSW'  
;TEMP STORAGE  
;TEMP STORAGE  
;PERMANENT STORAGE  
;PERMANENT STORAGE  
;PERMANENT STORAGE  
;PERMANENT STORAGE

;TEMPORARY STORAGE  
;TEMPORARY STORAGE  
;TEMPORARY STORAGE

2182 015124 000000  
2183 015126 000000  
2184 015130 000000  
2185 015132 000000  
2186 015134 000000  
2187 015136 000000  
2188 015140 000000  
2189 015142 000000  
2190 015144 000000  
2191 015146 000000  
2192 015150 000000  
2193 015152 000000  
2194 015154 000000  
2195 015156 000000  
2196 015160 000000  
2197 015162 000000  
2198 015164 000000  
2199 015166 000000  
2200 015170 000000  
2201 015172 000000  
2202 015174 000000  
2203 015176 000000  
2204 015200 015202  
2205 015202 023420  
2206 015204 001750  
2207 015206 000144  
2208 015210 000012  
2209 015212 000001  
2210  
2211 015214 000000  
2212  
2213 015256 015256  
2214 015256 000000  
2215 015320 015320  
2216 015320 000000  
2217 015362 015362  
2218 015362 000000  
2219 015424 015424  
2220 015424 000000  
2221 015466 015466  
2222 015466 000000  
2223 015530 015530  
2224 015530 000000  
2225 015572 015572  
2226 015572 000000  
2227 015634 015634  
2228 015634 000000  
2229 015676 015676  
2230 015676 001000  
2231  
2232  
2233  
2234  
2235

AVERP4: 0  
AVERP5: 0  
ORLOW: 0  
MINUS5: 0  
MINUS4: 0  
MINUS3: 0  
MINUS2: 0  
MINUS1: 0  
AVGCNT: 0  
PLUS1: 0  
PLUS2: 0  
PLUS3: 0  
PLUS4: 0  
PLUS5: 0  
ORHIGH: 0  
XSPRD1: 0  
XSPRD2: 0  
XSPRD3: 0  
XSPRD4: 0  
DIAB: 0  
DIAB: 0  
DIAC: 0  
DIAD: 0

.+2  
10000.  
1000.  
100.  
10.  
1.

HERE STARTS THE '512' WORD A/D DATA BUFFER.  
ADBUFF: 0

ADTB0: 0  
ADTB1: 0  
ADTB2: 0  
ADTB3: 0  
ADTB4: 0  
ADTB5: 0  
ADTB6: 0  
ADTB7: 0  
.BLKW 512.

;  
;\*THIS SUB CODE IS USED TO INITIALIZE THE LPA-11  
;\*FIRST WE WILL LOAD MICROCODE INTO KMC-11  
;\*NEXT WE WILL INIT BOTH UPROCESSORS



```
2236
2237
2238
2239
2240
2241
2242
2243
2244
2245
2246
2247
2248 017676 013746 000004 SLPAI:
2249 017676
2250
2251 017702 000413
2252
2253
2254
2255
2256
2257
2258
2259
2260
2261
2262
2263
2264 017704 012737 017730 000004 MOV #30$,4
2265 017712 005237 170000 INC 170000
2266 017716 104000 PRINT
2267 017720 017724 64$
2268 017722 000401 BR 65$
2269 017724 64$: ;ASCII <7>##
2270 017726 65$:
2271 017726 000401 BR 31$
2272 017730 022626 30$: CMP (SP)+,(SP)+
2273 017732 012637 000004 31$: MOV (SP)+,4 ;ALL THIS JUNK MUST BE REMOVED!!
2274 017736 005037 020554 CLR $AERR ;LOAD MICRO-CODE.
2275 017742 004537 020556 JSR R5,$LOAD ;FILE "DRLPX2.OBJ"
2276 017746 000000G .WORD DRLPX2
2277
2278 017750 052777 040000 161062 BIS #BIT14,$KMADO ;ISSUE KMC+DMC INIT.
2279
2280 017756 1$: ;"HANGS" HERE THEN KMC-11 ERROR.
2281
2282 017756 010146 MOV R1,-(SP)
2283 017760 005001 CLR R1
2284 017762 005201 2$: INC R1 ;STALL FOR DMC-UP
2285 017764 001376 BNE 2$
2286 017766 012777 104000 161044 MOV #BIT15:BIT11,$KMADO ;SET RUN, AND ENABLE ARBITRATION.
2287 017774 105201 25$: INCB R1
2288 017776 001376 BNE 25$
2289
```

```
;*THEN WE WILL LOAD DEVICE TABLE IN SLAVE UP.
;*THE ORDER OF LOAD IS DETERMINED BY THE USER.
```

```
;*
;*      CALL=   JSR      R5,SLPAI
;*      .WORD   0                ;ADDR. OF DEVICE ADDRESS.
;* ROUTINES REQUIRED: .LOADLP
;* PROGRAMS REQUIRED: DRLPX2
;*
;
```

```
;*
;*      ;RETURNS WITH $AERR=1 IF SLAVE
;*      ;MICRO SAYS AN ADDR. DOES NOT EXSIST. IN THE LIST.
;*
;
```

```
;FIELD DOES NOT HAVE A BUS SWITCH TO
;WORRY ABOUT,SO WE WILL UNCONDITIONALLY
;BRANCH AROUND THE NEXT CODE THAT
;WORKS BASED ON A BUS SWITCH.
;CODE LEFT IN HERE FOR IN HOUSE
;PERSONAL WHO MAY PATCH THIS BRANCH
;INSTRUCTION TO A <NOP> OCTAL <240>
;IN ORDER TO RUN PROGRAM WITH A SWITCH.
```

```
;NOTE THIS "SWITCH" IS A PIECE OF INHOUSE
;TEST EQUIPMENT ONLY IT CONNECTS
;THE UNIBUS TO THE I/O BUS FOR
;CERTAIN TESTING.
```

```
;ALL THIS JUNK MUST BE REMOVED!!
```

```
;LOAD MICRO-CODE.
;FILE "DRLPX2.OBJ"
```

```
;ISSUE KMC+DMC INIT.
```

```
;"HANGS" HERE THEN KMC-11 ERROR.
```

```
;STALL FOR DMC-UP
```

```
;SET RUN, AND ENABLE ARBITRATION.
```

|      |        |        |        |        |        |                                                                       |                                              |
|------|--------|--------|--------|--------|--------|-----------------------------------------------------------------------|----------------------------------------------|
| 2290 | 020000 | 032777 | 000040 | 161032 | BIT    | #BITS,AKMADO                                                          | ;SLAVE READY? (READING IPBM SR)              |
| 2291 | 020006 | 001401 |        |        | BEQ    | 3\$                                                                   |                                              |
| 2292 |        |        |        |        |        |                                                                       | ;FATAL LPA-11 ERROR SLAVE NOT READY.         |
| 2293 | 020010 | 104400 |        |        | ERROR  |                                                                       |                                              |
| 2294 |        |        |        |        |        |                                                                       |                                              |
| 2295 | 020012 | 012777 | 000004 | 161024 | MOV    | #4,AKMAD2                                                             | ;READ FAST PATH                              |
| 2296 | 020020 |        |        |        |        |                                                                       |                                              |
| 2297 | 020020 | 004537 | 021466 |        | JSR    | R5, \$TOUT                                                            | ; -TOUT-CHECK FOR TIMEOUT                    |
| 2298 |        |        |        |        |        |                                                                       |                                              |
| 2299 | 020024 | 104400 |        |        | ERROR  |                                                                       | ; /TIME-OUT ERROR                            |
| 2300 |        |        |        |        |        |                                                                       | ; /WE FAILED TO COMPLETE                     |
| 2301 |        |        |        |        |        |                                                                       | ; /CURRENT OPERATION.                        |
| 2302 |        |        |        |        |        |                                                                       | ; /CONTINUES IN THIS LOOP                    |
| 2303 |        |        |        |        |        |                                                                       | ; /WOULD MAKE US "HANG" HERE                 |
| 2304 |        |        |        |        |        |                                                                       |                                              |
| 2305 | 020026 | 000774 |        |        | BR     | 4\$                                                                   |                                              |
| 2306 |        |        |        |        |        |                                                                       |                                              |
| 2307 |        |        |        |        |        |                                                                       | ; /RETURNS HERE-FROM-TIMED OUT.              |
| 2308 | 020030 | 122777 | 000377 | 161006 | CMPB   | #377,AKMAD2                                                           | ;WAIT TILL KMC DONE COMMAND.                 |
| 2309 | 020036 | 001370 |        |        | BNE    | 4\$                                                                   |                                              |
| 2310 | 020040 | 122777 | 000377 | 161002 | CMPB   | #377,AKMAD4                                                           | ; IF FAST PATH=377 THEN ERROR.               |
| 2311 | 020046 | 001001 |        |        | BNE    | 35\$                                                                  |                                              |
| 2312 | 020050 | 104400 |        |        | ERROR  |                                                                       | ; IPBM ERROR (SLAVE SIDE)                    |
| 2313 |        |        |        |        |        |                                                                       | ; YOU MUST RUN IPBM DIAGNOSTIC.              |
| 2314 |        |        |        |        |        |                                                                       |                                              |
| 2315 | 020052 | 122777 | 000004 | 160770 | CMPB   | #4,AKMAD4                                                             | ; IS THIS THE CORRECT VERSION OF MICRO-CODE? |
| 2316 | 020060 | 001543 |        |        | BEQ    | 5\$                                                                   | ; YES-CONTINUE.                              |
| 2317 | 020062 | 005227 | 177777 |        | INC    | #-1                                                                   |                                              |
| 2318 | 020066 | 001140 |        |        | BNE    | 5\$                                                                   |                                              |
| 2319 | 020070 | 005227 | 177777 |        | INC    | #-1                                                                   |                                              |
| 2320 | 020074 | 001135 |        |        | BNE    | 5\$                                                                   |                                              |
| 2321 | 020076 | 104000 |        |        | PRINT  |                                                                       |                                              |
| 2322 | 020100 | 020104 |        |        | 66\$   |                                                                       |                                              |
| 2323 | 020102 | 000440 |        |        | BR     | 67\$                                                                  |                                              |
| 2324 | 020104 |        |        |        | ;ASCII | <200>"W A R N I N G THIS PROGRAM WAS DESIGNED TO RUN WITH VERSION 4"  |                                              |
| 2325 | 020204 |        |        |        | 67\$:  |                                                                       |                                              |
| 2326 | 020204 | 104000 |        |        | PRINT  |                                                                       |                                              |
| 2327 | 020206 | 020212 |        |        | 68\$   |                                                                       |                                              |
| 2328 | 020210 | 000430 |        |        | BR     | 69\$                                                                  |                                              |
| 2329 | 020212 |        |        |        | ;ASCII | <200>"MICRO-CODE. ANOTHER VERSION CODE WAS DETECTED."                 |                                              |
| 2330 | 020272 |        |        |        | 69\$:  |                                                                       |                                              |
| 2331 | 020272 | 104000 |        |        | PRINT  |                                                                       |                                              |
| 2332 | 020274 | 020300 |        |        | 70\$   |                                                                       |                                              |
| 2333 | 020276 | 000434 |        |        | BR     | 71\$                                                                  |                                              |
| 2334 | 020300 |        |        |        | ;ASCII | <200>"THIS MAY OR MAYNOT CAUSE FALSE ERROR TO BE REPORTED."<200><200> |                                              |
| 2335 | 020370 |        |        |        | 71\$:  |                                                                       |                                              |
| 2336 |        |        |        |        |        |                                                                       |                                              |
| 2337 | 020370 | 112737 | 177777 | 020522 | MOVB   | #0-1,11\$                                                             | ;DAC CODE FOR SLAVE.                         |
| 2338 | 020376 | 012501 |        |        | MOV    | (5)+,R1                                                               | ;GET NEXT DEVICE ADDR.                       |
| 2339 | 020400 | 021127 | 000000 |        | CMP    | (R1),#0                                                               | ;TERM REACHED?                               |
| 2340 | 020404 | 001444 |        |        | BEQ    | 10\$                                                                  |                                              |
| 2341 | 020406 | 105237 | 020522 |        | INCB   | 11\$                                                                  |                                              |
| 2342 | 020412 | 113777 | 020522 | 160430 | MOVB   | 11\$,AKMAD4                                                           | ;FIFO DATA                                   |
| 2343 | 020420 | 004737 | 020524 |        | JSR    | PC,20\$                                                               | ;ISSUE SEND                                  |

