

LPA/AA11-K

DIAGNOSTIC TEST
MD-11-DRLPB-A

EP-DRLPB-A-DL
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MADE IN USA

This section contains a grid of 10 columns and 10 rows of small, illegible diagnostic test data tables. Each table appears to be a structured list of test results or parameters, but the text is too faint to read.

Small, illegible text located in the bottom right corner of the page.

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DRLPB-A-D
PRODUCT NAME: LPA/AA11-K DIAGNOSTIC TEST
DATE: JANUARY 1978
MAINTAINER: DIAGNOSTIC GROUP

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1. ABSTRACT

THIS DIAGNOSTIC EXERCISES THE "A11-K" ANALOG CIRCUITRY. THE PROGRAM WHEN STARTED WILL TYPE OUT THE PROGRAM TITLE. A MESSAGE IS THEN PRINTED GIVING THE TWO LETTER DESIGNATOR 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 TWO LETTER'S TO BE TYPED. ALTHOUGH THESE TESTS MAY BE RUN IN ANY ORDER IT IS IMPERATIVE THAT TEST "AL" IS RUN FIRST AND VERIFY THAT THE A11-K IS FULLY OPERATIONAL. THE PROGRAM IS SET UP TO GIVE THE OPERATOR AS MUCH CONTROL OVER THE PROGRAM AS POSSIBLE VIA THE TELETYPE. TYPING A '↑C' (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 '↑G' WHILE RUNNING WILL ENABLE THE SOFTWARE SWITCH REGISTER VALUE TO BE CHANGED.

THIS PROGRAM IS A MODIFIED VERSION OF "MD-11-DZAAC-B". IT WAS MODIFIED TO ENABLE THE OPERATOR TO CHECK OUT THE A11-K OPTION WHEN IT IS ON THE LPA11KX I/O BUS. NO RECAPLING 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 "MD-11-DZAAC-B". YOU SHOULD RUN "MD-11-DRLPA" BEFORE RUNNING THIS DIAGNOSTIC. PLEASE READ SECTION 10.

2. REQUIREMENTS (EQUIPMENT)

-
- A. PDP-11 COMPUTER WITH 16K OF MEMORY AND A CONSOLE I/O TERMINAL
 - B. A11-K QUAD OPTION MODULE INSTALLED
 - C. <OPTIONAL> VR14 OR STORAGE SCOPE

3. LOADING PROCEDURE

USE STANDARD PROCEDURE FOR LOADING BINARY TAPES.

4. STARTING PROCEDURE

THE PROGRAM STARTING ADDRESS IS '200'.
THE RESTART ADDRESS IS '204'.

5. CONSOLE SWITCH SETTINGS

-
- THIS PROGRAM HAS BEEN MODIFIED TO RUN WITH OR WITHOUT A HARDWARE SWITCH REGISTER.
- 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. ALL SWITCHES SET TO A 1 WILL SELECT SOFTWARE SWITCH CONTROL.

6. ERRORS

ALL ERRORS ARE ACCOMPANIED WITH AN ENGLISH DESCRIPTIVE COMMENT AS TO THE TYPE OF FAILURE. FURTHER QUALIFICATION OF THE ERROR CAN BE OBTAINED FROM THE COMMENT AT THE ERROR PC OR THE TEST ITSELF.

7.0 TEST PROCEDURE

7.1 AUTO LOGIC TEST

A. THIS TEST IS DESIGNED TO VERIFY THE DATA PATH THAT IS ADDRESSABLE FROM THE CPU. THIS ALSO INCLUDES ALL CONTROL, INTERRUPT AND INITILIZE SIGNALS. THE LOGIC TEST ALSO INCLUDES PROVISIONS FOR TESTING MULTIPLE A11-K'S.