|      |        |        |        |        |               |              |                                           |                       |
|------|--------|--------|--------|--------|---------------|--------------|-------------------------------------------|-----------------------|
| 2344 | 020424 | 112177 | 160420 |        | MOVB          | (R1)+,AKMAD4 | ;SEND LOW BYTE OF DEVICE ADDR TO SLAVE.   |                       |
| 2345 | 020430 | 004737 | 020524 |        | JSR           | PC,20\$      | ;ISSUE SEND                               |                       |
| 2346 | 020434 | 112177 | 160410 |        | MOVB          | (R1)+,AKMAD4 | ;SEND HIGH BYTE OF DEVICE ADDR. TO SLAVE. |                       |
| 2347 | 020440 | 004737 | 020524 |        | JSR           | PC,20\$      |                                           |                       |
| 2348 |        |        |        |        |               |              |                                           |                       |
| 2349 | 020444 | 032777 | 000002 | 160366 | 7\$:          | BIT          | #BIT1,AKMAD0                              | ;WAIT FOR FIFO DATA   |
| 2350 | 020452 | 001374 | 000002 | 160362 |               | BNE          | 7\$                                       | ;=1 NO DATA. =0 DATA. |
| 2351 | 020454 | 112777 | 000002 | 160362 |               | MOVB         | #2,AKMAD2                                 | ;READ FIFO.           |
| 2352 |        |        |        |        |               |              |                                           |                       |
| 2353 | 020462 |        |        |        | 8\$:          |              |                                           |                       |
| 2354 | 020462 | 004537 | 021466 |        | JSR           | RS, \$TOUT   | ; -TOUT-CHECK FOR TIMEOUT                 |                       |
| 2355 |        |        |        |        |               |              |                                           |                       |
| 2356 | 020466 | 104400 |        |        | ERROR         |              | ; /TIME-OUT ERROR                         |                       |
| 2357 |        |        |        |        |               |              | ; /WE FAILED TO COMPLETE                  |                       |
| 2358 |        |        |        |        |               |              | ; /CURRENT OPERATION.                     |                       |
| 2359 |        |        |        |        |               |              | ; /CONTINUES IN THIS LOOP                 |                       |
| 2360 |        |        |        |        |               |              | ; /WOULD MAKE US "HANG" HERE              |                       |
| 2361 |        |        |        |        |               |              |                                           |                       |
| 2362 | 020470 | 000774 |        |        | BR            | 8\$          |                                           |                       |
| 2363 |        |        |        |        |               |              |                                           |                       |
| 2364 |        |        |        |        |               |              | ; /RETURNS HERE-FROM-TIMED OUT.           |                       |
| 2365 | 020472 | 122777 | 000377 | 160344 | CMPB          | #377,AKMAD2  | ;WAIT FOR READ.                           |                       |
| 2366 | 020500 | 001370 |        |        | BNE           | 8\$          |                                           |                       |
| 2367 | 020502 | 105777 | 160342 |        | TSTB          | AKMAD4       | ; WAS A ZERO RETURNED?                    |                       |
| 2368 | 020506 | 001734 |        |        | BEQ           | 6\$          | ; YES GET NEXT ADDR.                      |                       |
| 2369 |        |        |        |        |               |              | ; SLAVE WILL RETURN CODE 0 IF             |                       |
| 2370 | 020510 | 005237 | 020554 |        | INC           | \$AERR       | ; DEV PRESENT. ELSE                       |                       |
| 2371 |        |        |        |        |               |              | ; EXIT \$AERR=1 IF SLAVE GIVES ERROR.     |                       |
| 2372 | 020514 | 005041 |        |        | CLR           | -(1)         | ; GET RID OF REFERENCE TO BAD ADDR.       |                       |
| 2373 | 020516 | 012601 |        | 10\$:  | MOV           | (SP)+,R1     |                                           |                       |
| 2374 | 020520 | 000205 |        |        | RTS           | RS           | ; RETURN ALL ADDR. CHECKED.               |                       |
| 2375 |        |        |        |        |               |              |                                           |                       |
| 2376 | 020522 | 000000 |        | 11\$:  | .WORD         | 0            | ; HOLDS DAC CODE PLUS OFFSET              |                       |
| 2377 |        |        |        |        |               |              | ; TO SLAVES ADDR. TABLE.                  |                       |
| 2378 |        |        |        |        |               |              |                                           |                       |
| 2379 | 020524 | 112777 | 000003 | 160312 | 20\$:         | MOVB         | #3,AKMAD2                                 | ; ISSUE FIFO WRITE    |
| 2380 | 020532 |        |        |        | 21\$:         |              |                                           |                       |
| 2381 | 020532 | 004537 | 021466 |        | JSR           | RS, \$TOUT   | ; -TOUT-CHECK FOR TIMEOUT                 |                       |
| 2382 |        |        |        |        |               |              |                                           |                       |
| 2383 | 020536 | 104400 |        |        | ERROR         |              | ; /TIME-OUT ERROR                         |                       |
| 2384 |        |        |        |        |               |              | ; /WE FAILED TO COMPLETE                  |                       |
| 2385 |        |        |        |        |               |              | ; /CURRENT OPERATION.                     |                       |
| 2386 |        |        |        |        |               |              | ; /CONTINUES IN THIS LOOP                 |                       |
| 2387 |        |        |        |        |               |              | ; /WOULD MAKE US "HANG" HERE              |                       |
| 2388 |        |        |        |        |               |              |                                           |                       |
| 2389 | 020540 | 000774 |        |        | BR            | 21\$         |                                           |                       |
| 2390 |        |        |        |        |               |              |                                           |                       |
| 2391 |        |        |        |        |               |              | ; /RETURNS HERE-FROM-TIMED OUT.           |                       |
| 2392 | 020542 | 122777 | 000377 | 160274 | CMPB          | #377,AKMAD2  | ; KMC CODE WILL RETURN A "377"            |                       |
| 2393 | 020550 | 001370 |        |        | BNE           | 21\$         | ; WHEN DONE COMMAND.                      |                       |
| 2394 | 020552 | 000207 |        |        | RTS           | PC           |                                           |                       |
| 2395 |        |        |        |        |               |              |                                           |                       |
| 2396 | 020554 | 000000 |        |        | \$AERR: .WORD | 0            | ; =0 IF ADDR. LIST OK, =1 IF BAD.         |                       |
| 2397 |        |        |        |        |               |              |                                           |                       |



```
;*
;*THIS SUB CODE USED TO LOAD MICRO-CODE INTO LPA-11.
;*  CALL = JSR    R5,$LOAD
;*          .WORD  XX          ;ADDR. OF MICRO CODE.
;*          ;RETURNS HERE
;*  NOTE:  MICRO CODE FILE MUST END IN -1 DATA.
;*
```

```
2398
2399
2400
2401
2402
2403
2404
2405
2406 020556 010446          $LOAD: MOV    R4,-(SP)      ;SAVE R4.
2407 020560 010046          MOV    R0,-(SP)      ;SAVE R0.
2408 020562 012500          1$:  MOV    (5)+,R0    ;GET PROG. ADDR.
2409 020564 005077 160250   CLR    2KMADO      ;CLEAR CSR
2410 020570 005077 160254   CLR    2KMADO4     ;CLEAR CRAM ADDR.
2411 020574 052777 002000 160236 2$:  BIS    2000,2KMADO ;SELECT CRAM.
2412 020602 012077 160246   MOV    (0)+,2KMADO6 ;WRITE DATA.
2413 020606 052777 020000 160224   BIS    20000,2KMADO ;SET CRAM WRITE
2414 020614 005077 160220   CLR    2KMADO      ;DISABLE CRAM.
2415 020620 005277 160224   INC    2KMADO4     ;UPDATE CRAM ADDR.
2416 020624 021027 177777   CMP    (0),#-1    ;ALL DONE?
2417 020630 001361          BNE    2$          ;NO LOOP.
2418 020632 005077 160212   CLR    2KMADO4     ;CLEAR CRAM ADDR.
2419 020636 016500 177776   MOV    -2(5),R0    ;GET MICRO CODE ADDR.
2420
2421 020642 052777 002000 160170 3$:  BIS    2000,2KMADO ;SELECT CRAM
2422 020650 022077 160200   CMP    (R0)+,2KMADO6 ;DATA OK?
2423 020654 001013          BNE    5$          ;NO - REPORT AN ERROR.
2424 020656 021027 177777   CMP    (0),#-1    ;ALL DONE?
2425 020662 001405          BEQ    4$          ;YES - EXIT
2426 020664 005077 160150   CLR    2KMADO      ;NO - DESELECT CRAM.
2427 020670 005277 160154   INC    2KMADO4     ;UPDATE CRAM ADDR.
2428 020674 000762          BR      3$
2429
2430 020676 012600          4$:  MOV    (5)+,R0    ;RESTORE R0
2431 020700 012604          MOV    (5)+,R4    ;RESTORE R4
2432 020702 000205          RTS    R5          ;EXIT
2433
2434 020704          5$:          ;COME HERE ON LOAD ERROR
2435 020704 005745          TST    -(5)
2436 020706 105204          INCB   R4          ;UPDATE ERROR COUNTER.
2437 020710 100324          BPL    1$          ;IF NOT TOO MANY, TRY AGAIN.
2438 020712 000000          HALT   1$          ;MICRO CODE LOAD ERROR.
2439
2440 020714 000722          BR      1$          ;KMC-11 FAULT. YOU COULD TRY
2441                                     ;TO PRESS CONTINUE TO GIVE IT
2442                                     ;ANOTHER CHANCE, BUT I DOUBT
2443                                     ;THAT THAT WOULD WORK. SINCE I'VE
2444                                     ;ALREADY GIVEN IT 177 (OCTAL) CHANCES.
2445                                     ;TRY RUNNING THE KMC-11 DIAGNOSTIC.
2446
2447
2448
2449
2450
2451
```

```
;*THIS ROUTINE ISSUES A WRITE COMMAND TO THE LPA-11
;*
;*  CALL = JSR    R5,$TLKW
;*          .WORD  0          ;OFFSET OF DEVICE ADDR.
;*
```

```

2452          ;*          .WORD 0          ;DATA TO BE WRITTEN
2453          ;*
2454          STLKW: MOV      RO, -(SP)      ;SAVE RO
2455          MOV      (5)+, RO             ;GET DEVICE OFFSET
2456          BIS      #340, RO             ;ADD WRITE CODE.
2457          JSR      PC, SLPW             ;WAIT FOR FAST PATH READY
2458          MOV      RO, W1
2459          MOV      RO, @KMA4
2460          MOV      RO, @KMA2
2461          JSR      PC, SLPW
2462          MOV      (5), W2
2463          MOV      (5)+, @KMA4
2464          ;ISSUE FAST PATH WRITE
2465          MOV      #5, @KMA2
2466          JSR      PC, SLPW
2467          MOV      (5), W3
2468          MOV      (5)+, @KMA4
2469          MOV      #5, @KMA2
2470          JSR      PC, SLPW
2471          MOV      (SP)+, RO
2472          RTS      R5
2473          ;EXIT DONE.
2474          W1:      0
2475          W2:      0
2476          W3:      0
2477          ;*
2478          ;*THIS ROUTINE ISSUES A READ COMMAND TO THE LPA-11
2479          ;*
2480          CALL = JSR      R5, STLKR
2481          ;*          .WORD 0          ;OFFSET OF DEVICE
2482          ;*          ;RETURNS HERE
2483          ;*DATA IN WORD $DATA
2484          ;*
2485          STLKR: MOV      RO, -(SP)      ;SAVE RO
2486          MOV      (5)+, RO             ;GET OFFSET
2487          BIS      #300, RO             ;ADD READ CODE
2488          JSR      PC, SLPW             ;WAIT TILL READY
2489          MOV      RO, @KMA4
2490          MOV      RO, @KMA2
2491          JSR      PC, SLPW
2492          MOV      RO, RD1
2493          JSR      R5, $TOUT
2494          ;-TOUT-CHECK FOR TIMEOUT
2495          ERROR
2496          ;/TIME-OUT ERROR
2497          ;/WE FAILED TO COMPLETE
2498          ;/CURRENT OPERATION.
2499          ;/CONTINUES IN THIS LOOP
2500          ;/WOULD MAKE US "HANG" HERE
2501          BR
2502          1$
2503          021076 000774
2504          ;/RETURNS HERE-FROM-TIMED OUT.
2505

```

```

2506 021100 032777 000040 157732      BIT      #BIT5,AKMADO      ;FAST PATH GOT DATA?
2507 021106 001370                      BNE      1$                      ;
2508 021110 112777 000004 157726      MOV      #4,AKMAD2      ;ISSUE FAST PATH READ
2509 021116 004737 021200              JSR      PC,SLPW      ;
2510 021122 117737 157722 021176      MOV      AKMAD4,$DATR      ;GET LOW BYTE
2511 021130                      2$:
2512 021130 004537 021466              JSR      R5,$TOUT      ;--TOUT-CHECK FOR TIMEOUT
2513 021134 104400                      ERROR
2514                      ;/TIME-OUT ERROR
2515                      ;/WE FAILED TO COMPLETE
2516                      ;/CURRENT OPERATION.
2517                      ;/CONTINUES IN THIS LOOP
2518                      ;/WOULD MAKE US "HANG" HERE
2519
2520 021136 000774                      BR      2$
2521
2522 021140 032777 000040 157672      BIT      #BIT5,AKMADO      ;/RETURNS HERE--FROM-TIMED OUT.
2523 021146 001370                      BNE      2$                      ;FAST PATH READY?
2524 021150 112777 000004 157666      MOV      #4,AKMAD2      ;ISSUE FAST PATH READ
2525 021156 004737 021200              JSR      PC,SLPW      ;
2526 021162 117737 157662 021177      MOV      AKMAD4,$DATR+1 ;SAVE HIGH BYTE
2527 021170 012600                      MOV      (SP)+,R0
2528 021172 000205                      RTS      R5
2529 021174 000000                      RD1:
2530 021176 000000                      $DATR: .WORD 0
2531
2532                      ;THIS ROUTINE WAITS FOR KMC-CODE TO BECOME READY AS WELL
2533                      ;AS FAST PATH TO BE READ.
2534                      CALL = JSR      PC,SLPW
2535
2536                      ;IT WILL TIME OUT IF TOO MUCH TIME IS TAKEN BY
2537                      ;THE MICRO-PROCESSORS AND REPORT AN ERROR, THEN HALT.
2538
2539
2540
2541
2542 021200 010146                      SLPW: MOV      R1,-(SP)      ;SAVE R1
2543 021202 005001                      CLR      R1
2544 021204 122777 000377 157632 1$: CMP      #377,AKMAD2      ;FINISHED INSTRUCTION?
2545 021212 001403                      BEQ      2$
2546 021214 005201                      INC      R1
2547 021216 001372                      BNE      1$
2548 021220 000411                      BR      10$
2549
2550 021222 032777 000020 157610 2$: BIT      #BIT4,AKMADO      ;FAST PATH READ?
2551 021230 001403                      BEQ      3$
2552 021232 005201                      INC      R1
2553 021234 001372                      BNE      2$
2554 021236 000402                      BR      10$
2555                      ;YES - REPORT AN ERROR
2556 021240 012601                      3$: MOV      (SP)+,R1      ;RESTORE R1
2557 021242 000207                      RTS      PC
2558                      ;EXIT
2559 021244                      10$:

```



2560 021244 104000  
 2561 021246 021252  
 2562 021250 000407  
 2563 021252  
 2564 021270

64\$:  
 65\$:

PRINT  
 64\$  
 BR 65\$  
 ;ASCII <200>#LPA-11 FAULT#

2565  
 2566 021270 000000  
 2567 021272 000776  
 2568  
 2569  
 2570  
 2571  
 2572  
 2573  
 2574  
 2575  
 2576  
 2577  
 2578  
 2579  
 2580  
 2581

11\$:

HALT  
 BR 11\$ ;LPA-11 FAULT RUN LPA-11  
 ;DIAGNOSTICS.

;\* THIS ROUTINE PROVIDES THE LINKAGE FROM USER CODE TO  
 ;\* A DEVICE ADDRESS ON THE I/O BUSS FOR WRITE ONLY.  
 ;\*  
 ;\* FIRST WE WILL DETERMINE IF THE ADDRESS HAS BEEN USED  
 ;\* BEFORE. IF NOT WE HAVE TO INITIALIZE THE LPA WITH  
 ;\* THAT ADDRESS.  
 ;\* WHEN THE ADDR. IS KNOWN BY THE LPA, DO THE OUTPUT BY  
 ;\* STLKW  
 ;\*

2582 021274 010046  
 2583 021276 010146  
 2584  
 2585 021300 012700 001066  
 2586 021304 005001  
 2587 021306 005710  
 2588 021310 001421  
 2589 021312 027520 000000  
 2590 021316 001402  
 2591 021320 005201  
 2592 021322 000771  
 2593  
 2594 021324 010137 021342  
 2595 021330 005725  
 2596 021332 013537 021344  
 2597 021336 004537 020716  
 2598 021342 000000  
 2599 021344 000000  
 2600 021346 012601  
 2601 021350 012600  
 2602 021352 000205  
 2603 021354 017520 000000  
 2604 021360 005010  
 2605 021362 004537 017676  
 2606 021366 001066  
 2607 021370 000755  
 2608  
 2609  
 2610  
 2611  
 2612  
 2613

SOUTLP: MOV R0, -(SP) ;SAVE R0  
 MOV R1, -(SP) ;SAVE R1  
 MOV #.DVLS, R0 ;PROGRAM DEFINED LIST.  
 CLR R1  
 1\$: TST (0) ;TERMINATOR REACHED?  
 BEQ 10\$ ;YES NEXT STEP.  
 CMP 2(5), (0)+ ;MATCH WITH ADDR IN LIST?  
 BEQ 2\$  
 INC R1  
 BR 1\$  
 2\$: MOV R1, 3\$ ;SAVE OFFSET, DEVICE KNOWN.  
 TST (5)+  
 MOV 2(5)+, 4\$ ;GET DATA TO BE WRITTEN  
 JSR R5, STLKW ;DO WRITE  
 3\$: .WORD 0 ;DEVICE OFFSET  
 4\$: .WORD 0 ;DATA TO BE WRITTEN.  
 MOV (SP)+, R1  
 MOV (SP)+, R0  
 RTS R5  
 10\$: MOV 2(5), (0)+ ;SAVE ADDR.  
 CLR (0)  
 JSR R5, \$LPAI  
 .WORD .DVLS  
 BR 2\$