B. STARTING SEQUENCE

1. TYPE 'AL' TO RUN THE AUTO LOGIC TEST.
2. THE PROGRAM WILL THEN EXECUTE A LOGIC TEST ON ALL AVAILABLE UNITS

C. CONTROL SWITCHES

1. TYPING ↑C WILL ENABLE THE PROGRAM TO EXIT AND RETURN TO THE KEYBOARD MONITOR.
2. TYPING ↑G WHEN SOFTWARE SWITCH REGISTER IS ENABLED WILL REPORT LAST VALUE AND WAIT FOR NEW VALUE.

SWITCH -----	OCTAL -----	FUNCTION -----
SW15=1	100000	HALT ON ERROR
SW14=1	040000	LOOP ON CURRENT TEST
SW13=1	020000	INHIBIT ERROR TYPEOUT
SW12=1	010000	STORAGE SCOPE CONNECTED
SW11=1	004000	INHIBIT TEST INTERACTIONS
SW10=1	002000	EXTERNAL DELAY SIGNAL CONNECTED
SW09=1	001000	TWO'S COMPLIMENT MODE
SW08=1	0004XX	LOOP ON TEST IN SWR 7:0

D. ERRORS

REF. TO 6.

E. RESTRICTIONS

IF A STORAGE SCOPE IS CONNECTED, POWER MUST BE APPLIED TO IT.

F. EXECUTION TIME

IT TAKES APPROXIMATELY 25 SECONDS WITHOUT TEST INTERACTIONS.

7.2 AUTO DISPLAY TEST

A. THIS TEST IS DESIGNED TO AID IN THE ADJUSTING AND ALIGNMENT OF THE VR14 OR STORAGE SCOPE ON THE A11-K DISPLAY CONTROL.

B. TYPE 'AD' TO RUN THE AUTO VISUAL DISPLAY TEST. THE PROGRAM WILL THEN EXECUTE THE VISUAL DISPLAY TEST.

C. CONTROL SWITCHES

E01

1. TYPING ↑C AT ANY TIME WILL ENABLE THE PROGRAM TO EXIT AND RETURN TO THE MONITOR.
2. TYPING ↑G WHEN SOFTWARE SWITCH REGISTER IS ENABLED WILL ENABLE THE PROGRAM TO CHANGE THE SOFTWARE SWITCH REGISTER VALUE.

CONSOLE SWITCHES	FUNCTION
CONSOLE SW10=1	SELECTS EXTERNAL DELAY MODE
CONSOLE SW09=1	SELECTS TWO'S COMPLEMENT MODE
CONSOLE SW08=0	CYCLE THRU ALL FOUR DISPLAY PATTERNS
CONSOLE SW08=1	SELECT PATTERNS IN SW 00-02
CONSOLE SW03=0	SELECT DAC 0 AND DAC 1
CONSOLE SW03=1	SELECT DAC 2 AND DAC 3
CONSOLE SW00-02=0	DISPLAY A HORIZONTAL LINE
CONSOLE SW00-02=1	DISPLAY A VERTICAL LINE
CONSOLE SW00-02=2	DISPLAY A SQUARE
CONSOLE SW00-02=3	DISPLAY AN "X"

D. ERRORS

THE ONLY ERRORS IN THIS TEST ARE DETECTED VISUALLY.

E. RESTRICTIONS

IF VR14 CHANNEL SWITCH MUST BE SET TO "1 & 2" POSITION.
IF STORAGE SCOPE POWER MUST BE APPLIED.
THE "AUTO-CALIBRATION (AC)" MUST HAVE BEEN RUN PRIOR TO
RUNNING THIS SECTION WHEN ON THE "AUTO HARDWARE TESTER".

F. EXECUTION TIME

IT TAKES APPROXIMATELY 3 MINUTES TO COMPLETE THIS TEST
BEFORE IT REPEATS.