;\* THIS ROUTINE PROVIDES THE LINKAGE FROM USER CODE  
 ;\* TO A DEVICE ADDR. ON THE I/O BUSS FOR READ ONLY.  
 ;\*  
 ;\* FIRST WE WILL DETERMINE IF THE ADDRESS HAS BEEN

```

2614      ;*USED BEFORE. IF NOT, WE HAVE TO INITIALIZE THE LPA
2615      ;*WITH THE NEW ADDR.
2616      ;*WHEN THE ADDR IS KNOWN WE CAN DO OUTPUT THROUGH
2617      ;*STLKr
2618      ;*      CALL THROUGH      MOVEI      DATA,ADDR.
2619      ;*      WHICH EQUALS:
2620      ;*      JSR      R5,$INLP
2621      ;*      .WORD    XX      ADDR OF DEVICE
2622      ;*      .WORD    YY      ADDR TO STORE READ DATA.
2623
2624      021372  010046      $INLP:  MOV      R0,-(SP)      ;SAVE R0
2625      021374  010146      MOV      R1,-(SP)      ;SAVE R1
2626
2627      021376  012700  001066      MOV      #.DVLs,R0      ;PROG DEFINED ADDR. LIST.
2628      021402  005001      CLR      R1
2629      021404  005710      1$:      TST      (0)      ;EOL REACHED?
2630      021406  001420      BEQ      10$      ;YES - DEFINE NEW ADDR.
2631
2632      021410  027520  000000      CMP      2(5),(0)+      ;ADDR. MATCH?
2633      021414  001402      BEQ      R1
2634      021416  005201      INC      R1
2635      021420  000771      BR      1$
2636
2637      021422  010137  021434      2$:      MOV      R1,3$      ;SAVE LIST OFFSET
2638      021426  005725      TST      (5)+
2639      021430  004537  021032      JSR      R5,$TLKR      ;GO READ DEVICE
2640      021434  000000      $OFS=.
2641      3$:      .WORD    0      ;OFFSET OF DEVICE
2642
2643      021436  013735  021176      MOV      $DATA,2(5)+      ;STORE DATA.
2644      021442  012601      MOV      (SP)+,R1      ;RESTORE R1
2645      021444  012600      MOV      (SP)+,R0      ;RESTORE R2
2646      021446  000205      RTS      R5      ;EXIT
2647
2648      021450  017520  000000      10$:     MOV      2(5),(0)+
2649      021454  005010      CLR      (0)
2650      021456  004537  017676      JSR      R5,$LPAI
2651      021462  001066      .WORD    .DVLs
2652      021464  000756      BR      2$
2653
2654      ;*ROUTINE USED TO WATCH IF
2655      ;*WE'RE IN A LOOP TOO-LONG
2656      ;*CALL= JSR R5, $TOUT
2657      ;*      ERROR X      ;RETURNS HERE ON TIMEOUT
2658      ;*      BR
2659      ;*      ;RETURNS HERE NO ERROR
2660      ;*
2661
2662      021466  020537  021522      $TOUT:  CMP      R5,$$AD      ;SAME ADDR?
2663      021472  001405      BEQ      1$
2664      021474  010537  021522      MOV      R5,$$AD      ;NO-SAVE THIS ADDR.
2665      021500  005037  021524      CLR      $CNT      ;CLR CNT AT ADDR.
2666      021504  000403      BR      2$
2667      021506  005237  021524      1$:      INC      $CNT      ;OVERFLOW?

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2668 021512 100402          BMI      3$          ;YES-ERROR RETURN
2669 021514 062705 000004  2$:      ADD      #4,R5      ;NO-NON ERROR RETURN
2670 021520 000205          3$:      RTS      R5        ;RETURN.
2671
2672 021522 000000          $$AD:    .WORD    0          ;CONTAINS LOOP ADDR.
2673 021524 000000          $CNT:    .WORD    0          ;# OF TIMES AT ADDR.
2674
2675          ;*
2676          ;* THIS ROUTINE REPLACES WHAT THE USER WOULD ORDINARILY
2677          ;*USE FOR A RESET. FIRST WE DO A RESET INSTRUCTION.
2678          ;*THEN WE CLR ".DVLST" WHICH FORCES US TO RESET BOTH THE
2679          ;*KMC AND DMC AS SOON AS A DEVICE IS REFERENCED.
2680          ;*
2681          ;*      CALL=JSR      PC,$RESET      ;REPLACES "RESET INSTRUCTION
2682          ;*      ;RETURNS HERE.
2683          ;*
2684 021526 000005          $RESET:  RESET          ;RESET THE WORLD.
2685
2686          ;*
2687 021540 005737 020554      ;*      MOV      2$,$1$      ;/READ DEVICE REG 2$,PUT DATA IN 1$.
2688 021544 001004          TST      $AERR          ;IF NO ERROR,LOOP
2689 021546 062737 000002 021562  BNE      10$      ;THERE WAS AN ERROR.
2690          ADD      #2,2$      ;UPDATE DEVICE ADDR.
2691          ;YOU SEE, WE HAVE TO PROTECT OUR SELF!
2692          ;IF 2$ CONTAINED A VALID ADDR,WE
2693          ;MUST KEEP TRYING UNTIL WE GENERATE
2694          ;AN INVALID ADDR.
2695 021554 000764          10$:      BR      $RESET
2696 021556 000207          RTS      PC
2697 021560 000000          1$:      .WORD    0          ;JUNK LOC.
2698 021562 160000          2$:      .WORD    160000      ;DUMB ADDR. FORCES INIT OF DMC/KMC.
2699
2700
2701          ;SDELAY- ROUTINE TO GIVE A MINOR DELAY.
2702          ;IS NOT TIME DEPENDENT CODE SENCE
2703          ;NOT USED TO GET SPECIFIC TIME BUT
2704          ;JUST A LITTLE DELAY.
2705          ;
2706          ;
2707          ;      THAT IS UNLESS A REAL TIME CLOCK IS PRESENT!
2708          ;      THEN WE'LL GENERATE A TIME BETWEEN 16MS TO 32 MS
2709          ;
2710          ;
2711          ;      CALL= JSR PC, SDELAY
2712          ;
2713 021564          SDELAY:
2714 021564 005737 021646      TST      RTCCSR          ;CLOCK PRESENT?
2715 021570 100016          BPL      10$
2716 021572 012737 000002 021636  MOV      #2,TIME
2717 021600 052777 000115 000040  BIS      #115,RTCCSR      ;START CLOCK
2718 021606 005037 177776          CLR      PS
2719 021612 005737 021636          1$:      TST      TIME
2720 021616 001375          BNE      1$
2721 021620 005077 000022          CLR      RTCCSR          ;STOP CLOCK

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2722
2723 021624 000207
2724 021626 105237 021636      10$: RTS PC
2725 021632 001375              INCB TIME
2726 021634 000207              BNE 10$
2727                                RTS PC
2728 021636 000000      TIME: .WORD 0
2729
2730 021640 005337 021636      CLKINT: DEC TIME
2731 021644 000002              RTI
2732 021646 000000      RTCCSR: .WORD 0      ;CLOCK CSR IF USED.
2733
2734      :
2735      : THIS ROUTINE LOOKS THROUGH CURENT .DVL$ FOR A/D ADDR.
2736      : IF UNFOUND, GENERATES IT. THIS ROUTINE'S WHOLE PURPOSE IS
2737      : TO SET UP THE USER PROGRAM TO LINK TO FILE "DRLPX2" FOR
2738      : SAMPLE TAKEING PURPOSES.
2739      : TO TAKE SAMPLES, THE USER PROGRAM MUST SET UP
2740      : A/D CSR IN BSEL 4 AND 5.
2741      : (2) HE MUST CALL THIS ROUTINE:
2742      : JSR RS, $PUTS      ;CALL SET UP ROUTINE.
2743      : .WORD ADCSR      ;ADDR. OF A/D CSR.
2744      : RETURNS HERE ;KMC BSEL 3,6,7 PERMINENTLY SET UP
2745      : ;(UNTILL ONE DOES A RESET)
2746
2747      :
2748      : (3) THE USER MUST PUT CODE 006 INTO KMC REG 2 TO
2749      : START CONVERSION CAUTION*DO WITH MOV$ INSTR.!
2750      : (4) MONITOR KMC REG 2 FOR CODE 377 (DRLPX2 IS DONE)
2751      : (5) READ KMC REG 4,5 FOR A/D RESULT.
2752      : (6) TO TAKE MORE SAMPLES, SIMPLY PUT A/D CSR INTO
2753      : BSEL 4,5 AND CODE 6 INTO BSEL 2.
2754
2754 021650 012537 021660      $PUTS: MOV (5)+, 1$      ;GET ADDR OF ADDR. OF A/D
2755 021654 004537 021372      JSR RS, $INLP
2756 021660 000000      1$: .WORD 0
2757 021662 021756      .WORD 10$
2758 021664 113777 021434 157162      MOV$ $OFS, 2KMA$6
2759 021672 113777 021434 157156      MOV$ $OFS, 2KMA$7
2760 021700 013737 021660 021720      MOV 1$, 2$
2761 021706 062737 000002 021720      ADD #2, 2$
2762 021714 004537 021372      JSR RS, $INLP
2763 021720 000000      2$: .WORD 0
2764 021722 021756      .WORD 10$
2765 021724 113777 021434 157114      MOV$ $OFS, 2KMA$3
2766 021732 152777 000340 157114      BISB #340, 2KMA$6
2767 021740 152777 000300 157110      BISB #300, 2KMA$7
2768 021746 152777 000300 157072      BISB #300, 2KMA$3
2769 021754 000205      RTS RS
2770 021756 000000      10$: .WORD 0
2771
2772      .END
000001

```

[illegible]

[illegible]



[illegible]

[illegible]

|        |        |       |       |       |       |       |       |
|--------|--------|-------|-------|-------|-------|-------|-------|
| KSTR12 | 015022 | 1862* | 1884  | 2149# |       |       |       |
| LADTB  | 006752 | 1127  | 1150# |       |       |       |       |
| LEDS   | 013244 | 304   | 924   | 1168  | 1743  | 1856  | 1941# |
| LEDSA  | 013262 | 1944# | 1954  |       |       |       |       |
| LEDSV1 | 013346 | 1943* | 1944  | 1949* | 1950* | 1951* | 1958# |
| LEDSV2 | 013350 | 1944* | 1945* | 1946* | 1949  | 1959# |       |
| LEDSV3 | 013352 | 1942* | 1946  | 1952* | 1960# |       |       |
| LGERR1 | 013006 | 1866  | 1872# |       |       |       |       |
| LOGERR | 012664 | 101   | 1850# |       |       |       |       |
| LOGICA | 002022 | 104   | 337#  |       |       |       |       |
| LOW    | 015070 | 1041  | 1725* | 1730  | 1732* | 2168# |       |
| LPAOH  | 001052 | 172#  |       |       |       |       |       |
| LPAOL  | 001050 | 170#  |       |       |       |       |       |
| LPCI   | 001040 | 161#  |       |       |       |       |       |
| LPCO   | 001044 | 166#  |       |       |       |       |       |
| LPMR   | 001042 | 164#  |       |       |       |       |       |
| LPMS1  | 001054 | 174#  |       |       |       |       |       |
| LPMS2  | 001056 | 176#  |       |       |       |       |       |
| LPSADD | 001000 | 136#  | 228   | 229   | 230   | 231   | 232   |
| LPSO   | 001046 | 168#  |       |       |       |       |       |
| LPSVCT | 001002 | 137#  | 237   | 238   |       |       |       |
| MANCAL | 005246 | 116   | 893#  |       |       |       |       |
| MASK   | 012646 | 1820* | 1826  | 1831* | 1838# |       |       |
| MESPR  | 015062 | 957*  | 1025  | 1048  | 1052* | 2165# |       |
| MES1   | 013453 | 1870  | 1978# |       |       |       |       |
| MES10  | 014136 | 886   | 2053# |       |       |       |       |
| MES11  | 014203 | 2062# |       |       |       |       |       |
| MES12  | 014236 | 1557  | 2067# |       |       |       |       |
| MES13  | 014256 | 956   | 2071# |       |       |       |       |
| MES14  | 014306 | 962   | 1087  | 2076# |       |       |       |
| MES15  | 014321 | 1165  | 2078# |       |       |       |       |
| MES16  | 014346 | 973   | 2083# |       |       |       |       |
| MES18  | 014365 | 978   | 2086# |       |       |       |       |
| MES19  | 014444 | 1028  | 2094# |       |       |       |       |
| MES20  | 014477 | 1051  | 2100# |       |       |       |       |
| MES21  | 014565 | 1604  | 2111# |       |       |       |       |
| MES22  | 014605 | 1215  | 2114# |       |       |       |       |
| MES23  | 014663 | 1268  | 2122# |       |       |       |       |
| MES24  | 014742 | 1296  | 2130# |       |       |       |       |
| MES4   | 013515 | 289   | 1990# |       |       |       |       |
| MES5   | 014030 | 348   | 2037# |       |       |       |       |
| MES7   | 014057 | 884   | 2042# |       |       |       |       |
| MES8   | 014106 | 1085  | 2046# |       |       |       |       |
| MES9   | 014131 | 1138  | 2051# |       |       |       |       |
| MINUS1 | 015142 | 1801  | 2189# |       |       |       |       |
| MINUS2 | 015140 | 1804  | 2188# |       |       |       |       |
| MINUS3 | 015136 | 1807  | 2187# |       |       |       |       |
| MINUS4 | 015134 | 1810  | 2186# |       |       |       |       |
| MINUS5 | 015132 | 1790* | 2185# |       |       |       |       |
| MONITR | 001546 | 110   | 292#  | 1424  | 1605  |       |       |
| NEWIN  | 010144 | 1380# |       |       |       |       |       |
| NEWSWR | 014007 | 1454  | 2028# |       |       |       |       |
| NODMA  | 002036 | 332*  | 342#  |       |       |       |       |
| OCTPRT | 012522 | 1634  | 1816# |       |       |       |       |



|       |       |       |       |       |       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 960*  | 2157* |       |       |       |       |       |       |       |       |       |       |       |
| 1770  | 1792* | 2196* |       |       |       |       |       |       |       |       |       |       |
| 1057  | 1768  | 1794* | 2184* |       |       |       |       |       |       |       |       |       |
| 1402* | 1403  | 1432  |       |       |       |       |       |       |       |       |       |       |
| 1778  | 1792* |       |       |       |       |       |       |       |       |       |       |       |
| 1780  | 1794* |       |       |       |       |       |       |       |       |       |       |       |
| 151*  | 350*  | 352   | 839   | 870*  | 1166* | 1173  | 1902  | 1923  |       |       |       |       |
| 86*   | 227*  | 292*  | 335*  | 337*  | 349*  | 780*  | 793*  | 813*  | 826*  | 865*  | 869*  | 922*  |
| 995*  | 1102* | 1107* | 1129* | 1575* | 1602* | 1689* | 1937* | 2343* | 2345* | 2347* | 2394* | 2457* |
| 2461* | 2466* | 2470* | 2489* | 2492* | 2509* | 2526* | 2557* | 2696* | 2723* | 2726* |       |       |
| 139*  | 269*  | 271*  | 849   |       |       |       |       |       |       |       |       |       |
| 254*  | 260   |       |       |       |       |       |       |       |       |       |       |       |
| 1800  | 2191* |       |       |       |       |       |       |       |       |       |       |       |
| 1803  | 2192* |       |       |       |       |       |       |       |       |       |       |       |
| 1806  | 2193* |       |       |       |       |       |       |       |       |       |       |       |
| 1809  | 2194* |       |       |       |       |       |       |       |       |       |       |       |
| 2195* |       |       |       |       |       |       |       |       |       |       |       |       |
| 121*  | 286   | 288   | 296   | 310   | 329   | 347   | 883   | 885   | 890   | 929   | 955   | 961   |
| 972   | 977   | 1023  | 1027  | 1030  | 1050  | 1055  | 1084  | 1086  | 1137  | 1164  | 1212  | 1214  |
| 1265  | 1267  | 1293  | 1295  | 1411  | 1437  | 1449  | 1453  | 1469  | 1508  | 1556  | 1603  | 1867  |
| 1869  | 1872  | 1935  | 2266  | 2321  | 2326  | 2331  | 2560  |       |       |       |       |       |
| 285*  | 1865  | 1871* | 2137* |       |       |       |       |       |       |       |       |       |
| 889*  | 893*  | 901   | 905   | 1587* | 1594  | 2140* |       |       |       |       |       |       |
| 131*  | 928   | 1144  |       |       |       |       |       |       |       |       |       |       |
| 129*  | 1037  | 1040  | 1043  | 1046  | 1141  | 1364  | 1451  | 1874  | 1877  | 1880  | 1883  | 1886  |
| 255*  | 263   | 2718* |       |       |       |       |       |       |       |       |       |       |
| 144*  | 209*  | 294*  | 354*  | 841*  | 1175* | 1519* | 1593* | 1650* | 1680* | 1908* |       |       |
| 93    | 298   | 1580* |       |       |       |       |       |       |       |       |       |       |
| 1588  | 1593* |       |       |       |       |       |       |       |       |       |       |       |
| 330   | 1470  | 1509  | 2035* |       |       |       |       |       |       |       |       |       |
| 2493* | 2530* |       |       |       |       |       |       |       |       |       |       |       |
| 325   | 1081* |       |       |       |       |       |       |       |       |       |       |       |
| 1081  | 1086* |       |       |       |       |       |       |       |       |       |       |       |
| 1092* | 1136  | 1145  |       |       |       |       |       |       |       |       |       |       |
| 322   | 954*  |       |       |       |       |       |       |       |       |       |       |       |
| 954   | 957*  | 970   |       |       |       |       |       |       |       |       |       |       |
| 968   | 972*  |       |       |       |       |       |       |       |       |       |       |       |
| 983   | 985   | 988*  | 1071  |       |       |       |       |       |       |       |       |       |
| 981   | 984*  |       |       |       |       |       |       |       |       |       |       |       |
| 990*  | 1070  |       |       |       |       |       |       |       |       |       |       |       |
| 1000  | 1006  | 1011  | 1017  | 1020  | 1023* |       |       |       |       |       |       |       |
| 1026  | 1029* |       |       |       |       |       |       |       |       |       |       |       |
| 1049  | 1052* |       |       |       |       |       |       |       |       |       |       |       |
| 1058* | 1061  |       |       |       |       |       |       |       |       |       |       |       |
| 1002  | 1007  | 1012  | 1018  | 1022  | 1063  | 1065* |       |       |       |       |       |       |
| 1068  | 1071* |       |       |       |       |       |       |       |       |       |       |       |
| 1035  | 1037* |       |       |       |       |       |       |       |       |       |       |       |
| 1032* | 1033* | 1036* | 1038  | 1073* | 1140* | 1142  |       |       |       |       |       |       |
| 351*  | 1344* | 1909  | 1911* | 1914* |       |       |       |       |       |       |       |       |
| 2714  | 2717* | 2721* | 2732* |       |       |       |       |       |       |       |       |       |
| 79*   | 214   | 216*  | 219*  | 220   | 225*  | 258*  | 261*  | 264*  | 267*  | 268   | 269   | 336*  |
| 650*  | 665*  | 682*  | 723*  | 729*  | 730*  | 745*  | 850*  | 853*  | 93    |       |       |       |

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|        |          |                                                                                                                                                                                              |                                                                                                                                                             |                                                                                                                                                          |                                                                                                                         |                                                                                                                   |                                                                                                                         |                                                                                                                  |                                                                                                                         |                                                                                                                   |                                                                                                                         |                                                                                                                   |                                                                                                                         |                                                                                                                   |                                                                                                                         |
|--------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| R1     | =%000001 | 2454<br>2585*<br>80#<br>1113*<br>1393*<br>1447<br>1501<br>2338*<br>2594                                                                                                                      | 2455*<br>2601*<br>215<br>1114*<br>1394<br>1456*<br>1504<br>2339<br>2600*                                                                                    | 2456*<br>2624<br>217*<br>1115*<br>1396<br>1462*<br>1581<br>2344<br>2625                                                                                  | 2458<br>2627*<br>221<br>1116*<br>1398<br>1463*<br>1600*<br>2346<br>2628*                                                | 2459<br>2645*<br>224*<br>1117*<br>1404<br>1464*<br>1781*<br>2373*<br>2634*                                        | 2471*<br>274*<br>275*<br>1124*<br>1409<br>1465*<br>1785*<br>2542<br>2637                                                | 2486<br>276*<br>277<br>1127<br>1417*<br>1467<br>1786<br>2543*<br>2644*                                           | 2487*<br>276*<br>277<br>1131<br>1422<br>1482*<br>1789*<br>2546*<br>2552*                                                | 2488*<br>277<br>1328*<br>1425<br>1495<br>1790*<br>2552*<br>2556*                                                  | 2490<br>1108*<br>1330*<br>1430*<br>1496*<br>2282<br>2556*                                                               | 2493<br>1110*<br>1331<br>1433<br>1497*<br>2283*<br>2583                                                           | 2528*<br>1111*<br>1375<br>1435<br>1498*<br>2284*<br>2586*                                                               | 2582<br>1112*<br>1392*<br>1443*<br>1499*<br>2287*<br>2591*                                                        |                                                                                                                         |
| R2     | =%000002 | 81#<br>1461*<br>82#<br>1769*                                                                                                                                                                 | 273*<br>1465<br>1377<br>1770                                                                                                                                | 275<br>1483*<br>1415*                                                                                                                                    | 277*<br>1495*<br>1441*                                                                                                  | 278<br>1582<br>1480*                                                                                              | 279<br>1599*<br>1504*                                                                                                   | 1058*<br>1782*<br>1583                                                                                           | 1123*<br>1783<br>1598*                                                                                                  | 1130*<br>1752*<br>1754*                                                                                           | 1376<br>1754*<br>1760*                                                                                                  | 1416*<br>1760*<br>1762*                                                                                           | 1442*<br>1762*<br>1768*                                                                                                 | 1460*                                                                                                             |                                                                                                                         |
| R3     | =%000003 | 83#<br>1440*<br>1726                                                                                                                                                                         | 1057*<br>1479*<br>2406                                                                                                                                      | 1058<br>1487<br>2431*                                                                                                                                    | 1060<br>1489<br>2436*                                                                                                   | 1065*<br>1491                                                                                                     | 1066*<br>1493*                                                                                                          | 1067<br>1494                                                                                                     | 1127*<br>1503                                                                                                           | 1378<br>1521*                                                                                                     | 1380*<br>1584                                                                                                           | 1398*<br>1597*                                                                                                    | 1414*<br>1720*                                                                                                          | 1431<br>1723                                                                                                      |                                                                                                                         |
| R5     | =%000005 | 84#<br>415*<br>470*<br>537*<br>596*<br>657*<br>729*<br>813*<br>1188*<br>1245*<br>1413*<br>1652*<br>1860*<br>2597*<br>2769*                                                                   | 304*<br>417*<br>480*<br>539*<br>601*<br>665*<br>734*<br>816*<br>1190*<br>1248*<br>1439*<br>1656<br>1862*<br>2602*                                           | 362*<br>422*<br>482*<br>544*<br>603*<br>668*<br>743*<br>826*<br>1193*<br>1250*<br>1527*<br>1658*<br>1949*<br>2605*                                       | 364*<br>424*<br>487*<br>546*<br>613*<br>673*<br>745*<br>829*<br>1195*<br>1254*<br>1533*<br>1660<br>2275*<br>2639*       | 367*<br>435*<br>489*<br>556*<br>615*<br>682*<br>748*<br>849*<br>1198*<br>1258*<br>1540*<br>1662<br>2277*<br>2646* | 377*<br>437*<br>499*<br>558*<br>620*<br>686*<br>751*<br>915*<br>1201*<br>1259*<br>1544*<br>1674<br>2354*<br>2650*       | 379*<br>442*<br>501*<br>563*<br>622*<br>695*<br>756*<br>918*<br>1205*<br>1275*<br>1548*<br>1816<br>2374*<br>2662 | 384*<br>444*<br>506*<br>565*<br>632*<br>699*<br>780*<br>921*<br>1206*<br>1279*<br>1554*<br>1817<br>2381*<br>2664        | 386*<br>454*<br>508*<br>575*<br>634*<br>699*<br>783*<br>924*<br>1230*<br>1302<br>1568*<br>1822*<br>2432*<br>2669* | 396*<br>456*<br>518*<br>577*<br>639*<br>704*<br>793*<br>924*<br>1233*<br>1303<br>1572*<br>1823*<br>2472*<br>2670*       | 398*<br>462*<br>520*<br>582*<br>641*<br>712*<br>796*<br>924*<br>1235*<br>1316*<br>1585<br>1824*<br>2495*<br>2687* | 403*<br>464*<br>525*<br>584*<br>650*<br>723*<br>806*<br>1181*<br>1238*<br>1319*<br>1596*<br>1825<br>2512*<br>2755*      | 405*<br>468*<br>527*<br>594*<br>655*<br>726*<br>808*<br>1184*<br>1241*<br>1379<br>1651<br>1834*<br>2529*<br>2762* |                                                                                                                         |
| SAVS   | 012650   | 1651*<br>123#<br>1899<br>1628<br>1343*<br>1901<br>1629<br>1638<br>1905*<br>133#<br>124#<br>2713*<br>109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355* | 1658<br>392<br>1907*<br>1897*<br>1904<br>1903<br>1918*<br>1930*<br>1926<br>864<br>373<br>431<br>647<br>679<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1816*<br>411<br>1920<br>1906*<br>1905<br>1910*<br>1910*<br>1913*<br>1922<br>1925<br>1924<br>1933<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628 | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1839*<br>476<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628                                              | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1839*<br>476<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628                                             | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1839*<br>476<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628                                              | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1839*<br>476<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628                                              | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 | 1839*<br>476<br>495<br>514<br>533<br>552<br>571<br>590<br>609<br>628                                              | 1834<br>450<br>1932<br>1910*<br>1910*<br>1913*<br>1922<br>1924<br>1933<br>718<br>740<br>776<br>789<br>802<br>822<br>836 |
| SCOPE  | 104002   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEB | 013132   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEC | 013066   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEF | 013156   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEH | 013162   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEI | 013222   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEJ | 013124   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEK | 013124   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2407*<br>2624*<br>1876                           | 293*<br>353*<br>921*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2430<br>2625*<br>1879                                  | 353*<br>921*<br>988*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2431<br>2644<br>1882                             | 921*<br>988*<br>1092*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2454*<br>2645<br>1885                                 | 988*<br>1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2471<br>2486*                                  | 1092*<br>1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                        | 1128*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2486*                                                           |                                                                                                                         |
| SCOPEL | 013124   | 109#<br>108#<br>85#<br>1172*<br>1419<br>1586*<br>1615<br>2249*<br>2542*<br>128#<br>1355*                                                                                                     | 1452<br>208*<br>214*<br>1374*<br>1439<br>1587<br>1618*<br>2272<br>2556<br>1039<br>1357*                                                                     | 1467*<br>214*<br>215*<br>1375*<br>1440<br>1594*<br>1619*<br>2273<br>2582*<br>1042<br>1359*                                                               | 215*<br>224<br>225<br>1376*<br>1441<br>1595<br>1620*<br>2282*<br>2583*<br>1045<br>1367*                                 | 224<br>225<br>246<br>1377*<br>1442<br>1596<br>1621*<br>2373<br>2600<br>1143                                       | 225<br>246<br>293*<br>1413<br>1414<br>1580*<br>1599<br>1652<br>2406*<br>2601<br>1368                                    | 246<br>293*<br>353*<br>1413<br>1414<br>1580*<br>1599<br>1652                                                     |                                                                                                                         |                                                                                                                   |                                                                                                                         |                                                                                                                   |                                                                                                                         |                                                                                                                   |                                                                                                                         |