S

7.4 MANUAL LOGIC LOOP

A. THIS LOOP IS PROVIDED TO ENABLE THE OPERATOR A SIMPLE PROGRAM LOOP TO AID IN REPAIR OF THE AA11-K. SWITCH REGISTER BITS 15:13 SELECT THE REGISTER TO BE LOADED AND BITS 12:00 CONTAINS THE DATA TO BE LOADED.

B. STARTING SEQUENCE

1. TYPE 'ML' TO RUN THE MANUAL LOGIC LOOP.
2. THE PROGRAM WILL NOW LOOP AND LOAD THE VALUE OF THE SWITCH REGISTER BITS 12:00 INTO THE SELECTED AA11-K REGISTER.

C. CONTROL SWITCHES

<u>SW15:13</u>	<u>REGISTER SELECTED</u>
000	DAC #0
001	DAC #1
010	DAC #2
011	DAC #3
IXX	STATUS REGISTER

D. ERRORS

NO PROVISIONS ARE MADE FOR LOGIC ERRORS.

E. RESTRICTIONS

NONE

F. EXECUTION TIME

THIS IS A NON-ENDING PROGRAM LOOP THAT CAN BE EXITED BY TYPING ↑C.

7.5 MANUAL DISPLAY LOOP

A. THIS LOOP IS PROVIDED FOR THE OPERATOR TO VERIFY OPERATION OF THE D/A CONVERTER AND MULTIPLEXER.

B. STARTING SEQUENCE

1. TYPE 'MD' TO RUN MANUAL DISPLAY LOOP
2. THE PROGRAM WILL NOW LOAD A "RAMP PATTERN" INTO EACH D/A CONVERTER.

C. CONTROL SWITCHES

1. TYPING ↑C WILL RETURN CONTROL TO THE KEYBOARD MONITOR.
2. SW10=1 WILL SELECT EXTERNAL DELAY MODE.

D. ERRORS

NO PROVISIONS ARE MADE FOR LOGIC ERRORS.

E. RESTRICTIONS

NONE

7.6 MANUAL CALIBRATION LOOP

A. THIS LOOP IS PROVIDED TO ENABLE THE OPERATOR TO ADJUST THE D/A CONVERTER.

B. STARTING SEQUENCE

1. TYPE 'MC' TO RUN THE MANUAL CALIBRATION LOOP.
2. THE PROGRAM WILL NOW LOAD THE CONTENTS OF THE SWITCH REGISTER INTO EACH D/A REGISTER AND AFTER A DELAY CLEAR THE D/A REGISTER.

C. CONTROL SWITCHES

1. TYPING ↑C WILL EXIT THE LOOP AND RETURN TO THE KEYBOARD MONITOR.
2. TYPING ↑G WHEN SOFTWARE SWITCH REGISTER IS ENABLED TO CHANGE THE SWITCH REGISTER VALUE
3. SWITCH REGISTER BITS 11:0 ARE LOADED IN TO ALL DAC'S.

D. ERRORS

NO PROVISIONS ARE MADE FOR LOGIC ERRORS.

E. RESTRICTIONS

NONE

8. AUTO DISPLAY TEST PATTERN DESCRIPTIONS

DISPLAY HORIZONTAL LINE

A HORIZONTAL LINE IS DISPLAYED ON THE SCOPE BY INITIALLY SETTING THE X AND Y DAC'S TO ZERO AND THEN INCREMENTING THE X VALUE WHILE HOLDING THE Y VALUE AT 4000. THE POINTS ARE DISPLAYED USING THE DISPLAY INTERRUPT ENABLED.

DISPLAY VERTICAL LINE

A VERTICAL LINE IS DISPLAYED ON THE SCOPE IN THE SAME MANNER AS FOR A HORIZONTAL LINE EXCEPT NOW THE Y VALUE IS INCREMENTED WHILE HOLDING THE X VALUE AT 1000.