|       |       |       |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
|-------|-------|-------|------|-------|------|-------|-------|------|------|------|------|------|--|--|--|--|--|--|--|
| 1395  | 1397  | 1409# |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
| 1410  | 1422# |       |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
| 1426  | 1433# |       |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
| 1435# |       |       |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
| 1401  | 1448  | 1469# |      |       |      |       |       |      |      |      |      |      |  |  |  |  |  |  |  |
| 208   | 293   | 353   | 921  | 988   | 1092 | 1172  | 2138# |      |      |      |      |      |  |  |  |  |  |  |  |
| 1167* | 1169  | 1174  | 1227 | 1263* | 1284 | 1287* | 2150# |      |      |      |      |      |  |  |  |  |  |  |  |
| 149#  | 244   | 247*  | 851  | 898   | 900  | 926   | 937   | 999  | 1001 | 1062 | 1135 | 1210 |  |  |  |  |  |  |  |
| 1216  | 1263  | 1269  | 1291 | 1297  | 1554 | 1558  | 1851  | 1890 | 1898 | 1900 | 1919 | 1921 |  |  |  |  |  |  |  |

|       |       |       |       |       |       |       |       |       |       |       |       |       |  |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| 75#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 74#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 73#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 72#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 71#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 70#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 69#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 68#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 67#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 66#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 65#   | 926   | 999   | 1135  |       |       |       |       |       |       |       |       |       |  |
| 64#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 63#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 62#   | 1001  |       |       |       |       |       |       |       |       |       |       |       |  |
| 61#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 60#   |       |       |       |       |       |       |       |       |       |       |       |       |  |
| 1731  | 1733# |       |       |       |       |       |       |       |       |       |       |       |  |
| 1863  | 2158# |       |       |       |       |       |       |       |       |       |       |       |  |
| 843#  | 844   | 860*  | 861   | 1125* | 1520* | 1573* | 1719* | 1735* | 1737* | 1740* | 1750* | 1755* |  |
| 1758# | 1763# | 1772* | 1774* | 2159# |       |       |       |       |       |       |       |       |  |
| 844#  | 846   | 857*  | 1726* | 1727  | 1729  | 1730  | 1732  | 1733  | 1751* | 1753* | 1754  | 1759* |  |
| 1761# | 1762  | 1776* | 1777  | 1779  | 1783  | 2160# |       |       |       |       |       |       |  |
| 845#  | 858*  | 923*  | 1096* | 1369* | 2161# |       |       |       |       |       |       |       |  |

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[illegible]

007

LPS-11 DIAGNOSTIC TEST I MAINDEC-11-DRLPH-A  
DRLPH.P11 CROSS REFERENCE TABLE

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SEQ 0081

|         |          |       |       |       |       |       |       |       |       |       |       |       |       |       |
|---------|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|         |          | 751   | 780   | 793   | 806   | 813   | 826   | 849   | 915   | 918   | 921   | 1178  | 1181  | 1193  |
|         |          | 1198  | 1230  | 1233  | 1238  | 1248  | 1533  | 1540  | 1544  | 1554  | 1949  | 2582* |       |       |
| \$PUTS  | 021650   | 2754* |       |       |       |       |       |       |       |       |       |       |       |       |
| \$RESET | 021526   | 227   | 292   | 335   | 349   | 780   | 793   | 813   | 826   | 865   | 1602  | 2684* | 2694  |       |
| \$SAD   | 021522   | 2662  | 2664* | 2672* |       |       |       |       |       |       |       |       |       |       |
| \$TLKR  | 021032   | 2486* | 2639  |       |       |       |       |       |       |       |       |       |       |       |
| \$TLKW  | 020716   | 2454* | 2597  |       |       |       |       |       |       |       |       |       |       |       |
| \$TMDAT | 015072   | 364*  | 367   | 374*  | 377   | 393*  | 396   | 412*  | 415   | 432*  | 435   | 437   | 451*  | 454   |
|         |          | 465*  | 468   | 477*  | 480   | 496*  | 499   | 515*  | 518   | 534*  | 537   | 553*  | 555   | 572*  |
|         |          | 575   | 591*  | 594   | 610*  | 613   | 629*  | 632   | 652*  | 655   | 683*  | 686   | 692*  | 695   |
|         |          | 726*  | 729   | 748*  | 751   | 777*  | 780   | 790*  | 793   | 803*  | 806   | 810*  | 813   | 823*  |
|         |          | 826   | 846*  | 849   | 915*  | 918*  | 921   | 1174* | 1178* | 1181  | 1190* | 1193  | 1195* | 1198  |
|         |          | 1227* | 1230* | 1233  | 1235* | 1238  | 1245* | 1248  | 1527  | 1530* | 1533  | 1537* | 1540  | 1541* |
|         |          | 1544  | 1572  | 2169* |       |       |       |       |       |       |       |       |       |       |
| \$TOuT  | 021466   | 2297  | 2354  | 2381  | 2495  | 2512  | 2662* |       |       |       |       |       |       |       |
| \$VECT1 | 001150   | 199*  |       |       |       |       |       |       |       |       |       |       |       |       |
| \$ZERO  | 015100   | 362   | 364   | 384   | 403   | 422   | 442   | 462   | 487   | 506   | 525   | 544   | 563   | 582   |
|         |          | 601   | 620   | 639   | 704   | 721   | 743   | 915   | 1554  | 2172* |       |       |       |       |
|         |          | 89*   | 92*   | 95*   | 98*   | 103*  | 105*  | 107*  | 135*  | 185*  | 282   | 307   | 315   | 318   |
|         | = 021760 | 321   | 324   | 327   | 368   | 380   | 387   | 399   | 406   | 418   | 425   | 438   | 445   | 457   |
|         |          | 471   | 483   | 490   | 502   | 509   | 521   | 528   | 540   | 547   | 559   | 566   | 578   | 585   |
|         |          | 597   | 604   | 616   | 623   | 635   | 642   | 669   | 674   | 700   | 713   | 731   | 735   | 757   |
|         |          | 762   | 765   | 784   | 797   | 809   | 817   | 830   | 867   | 892   | 1340  | 1353  | 1475* | 1666  |
|         |          | 1704  | 1711  | 1821  | 1829  | 1844  | 1889  | 1891  | 2204  | 2213* | 2215* | 2217* | 2219* | 2221* |
|         |          | 2223* | 2225* | 2227* | 2229* | 2230* | 2640  |       |       |       |       |       |       |       |
| .DVLs   | 001066   | 184*  | 223*  | 356*  | 2585  | 2606  | 2627  | 2651  |       |       |       |       |       |       |

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|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| ADC  | 1734 | 1742 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| ADD  | 234  | 235  | 236  | 239  | 772  | 1036 | 1118 | 1308 | 1331 | 1342 | 1366 | 1465 | 1499 | 1620 | 1653 |
| ASL  | 1688 | 1693 | 1733 | 1800 | 1801 | 1803 | 1804 | 1806 | 1807 | 1809 | 1810 | 1818 | 2669 | 2689 | 2761 |
| ASR  | 267  | 1334 | 1335 | 1336 | 1462 | 1463 | 1464 | 1496 | 1497 | 1498 | 1618 | 1789 |      |      |      |
| BEQ  | 689  | 690  | 691  | 1738 | 1949 | 1950 | 1951 |      |      |      |      |      |      |      |      |
|      | 282  | 307  | 368  | 380  | 387  | 399  | 406  | 418  | 425  | 438  | 445  | 457  | 471  | 483  | 490  |
|      | 502  | 509  | 521  | 528  | 540  | 547  | 559  | 566  | 578  | 585  | 597  | 604  | 616  | 623  | 635  |
|      | 642  | 674  | 784  | 797  | 817  | 830  | 840  | 867  | 912  | 927  | 938  | 968  | 1022 | 1035 | 1068 |
|      | 1285 | 1306 | 1333 | 1428 | 1434 | 1459 | 1488 | 1529 | 1563 | 1565 | 1661 | 1698 | 1775 | 1784 | 1903 |
| BGT  | 1905 | 1924 | 2291 | 2316 | 2340 | 2368 | 2425 | 2545 | 2551 | 2588 | 2590 | 2630 | 2633 | 2663 |      |
| BIC  | 1356 | 1492 | 1502 | 1574 | 1731 |      |      |      |      |      |      |      |      |      |      |
| BICB | 313  | 761  | 888  | 899  | 993  | 1033 | 1066 | 1099 | 1104 | 1330 | 1381 | 1393 | 1461 | 1493 | 1619 |
| BIS  | 1945 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| BISB | 1826 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| BIT  | 355  | 726  | 748  | 842  | 903  | 907  | 910  | 987  | 994  | 1052 | 1100 | 1105 | 1171 | 1178 | 1195 |
| BITB | 1230 | 1235 | 1420 | 1445 | 1702 | 1827 | 2278 | 2411 | 2413 | 2421 | 2456 | 2488 | 2717 |      |      |
| BLE  | 1190 | 2766 | 2767 | 2768 |      |      |      |      |      |      |      |      |      |      |      |
| BLT  | 673  | 851  | 926  | 999  | 1001 | 1135 | 1210 | 1263 | 1291 | 1554 | 1851 | 1898 | 1900 | 1919 | 1921 |
| BMI  | 1931 | 2290 | 2349 | 2506 | 2523 | 2550 |      |      |      |      |      |      |      |      |      |
| BNE  | 1828 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|      | 1312 | 1485 | 1728 |      |      |      |      |      |      |      |      |      |      |      |      |
|      | 1490 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|      | 658  | 700  | 970  | 1395 | 1397 | 1401 | 1778 | 1780 | 2668 |      |      |      |      |      |      |
|      | 222  | 270  | 280  | 315  | 318  | 321  | 324  | 327  | 660  | 731  | 753  | 762  | 765  | 838  | 852  |
|      | 854  | 856  | 859  | 862  | 902  | 906  | 981  | 985  | 1000 | 1002 | 1004 | 1006 | 1009 | 1011 | 1015 |
|      | 1017 | 1020 | 1026 | 1049 | 1061 | 1120 | 1133 | 1136 | 1209 | 1211 | 1262 | 1264 | 1278 | 1282 | 1292 |
|      | 1370 | 1410 | 1423 | 1426 | 1436 | 1448 | 1506 | 1524 | 1535 | 1555 | 1616 | 1657 | 1691 | 1696 | 1736 |
|      | 1741 | 1756 | 1764 | 1771 | 1787 | 1833 | 1852 | 1866 | 1899 | 1901 | 1920 | 1922 | 1932 | 1954 | 2285 |
|      | 2288 | 2309 | 2311 | 2318 | 2320 | 2350 | 2366 | 2393 | 2417 | 2423 | 2507 | 2524 | 2547 | 2553 | 2688 |
| BPL  | 2720 | 2725 |      |      |      |      |      |      |      |      |      |      |      |      |      |
|      | 669  | 687  | 696  | 706  | 713  | 735  | 757  | 809  | 1063 | 1185 | 1202 | 1217 | 1242 | 1255 | 1270 |
|      | 1298 | 1307 | 1309 | 1340 | 1353 | 1391 | 1403 | 1549 | 1551 | 1559 | 1655 | 1666 | 1670 | 1673 | 1687 |
| BR   | 1704 | 1829 | 1844 | 1889 | 1891 | 2437 | 2715 |      |      |      |      |      |      |      |      |
|      | 245  | 290  | 331  | 892  | 904  | 909  | 931  | 939  | 983  | 1007 | 1012 | 1018 | 1145 | 1272 | 1289 |
|      | 1310 | 1313 | 1337 | 1405 | 1432 | 1466 | 1468 | 1500 | 1540 | 1568 | 1663 | 1675 | 1694 | 1700 | 1791 |
|      | 1793 | 1795 | 1821 | 1926 | 1933 | 2251 | 2268 | 2271 | 2305 | 2323 | 2328 | 2333 | 2362 | 2389 | 2428 |
|      | 2440 | 2503 | 2520 | 2548 | 2554 | 2562 | 2567 | 2592 | 2607 | 2635 | 2652 | 2666 | 2694 |      |      |
| CLR  | 223  | 265  | 266  | 276  | 285  | 300  | 302  | 332  | 350  | 354  | 356  | 651  | 729  | 751  | 841  |
|      | 843  | 893  | 894  | 895  | 896  | 957  | 958  | 959  | 960  | 1082 | 1083 | 1095 | 1166 | 1167 | 1175 |
|      | 1287 | 1315 | 1329 | 1343 | 1357 | 1382 | 1383 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1456 | 1481 |
|      | 1482 | 1483 | 1519 | 1522 | 1536 | 1650 | 1680 | 1722 | 1769 | 1781 | 1862 | 1910 | 1942 | 2274 | 2283 |
|      | 2372 | 2409 | 2410 | 2414 | 2418 | 2426 | 2543 | 2586 | 2604 | 2628 | 2649 | 2665 | 2718 | 2721 |      |
| CLRB | 465  |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| CMP  | 221  | 246  | 279  | 379  | 398  | 417  | 437  | 456  | 482  | 501  | 520  | 539  | 558  | 577  | 596  |
|      | 615  | 634  | 764  | 861  | 901  | 937  | 969  | 1003 | 1005 | 1008 | 1010 | 1014 | 1016 | 1019 | 1021 |
|      | 1053 | 1060 | 1067 | 1284 | 1339 | 1400 | 1419 | 1491 | 1501 | 1697 | 1727 | 1730 | 1770 | 1777 | 1779 |
| CMPB | 1783 | 1786 | 1904 | 1907 | 1925 | 2272 | 2339 | 2416 | 2422 | 2424 | 2589 | 2632 | 2662 |      |      |
|      | 314  | 317  | 320  | 323  | 326  | 905  | 980  | 984  | 1394 | 1396 | 1409 | 1422 | 1425 | 1433 | 1435 |
|      | 1447 | 1487 | 1489 | 1528 | 1656 | 1660 | 2308 | 2310 | 2315 | 2365 | 2392 | 2544 |      |      |      |
| COM  | 982  | 986  | 1318 | 1564 |      |      |      |      |      |      |      |      |      |      |      |
| DEC  | 695  | 705  | 853  | 855  | 858  | 1119 | 1132 | 1332 | 1355 | 1369 | 1429 | 1486 | 1534 | 1573 | 1672 |
| EMT  | 1735 | 1740 | 1755 | 1761 | 1763 | 1774 | 1832 | 1953 | 2730 |      |      |      |      |      |      |
| HALT | 121  | 122  | 123  | 124  | 125  | 126  | 127  | 128  | 129  | 130  | 131  | 132  | 133  |      |      |
|      | 90   | 91   | 92   | 763  | 766  | 1064 | 1218 | 1271 | 1299 | 1560 | 1589 | 1617 | 1788 | 1892 | 2438 |

|       |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INC   | 2566<br>219<br>1690<br>2427<br>857                                                                                                                                           | 233<br>1753<br>2287<br>111<br>1070                                                                                                                                           | 271<br>1785<br>2552<br>2341<br>112                                                                                                                                            | 659<br>1790<br>2591<br>2436<br>115                                                                                                                                            | 730<br>1792<br>2634<br>2724<br>116                                                                                                                                            | 752<br>1794<br>2667<br>283                                                                                                                                                    | 860<br>1871<br>308                                                                                                                                                           | 870<br>1906<br>316                                                                                                                                                           | 1069<br>1952<br>319                                                                                                                                                          | 1101<br>2265<br>322                                                                                                                                                                  | 1106<br>2284<br>325                                                                                                                                                                   | 1245<br>2317<br>328                                                                                                                                                                   | 1283<br>2319<br>333                                                                                                                                                                   | 1399<br>2370<br>341                                                                                                                                                                   | 1685<br>2415<br>868                                                                                                                                                                   |
| INCB  |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| JMP   | 110<br>871<br>227                                                                                                                                                            | 111<br>1070<br>292                                                                                                                                                           | 112<br>1071<br>304                                                                                                                                                            | 115<br>1286<br>335                                                                                                                                                            | 116<br>1300<br>337                                                                                                                                                            | 283<br>1341<br>349                                                                                                                                                            | 308<br>1345<br>362                                                                                                                                                           | 316<br>1421<br>364                                                                                                                                                           | 319<br>1424<br>367                                                                                                                                                           | 322<br>1471<br>377                                                                                                                                                                   | 325<br>1511<br>379                                                                                                                                                                    | 328<br>1605<br>384                                                                                                                                                                    | 333<br>1622<br>386                                                                                                                                                                    | 341<br>1909<br>396                                                                                                                                                                    | 868<br>398                                                                                                                                                                            |
| JSR   | 403<br>470<br>544<br>615<br>695<br>783<br>922<br>1201<br>1279<br>1949<br>2509                                                                                                | 405<br>480<br>546<br>620<br>699<br>793<br>924<br>1205<br>1527<br>2275<br>2512                                                                                                | 415<br>482<br>556<br>632<br>704<br>796<br>995<br>1206<br>1533<br>2297<br>2526                                                                                                 | 417<br>487<br>558<br>632<br>712<br>806<br>1102<br>1230<br>1540<br>2343<br>2597                                                                                                | 422<br>489<br>563<br>634<br>721<br>808<br>1107<br>1233<br>1544<br>2345<br>2605                                                                                                | 424<br>499<br>565<br>639<br>723<br>813<br>1129<br>1235<br>1548<br>2347<br>2639                                                                                                | 435<br>501<br>575<br>641<br>726<br>816<br>1168<br>1238<br>1554<br>2354<br>2650                                                                                               | 437<br>506<br>577<br>650<br>734<br>826<br>1178<br>1241<br>1568<br>2381<br>2687                                                                                               | 442<br>508<br>582<br>655<br>734<br>829<br>1181<br>1245<br>1572<br>2457<br>2755                                                                                               | 444<br>518<br>584<br>657<br>743<br>849<br>1184<br>1248<br>1602<br>2461<br>2762                                                                                                       | 454<br>520<br>594<br>665<br>745<br>865<br>1188<br>1250<br>1689<br>2466<br>2766                                                                                                        | 456<br>525<br>596<br>668<br>748<br>869<br>1190<br>1254<br>1743<br>2470<br>2770                                                                                                        | 462<br>527<br>601<br>673<br>751<br>915<br>1193<br>1258<br>1856<br>2489<br>2774                                                                                                        | 464<br>537<br>603<br>682<br>756<br>918<br>1195<br>1259<br>1860<br>2492<br>2777                                                                                                        | 468<br>539<br>613<br>686<br>780<br>921<br>1198<br>1275<br>1862<br>2495<br>2780                                                                                                        |
| MOV   | 208<br>238<br>294<br>432<br>683<br>845<br>954<br>1091<br>1122<br>1328<br>1414<br>1479<br>1585<br>1621<br>1720<br>1760<br>1831<br>2286<br>2462<br>2603<br>898<br>2337<br>2510 | 209<br>243<br>295<br>451<br>688<br>846<br>965<br>1092<br>1123<br>1344<br>1415<br>1480<br>1586<br>1651<br>1721<br>1762<br>1834<br>2295<br>2471<br>2624<br>992<br>2342<br>2525 | 214<br>247<br>298<br>477<br>692<br>849<br>966<br>1094<br>1124<br>1354<br>1416<br>1494<br>1587<br>1652<br>1723<br>1768<br>1853<br>2338<br>2486<br>2625<br>1098<br>2344<br>2527 | 215<br>248<br>299<br>496<br>704<br>850<br>971<br>1096<br>1125<br>1363<br>1417<br>1495<br>1588<br>1658<br>1724<br>1772<br>1854<br>2373<br>2487<br>2627<br>1103<br>2346<br>2527 | 216<br>256<br>301<br>515<br>723<br>882<br>976<br>1097<br>1126<br>1367<br>1418<br>1504<br>1593<br>1664<br>1725<br>1773<br>1863<br>2406<br>2493<br>2637<br>1174<br>2351<br>2559 | 217<br>257<br>303<br>534<br>745<br>889<br>988<br>1108<br>1127<br>1374<br>1430<br>1521<br>1594<br>1667<br>1726<br>1776<br>1864<br>2407<br>2528<br>2643<br>1227<br>2379<br>2765 | 220<br>258<br>309<br>553<br>768<br>897<br>989<br>1109<br>1128<br>1375<br>1439<br>1521<br>1595<br>1668<br>1729<br>1782<br>1908<br>2408<br>2542<br>2644<br>1404<br>2460<br>707 | 224<br>268<br>336<br>572<br>770<br>900<br>991<br>1110<br>1130<br>1376<br>1440<br>1533<br>1596<br>1681<br>1732<br>1799<br>1911<br>2412<br>2556<br>2645<br>1527<br>2463<br>708 | 225<br>269<br>351<br>591<br>771<br>908<br>998<br>1111<br>1140<br>1377<br>1441<br>1541<br>1597<br>1682<br>1737<br>1802<br>1941<br>2419<br>2582<br>2648<br>1530<br>2465<br>709 | 228<br>273<br>352<br>610<br>777<br>915<br>998<br>1032<br>1112<br>1163<br>1378<br>1442<br>1572<br>1598<br>1683<br>1750<br>1805<br>1943<br>2430<br>2583<br>2664<br>1537<br>2467<br>935 | 229<br>274<br>353<br>629<br>790<br>918<br>998<br>1057<br>1113<br>1172<br>1379<br>1443<br>1580<br>1599<br>1684<br>1751<br>1808<br>1944<br>2431<br>2585<br>2664<br>1662<br>2468<br>1170 | 230<br>275<br>364<br>650<br>803<br>921<br>998<br>1058<br>1114<br>1173<br>1380<br>1444<br>1581<br>1600<br>1699<br>1752<br>1816<br>1944<br>2454<br>2594<br>2754<br>1671<br>2469<br>1170 | 231<br>277<br>374<br>652<br>810<br>923<br>998<br>1065<br>1115<br>1173<br>1392<br>1457<br>1582<br>1601<br>1699<br>1754<br>1817<br>1944<br>2455<br>2596<br>2760<br>1825<br>2490<br>1170 | 232<br>284<br>393<br>665<br>823<br>932<br>998<br>1081<br>1116<br>1173<br>1398<br>1460<br>1583<br>1612<br>1705<br>1758<br>1819<br>1944<br>2458<br>2600<br>2760<br>1830<br>2491<br>1170 | 237<br>293<br>412<br>682<br>844<br>933<br>998<br>1090<br>1117<br>1173<br>1304<br>1413<br>1584<br>1614<br>1719<br>1759<br>1820<br>1944<br>2459<br>2601<br>2760<br>1946<br>2508<br>1170 |
| MOVB  |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| NOP   | 113<br>2684                                                                                                                                                                  | 114<br>1823                                                                                                                                                                  | 338<br>1824                                                                                                                                                                   | 339                                                                                                                                                                           | 340                                                                                                                                                                           | 707                                                                                                                                                                           | 708                                                                                                                                                                          | 709                                                                                                                                                                          | 935                                                                                                                                                                          | 1054                                                                                                                                                                                 | 1170                                                                                                                                                                                  |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| RESET |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| ROL   | 1822                                                                                                                                                                         | 1823                                                                                                                                                                         | 1824                                                                                                                                                                          |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| ROR   | 1739                                                                                                                                                                         |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| RTI   | 256                                                                                                                                                                          | 1358                                                                                                                                                                         | 1371                                                                                                                                                                          | 1446                                                                                                                                                                          | 1507                                                                                                                                                                          | 1659                                                                                                                                                                          | 1692                                                                                                                                                                         | 1745                                                                                                                                                                         | 1811                                                                                                                                                                         | 1835                                                                                                                                                                                 | 1848                                                                                                                                                                                  | 1853                                                                                                                                                                                  | 1893                                                                                                                                                                                  | 1912                                                                                                                                                                                  | 2731                                                                                                                                                                                  |
| RTS   | 1316<br>2696                                                                                                                                                                 | 1319<br>2723                                                                                                                                                                 | 1575<br>2726                                                                                                                                                                  | 1706<br>2769                                                                                                                                                                  | 1937                                                                                                                                                                          | 1955                                                                                                                                                                          | 2374                                                                                                                                                                         | 2394                                                                                                                                                                         | 2432                                                                                                                                                                         | 2472                                                                                                                                                                                 | 2529                                                                                                                                                                                  | 2557                                                                                                                                                                                  | 2602                                                                                                                                                                                  | 2646                                                                                                                                                                                  | 2670                                                                                                                                                                                  |
| SBC   | 261                                                                                                                                                                          | 264                                                                                                                                                                          |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| SEC   | 259                                                                                                                                                                          | 262                                                                                                                                                                          |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| SUB   | 769                                                                                                                                                                          | 1305                                                                                                                                                                         | 1311                                                                                                                                                                          | 1613                                                                                                                                                                          | 1686                                                                                                                                                                          | 1855                                                                                                                                                                          |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| TRAP  | 120                                                                                                                                                                          |                                                                                                                                                                              |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                               |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                              |                                                                                                                                                                                      |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |                                                                                                                                                                                       |
| TST   | 244                                                                                                                                                                          | 260                                                                                                                                                                          | 278                                                                                                                                                                           | 281                                                                                                                                                                           | 306                                                                                                                                                                           | 367                                                                                                                                                                           | 386                                                                                                                                                                          | 405                                                                                                                                                                          | 424                                                                                                                                                                          | 444                                                                                                                                                                                  | 464                                                                                                                                                                                   | 470                                                                                                                                                                                   | 489                                                                                                                                                                                   | 508                                                                                                                                                                                   | 527                                                                                                                                                                                   |