DISPLAY SQUARE

A SQUARE IS DISPLAYED BY INITIALLY SETTING THE X AND Y VALUES TO NEGATIVE FULL SCALE, THEN X IS INCREMENTED TO POSITIVE FULL SCALE (BOTTOM LINE) THEN Y IS INCREMENTED TO POSITIVE FULL SCALE (RIGHT LINE) THEN X IS DECREMENTED TO NEGATIVE FULL SCALE (TOP LINE) AND FINALLY Y IS DECREMENTED TO NEGATIVE FULL SCALE (LEFT LINE). MODE 01 (INTENSIFY ON LOADING X) AND MODE 10 (INTENSIFY ON LOADING Y) ARE USED.

DISPLAY X

AN X IS DISPLAYED BY INITIALLY SETTING THE X AND Y VALUES TO NEGATIVE FULL SCALE AND THEN INCREMENTING BOTH TO POSITIVE FULL SCALE (LOWER LEFT TO UPPER RIGHT DIAGONAL) THEN X IS RESET TO NEGATIVE FULL SCALE, Y REMAINS AT POSITIVE FULL SCALE AND THEN X IS INCREMENTED WHILE Y IS DECREMENTED UNTIL BOTH REACH FULL SCALE AGAIN (UPPER LEFT TO LOWER RIGHT DIAGONAL). MODE 01 (INTENSIFY ON LOADING X) IS USED.

9. MISCELLANEOUS

9.1 AA11-K BUS & VECTOR ADDRESS MODIFICATION

MODIFY LOCATION '\$BASE' IF BASE ADDRESS IS NOT 170416.
MODIFY LOCATION '\$VECT1' IF THE VECTOR AND PRIORITY IS NOT 100360.

*NOTE IF EITHER VALUE IS CHANGED, THE PROGRAM MUST BE RESTARTED AT 200.

9.2 XXDP/APT NOTES

THIS DIAGNOSTIC IS CHAINABLE UNDER XXDP.
THIS DIAGNOSTIC HAS THE "APT" HOOKS BUT HAS NOT BEEN TESTED.

9.3 POWER FAIL

A POWER FAIL WILL CAUSE A RESTART MESSAGE ON POWER UP AT WHICH TIME THE PROGRAM IS RESTARTED.

9.4 MULTIPLE AA11-K INTERFACE TESTING

THE PROGRAM WILL "AUTO-SIZE" THE NUMBER OF AA11-K'S. THE PROGRAM WILL REPORT THE NUMBER TO THE OPERATOR WHEN THE "AL" TEST IS SELECTED THE FIRST TIME.
IF THE OPERATOR WISHES TO INHIBIT "AUTO-SIZE" BIT 15 OF LOCATION "\$ENV" MUST BE SET.

9.5 RESTRICTION

POWER MUST BE APPLIED TO A STORAGE SCOPE IF CONNECTED.

9.6 EXECUTION TIME

1. EXECUTION TIME OF THE AUTO LOGIC TEST IS:
25 SECONDS WITHOUT INTERACTIONS.
50 SECONDS WITH INTERACTIONS.
2. EXECUTION TIME OF THE AUTO DISPLAY TEST IS:
180 SECONDS
3. EXECUTION TIME OF THE MANUAL LOGIC LOOP IS:
OPERATOR DEPENDANT
4. EXECUTION TIME OF THE MANUAL DISPLAY LOOP IS:
OPERATOR DEPENDANT
5. EXECUTION TIME OF THE MANUAL CALIBRATION LOOP IS:
OPERATOR DEPENDANT

9.7 USER LINK TO I/O DEVICE

A SPECIAL USER LINK HAS BEEN PROVIDED IN ORDER FOR THE OPERATOR TO EXAMINE OR MODIFY LOCATIONS ON THE LPA11-KX I/O BUS. (NOTE: THIS CANNOT BE DONE DIRECTLY.)

PROCEDURE:

- 1) START THE PROCESSOR AT LOCATION \$UTK:
- 2) THE DIALOG TO EXAMINE A LOCATION IS AS FOLLOWS:

E OR D "E"

DEVICE ADDRS= "OCTAL ADDRS"
XXXXXX

WHERE XXXXXX IS THE CONTENTS OF THE SPECIFIED LOC.

3) THE DIALOG TO MODIFY A LOCATION IS AS FOLLOWS:

E OR D "D"
DATA= "DATA TO BE DEPOSITED"

4) THE PROGRAM WILL STAY IN THIS LOOP UNTIL THE OPERATOR IS FINISHED. AT THIS TIME THE PROCESSOR SHOULD BE HALTED.

NOTE: THE OPERATORS RESPONSE IS ENCLOSE IN QUOTES.

10. LPA11 (SYSTEM) DIAGNOSTIC SUMMARY

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 DISTINGJISH 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" CA AGORY.

THE LPA11-KX DIAGNOSTIC KIT WILL INCLUDE:

<u>OPTION</u>	<u>GROUP</u>	<u>DIAG. #</u>	<u>DIAG. TITLE</u>
LPA11-KX	LEVEL 2	MD-11-DRLPA	LPA11-K SYSTEM DIAG.
M8254	"B"	MD-11-DRLPN	M8254 (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.
M8200-YC	B	MD-11-DZLPL	LPA/M8200-YC BASIC MICRO-CPU R/W TEST
	B	MD-11-DZLPM	LPA/M8200-YC JMP+ROM READ TEST

53 BASIC DEFINITIONS
168 OPERATIONAL SWITCH SETTINGS
180 TRAP CATCHER
189 STARTING ADDRESS(ES)
193 ACT11 HOOKS
204 APT PARAMETER BLOCK
226 COMMON TAGS
272 APT MAILBOX-ETABLE
321 ERROR POINTER TABLE
473 INITIALIZE THE COMMON TAGS
531 SUBROUTINE TO LOAD A TRAP CATCHER
540 LOAD DEVICE ADDRESSES LOCATIONS

TEST #	DESCRIPTION
561	-----
562	-----
563	-----
565	INITIAL HEADER TYPEOUT AND WAIT FOR OPERATOR
611	DETERMINE THE NUMBER OF AA11-K ON THIS SYSTEM
649	T1 TEST THAT THE AA11-K RESPONDS TO THE CPU
676	T2 TEST THAT THE DAC0 REGISTER CAN BE CLEARED
690	T3 TEST THAT THE DAC0 REGISTER CAN BE LOADED WITH #7777
704	T4 TEST THAT THE DAC0 REGISTER CAN HOLD A FLOATING 1 PATTERN
721	T5 TEST THAT THE DAC #1 REGISTER CAN BE CLEARED
735	T6 TEST THAT THE Y REGISTER CAN BE LOADED WITH #7777
749	T7 TEST THAT THE Y REGISTER CAN HOLD A FLOATING 1 PATTERN
767	T10 TEST THAT THE DAC #2 REGISTER CAN BE CLEARED
781	T11 TEST THAT THE DAC #2 REGISTER CAN BE LOADED WITH #7777
795	T12 TEST THAT THE DAC #2 REGISTER CAN HOLD A FLOATING 1 PATTERN
814	T13 TEST THAT THE DAC #3 REGISTER CAN BE CLEARED
828	T14 TEST THAT THE DAC #3 REGISTER CAN BE LOADED WITH #7777
842	T15 TEST THAT THE DAC #3 REGISTER CAN HOLD A FLOATING 1 PATTERN
859	T16 TEST THAT THE FOUR DAC REGISTERS CAN HOLD DIFFERENT DATA
906	T17 TEST THAT RESET SETS READY BIT
920	T20 TEST THAT FAST INTENSIFY CAN BE SET AND CLEARED
944	T21 TEST THAT MODE BIT 2 CAN BE SET AND CLEARED
969	T22 TEST THAT MODE BIT 3 CAN BE SET
994	T23 TEST THAT EXT. DELAY (BIT 4) CAN BE SET AND CLEARED
1017	T24 TEST THAT INTERRUPT ENABLE (BIT 6) CAN BE SET
1032	T25 TEST THAT CHANNEL (BIT 9) CAN BE SET
1047	T26 TEST THAT STORE (BIT 10) CAN BE SET
1062	T27 TEST THAT WRITE THRU (BIT 11) CAN BE SET
1077	T30 TEST THAT INTENSIFY BIT SETS THAT THE READY BIT
1095	T31 TEST THAT MODE 1 (INTENSIFY ON DAC0) SETS THE READY FLAG
1127	T32 TEST THAT MODE 2 (INTENSIFY ON DAC1) SETS THE READY FLAG
1156	T33 TEST WHEN ERASE IS SET, READY BIT CLEARS AND SET AFTER DELAY (SW12=1)
1184	T34 TEST THAT RESET CLEARS MODE, EXT. DELAY AND FAST INTENSIFY BITS
1200	T35 TEST THAT RESET CLEARS INTERRUPT ENABLE, CHANNEL, STORE, WRITE THRU
1216	T36 TEST THAT RESET CLEARS DAC0 REGISTER (SW09=0)
1234	T37 TEST THAT RESET CLEARS DAC1 REGISTER (SW09=0)
1252	T40 TEST THAT RESET CLEARS DAC #2 REGISTER (SW09=0)
1270	T41 TEST THAT RESET CLEARS DAC #3 REGISTER (SW09=0)
1288	T42 TEST THAT RESET SET DAC0 TO 4000 (SW09=1)
1306	T43 TEST THAT RESET SET DAC1 TO 4000 (SW09=1)
1324	T44 TEST THAT RESET SET DAC2 TO 4000 (SW09=1)