## CROSS REFERENCE TABLE

SEQ 0085

|        |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|        | 546  | 565  | 584  | 603  | 622  | 641  | 699  | 712  | 783  | 796  | 816  | 829  | 837  | 839  | 866  |
|        | 911  | 967  | 1025 | 1034 | 1048 | 1062 | 1131 | 1216 | 1269 | 1297 | 1427 | 1431 | 1458 | 1484 | 1503 |
|        | 1505 | 1523 | 1550 | 1558 | 1562 | 1615 | 1695 | 1865 | 1890 | 1902 | 1923 | 2435 | 2587 | 2595 | 2629 |
| TSTB   | 2638 | 2687 | 2714 | 2719 |      |      |      |      |      |      |      |      |      |      |      |
|        | 263  | 657  | 668  | 686  | 734  | 756  | 808  | 1184 | 1201 | 1241 | 1254 | 1352 | 1390 | 1402 | 1548 |
| .ASCII | 1654 | 1665 | 1669 | 1674 | 1703 | 1843 | 1988 | 2367 |      |      |      |      |      |      |      |
|        | 1963 | 1969 | 1978 | 1980 | 1982 | 1984 | 1967 | 1990 | 1997 | 2001 | 2005 | 2010 | 2014 | 2022 | 2024 |
|        | 2025 | 2028 | 2031 | 2033 | 2035 | 2037 | 2042 | 2046 | 2051 | 2053 | 2062 | 2067 | 2071 | 2076 | 2078 |
|        | 2083 | 2086 | 2094 | 2100 | 2111 | 2114 | 2270 | 2325 | 2330 | 2335 | 2564 |      |      |      |      |
| .ASCIZ | 2122 | 2130 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .ASECT | 14   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .BLKW  | 185  | 2230 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .BYTE  | 1962 | 1968 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .ENABL | 30   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .END   | 2772 |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .ENDC  | 182  | 226  | 2300 | 2307 | 2357 | 2364 | 2384 | 2391 | 2498 | 2505 | 2515 | 2522 | 2734 |      |      |
| .EVEN  | 2134 | 2270 | 2325 | 2330 | 2335 | 2564 |      |      |      |      |      |      |      |      |      |
| .GLOBL | 14   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .IF    | 179  | 226  | 2299 | 2305 | 2356 | 2362 | 2383 | 2389 | 2497 | 2503 | 2514 | 2520 | 2734 |      |      |
| .IFF   | 2299 | 2305 | 2356 | 2362 | 2383 | 2389 | 2497 | 2503 | 2514 | 2520 |      |      |      |      |      |
| .LIST  | 14   | 30   | 92   | 362  | 364  | 367  | 377  | 379  | 384  | 386  | 396  | 398  | 403  | 405  | 415  |
|        | 417  | 422  | 424  | 435  | 437  | 442  | 444  | 454  | 456  | 462  | 464  | 468  | 470  | 480  | 482  |
|        | 487  | 489  | 499  | 501  | 506  | 508  | 518  | 520  | 525  | 527  | 537  | 539  | 544  | 546  | 556  |
|        | 558  | 563  | 565  | 575  | 577  | 582  | 584  | 594  | 596  | 601  | 603  | 613  | 615  | 620  | 622  |
|        | 632  | 634  | 639  | 641  | 650  | 655  | 657  | 665  | 668  | 673  | 682  | 686  | 695  | 699  | 704  |
|        | 712  | 721  | 723  | 726  | 729  | 734  | 743  | 745  | 748  | 751  | 756  | 780  | 783  | 793  | 796  |
|        | 806  | 808  | 813  | 816  | 826  | 829  | 849  | 915  | 918  | 921  | 1178 | 1181 | 1184 | 1188 | 1190 |
|        | 1193 | 1195 | 1198 | 1201 | 1205 | 1230 | 1233 | 1235 | 1238 | 1241 | 1245 | 1248 | 1250 | 1254 | 1258 |
|        | 1527 | 1533 | 1540 | 1544 | 1548 | 1554 | 1568 | 1572 | 1860 | 1862 | 1949 | 2270 | 2325 | 2330 | 2335 |
| .MACRO | 2564 | 2687 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .NLIST | 17   | 18   | 19   | 20   | 22   | 24   | 25   | 26   | 27   | 28   | 29   | 30   | 187  | 202  |      |
|        | 14   | 30   | 92   | 362  | 364  | 367  | 377  | 379  | 384  | 386  | 396  | 398  | 403  | 405  | 415  |
|        | 417  | 422  | 424  | 435  | 437  | 442  | 444  | 454  | 456  | 462  | 464  | 468  | 470  | 480  | 482  |
|        | 487  | 489  | 499  | 501  | 506  | 508  | 518  | 520  | 525  | 527  | 537  | 539  | 544  | 546  | 556  |
|        | 558  | 563  | 565  | 575  | 577  | 582  | 584  | 594  | 596  | 601  | 603  | 613  | 615  | 620  | 622  |
|        | 632  | 634  | 639  | 641  | 650  | 655  | 657  | 665  | 668  | 673  | 682  | 686  | 695  | 699  | 704  |
|        | 712  | 721  | 723  | 726  | 729  | 734  | 743  | 745  | 748  | 751  | 756  | 780  | 783  | 793  | 796  |
|        | 806  | 808  | 813  | 816  | 826  | 829  | 849  | 915  | 918  | 921  | 1178 | 1181 | 1184 | 1188 | 1190 |
|        | 1193 | 1195 | 1198 | 1201 | 1205 | 1230 | 1233 | 1235 | 1238 | 1241 | 1245 | 1248 | 1250 | 1254 | 1258 |
|        | 1527 | 1533 | 1540 | 1544 | 1548 | 1554 | 1568 | 1572 | 1860 | 1862 | 1949 | 2270 | 2325 | 2330 | 2335 |
| .PSECT | 2564 | 2687 |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .REM   | 14   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .REPT  | 1    | 14   | 30   |      |      |      |      |      |      |      |      |      |      |      |      |
| .TITLE | 92   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
| .WORD  | 30   |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|        | 162  | 165  | 167  | 169  | 171  | 173  | 175  | 177  | 179  | 180  | 182  | 184  | 199  | 362  | 364  |
|        | 367  | 377  | 379  | 384  | 386  | 396  | 398  | 403  | 405  | 415  | 417  | 422  | 424  | 435  | 437  |
|        | 442  | 444  | 454  | 456  | 462  | 464  | 468  | 470  | 480  | 482  | 487  | 489  | 499  | 501  | 506  |
|        | 508  | 518  | 520  | 525  | 527  | 537  | 539  | 544  | 546  | 556  | 558  | 563  | 565  | 575  | 577  |
|        | 582  | 584  | 594  | 596  | 601  | 603  | 613  | 615  | 620  | 622  | 632  | 634  | 639  | 641  | 650  |
|        | 655  | 657  | 665  | 668  | 673  | 682  | 686  | 695  | 699  | 704  | 712  | 721  | 723  | 726  | 729  |
|        | 734  | 743  | 745  | 748  | 751  | 756  | 780  | 783  | 793  | 796  | 806  | 808  | 813  | 816  | 826  |
|        | 829  | 849  | 915  | 918  | 921  | 1178 | 1181 | 1184 | 1188 | 1190 | 1193 | 1195 | 1198 | 1201 | 1205 |
|        | 1230 | 1233 | 1235 | 1238 | 1241 | 1245 | 1248 | 1250 | 1254 | 1258 | 1527 | 1533 | 1540 | 1544 | 1548 |



LPS-11 DIAGNOSTIC TEST I MAINDEC-11-DRLPH-A  
DRLPH.P11 CROSS REFERENCE TABLE

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SEQ 0086

|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1554 | 1568 | 1572 | 1860 | 1862 | 1949 | 2276 | 2376 | 2396 | 2531 | 2598 | 2599 | 2606 | 2641 | 2651 |
| 2672 | 2673 | 2687 | 2697 | 2698 | 2728 | 2732 | 2756 | 2757 | 2763 | 2764 | 2770 |      |      |      |

000000

ERRORS DETECTED: 0

LPS-11 DIAGNOSTIC TEST I MAINDEC-11-DRLPH-A  
DRLPH.P11

J07  
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SEQ 0087

\*DRLPH,DRLPH/SOL/CRF=DRLPA.MAC,DRLPH  
RUN-TIME: 7 10 1 SECONDS  
CORE USED: 21K