1342	T45	TEST THAT RESET SET DAC3 TO 4000	(SW09=1)
1360	T46	TEST THAT EXTERNAL DELAY DOES NOT SET DISPLAY READY	SW10=0
1393	T47	TEST THE EXTERNAL DELAY DOES SET DISPLAY READY	SW10=1
1422	T50	DETERMINE IF MORE AA11-K'S REMAIN TO BE TESTED	
1442	END OF PASS ROUTINE		
1480			
1481			
1482			
1483			
1484			
1485			
1486			
1487			
1488	VISUAL TEST PATTERNS		
1489	-----		
1498	DISPLAY HORIZONTAL LINE		
1516	DISPLAY A VERTICAL LINE		
1567	PINCUSHION TEST (DISPLA/ SQUARE)		
1671	PLOT AN X		
1765	MANUAL DISPLAY ROUTINE		
1800	AUTO CALIBRATION		
1818	T51	TEST THAT CH 3 IS AT +2.5 BIPOLAR	
1832	T52	TEST THAT CH 4 IS AT -2.5 BIPOLAR	
1853	T53	TEST THAT ERASE L (CH 53) IS GREATER THAN +3 VOLTS WHEN HIGH	
1869	T54	TEST THAT ERASE L (CH 53) IS LESS THAN +400 MVOLTS WHEN LOW	
1887	T55	TEST THAT WRITE-THRU (CH 53) IS LESS THAN +400 MVOLTS WHEN LOW	
1902	T56	TEST THAT NON-STORE (CH 55) IS LESS THAN +400 MVOLTS WHEN LOW	
1917	T57	TEST THAT NON-STORE L (CH 55) IS GREATER THAN +3 VOLTS WHEN HIGH	
1932	T60	TEST THAT DELAY RETURN SETS READY	
1962	T61	TEST THAT CHANNEL 02 L (CH 56) IS GREATER THAN +3 VOLTS WHEN HIGH	
1979	T62	TEST THAT CHANNEL 02 L (CH 56) IS LESS THAN +400 MVOLTS WHEN LOW	
1999	T63	TEST THAT "ERASE" AND DONE CAN BE CLEARED AND SET	
2048	T64	ADJUSTMENT ROUTINES FOR DAC 0 - 1	
2106	T65	ADJUSTMENT ROUTINES FOR DAC 2 - 3	
2183	MANUAL LOGIC TEST		
2256	MANUAL DAC CALIBRATION		
2274	DYNAMIC DAC CALIBRATION		
2300			
2301	MISC. SUB-ROUTINES, ASCII MESSAGES AND SOFTWARE HANDLERS		
2302			
2304	SUBROUTINE TO ERASE STORAGE SCOPE SCREEN		
2339	SUBROUTINE TO DRAW A HORIZONTAL LINE		
2428	TIMER ROUTINE FOR VISUAL TEST PATTERNS		
2552	ASCII MESSAGES		
2920	CONVERT BINARY TO DECIMAL AND TYPE ROUTINE		
2987	SCOPE HANDLER ROUTINE		
3042	ERROR HANDLER ROUTINE		
3082	ERROR MESSAGE TYPEOUT ROUTINE		
3129	POWER DOWN AND UP ROUTINES		
3180	BINARY TO OCTAL (ASCII) AND TYPE		
3257	TYPE ROUTINE		
3336	TTY INPUT ROUTINE		
3475	READ AN OCTAL NUMBER FROM THE TTY		
3513	APT COMMUNICATIONS ROUTINE		

MAINDEC-11-DRLPB-A RA11-K DIAGNOSTIC
DRLPB P11 TABLE OF CONTENTS

3571
3594

TRAP DECODER
TRAP TABLE

NO1

MACY11 27(654) 14-DEC-77 20:20

SEQ 0013

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.REM !

THIS IS A LIST OF TESTS DELETED FROM THIS DIAGNOSTIC. THESE TESTS COULD NOT BE DONE THROUGH THE LPA-11

TEST THAT THE LOW BYTE OF STATUS REG CAN BE CLEARED
TEST THAT THE HIGH BYTE OF STATUS REG CAN BE CLEARED
TEST THAT DISPLAY DOES INTR. AT LEVEL INDICATED
TEST THAT DISPLAY DOES NOT INTR. AT LEVEL INDICATED
TEST THE SCOPE SETTLING TIME

!
:TITLE MAINDEC-11-DRLPB-A AA11-K DIAGNOSTIC
: *COPYRIGHT (C) 1978
: *DIGITAL EQUIPMENT CORP.
: *MAYNARD, MASS. 01754
: *
: *PROGRAM BY EDWARD C. BADGER
: *
: *THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
: *PACKAGE (MAINDEC-11-DZQAC-C2), SEPT 14, 1976.
: *
:SBTTL BASIC DEFINITIONS

001100

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

000011
000012
000015
000200
177776

177774
177772
177570
177570

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

000000
000001
000002
000003
000004
000005
000006
000007
000006
000007

: *GENERAL PURPOSE REGISTER DEFINITIONS
R0= %0 ;:GENERAL REGISTER
R1= %1 ;:GENERAL REGISTER
R2= %2 ;:GENERAL REGISTER
R3= %3 ;:GENERAL REGISTER
R4= %4 ;:GENERAL REGISTER
R5= %5 ;:GENERAL REGISTER
R6= %6 ;:GENERAL REGISTER
R7= %7 ;:GENERAL REGISTER
SP= %6 ;:STACK POINTER
PC= %7 ;:PROGRAM COUNTER

: *PRIORITY LEVEL DEFINITIONS

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000000
000040
000100
000140
000200
000240
000300
000340

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

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

PRO= 0
PR1= 40
PR2= 100
PR3= 140
PR4= 200
PR5= 240
PR6= 300
PR7= 340

:: PRIORITY LEVEL 0
:: PRIORITY LEVEL 1
:: PRIORITY LEVEL 2
:: PRIORITY LEVEL 3
:: PRIORITY LEVEL 4
:: PRIORITY LEVEL 5
:: PRIORITY LEVEL 6
:: PRIORITY LEVEL 7

:"SWITCH REGISTER" SWITCH DEFINITIONS

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

.EQUIV SW09, SW9
.EQUIV SW08, SW8
.EQUIV SW07, SW7
.EQUIV SW06, SW6
.EQUIV SW05, SW5
.EQUIV SW04, SW4
.EQUIV SW03, SW3
.EQUIV SW02, SW2
.EQUIV SW01, SW1
.EQUIV SW00, SW0

:"DATA BIT DEFINITIONS (BIT00 TO BIT15)

BIT15= 100000
BIT14= 40000
BIT13= 20000
BIT12= 10000
BIT11= 4000
BIT10= 2000
BIT09= 1000
BIT08= 400
BIT07= 200
BIT06= 100
BIT05= 40
BIT04= 20
BIT03= 10
BIT02= 4
BIT01= 2
BIT00= 1

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138 .EQUIV BIT09,BIT9
139 .EQUIV BIT08,BIT8
140 .EQUIV BIT07,BIT7
141 .EQUIV BIT06,BIT6
142 .EQUIV BIT05,BIT5
143 .EQUIV BIT04,BIT4
144 .EQUIV BIT03,BIT3
145 .EQUIV BIT02,BIT2
146 .EQUIV BIT01,BIT1
147 .EQUIV BIT00,BIT0
148
149
150 .;BASIC "CPU" TRAP VECTOR ADDRESSES
151 ERRVEC= 4 ;: TIME OUT AND OTHER ERRORS
152 RESVEC= 10 ;: RESERVED AND ILLEGAL INSTRUCTIONS
153 TBITVEC=14 ;: "T" BIT
154 TRTVEC= 14 ;: TRACE TRAP
155 BPTVEC= 14 ;: BREAKPOINT TRAP (BPT)
156 IOTVEC= 20 ;: INPUT/OUTPUT TRAP (IOT) **SCOPE**
157 PWRVEC= 24 ;: POWER FAIL
158 EMTVEC= 30 ;: EMULATOR TRAP (EMT) **ERROR**
159 TRAPVEC=34 ;: "TRAP" TRAP
160 TKVEC= 60 ;: TTY KEYBOARD VECTOR
161 TPVEC= 64 ;: TTY PRINTER VECTOR
162 PIRQVEC=240 ;: PROGRAM INTERRUPT REQUEST VECTOR
163
164 ABASE=170416
165 AVECT1=100360
166 APRIOR=200
167
168 .SBTTL OPERATIONAL SWITCH SETTINGS
169
170 .;
171 .; SWITCH USE
172 .; -----
173 .; 15 HALT ON ERROR
174 .; 14 LOOP ON TEST
175 .; 13 INHIBIT ERROR TYPEOUTS
176 .; 12 STORAGE SCOPE CONNECTED
177 .; 11 INHIBIT ITERATIONS
178 .; 10 EXTERNAL DELAY SIGNAL CONNECTED
179 .; 8 LOOP ON TEST IN SWR<7:0>
180 .; 9 TWO'S COMPLEMENT MODE
181 .SBTTL TRAP CATCHER
182
183 .;=0
184 .;ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
185 .;SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
186 .;LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
187
188 .;=174
189 DISPREG: .WORD 0 ;: SOFTWARE DISPLAY REGISTER
190 SWREG: .WORD 0 ;: SOFTWARE SWITCH REGISTER
191 .SBTTL STARTING ADDRESS(ES)
192 JMP @#BEGIN ;: JUMP TO STARTING ADDRESS OF PROGRAM
193 JMP BEGIN1 ;: JUMP TO RESTART ADDRESS
194 JMP DYNCAL ;: JUMP TO DYNAMIC DAC CALIBRATION

```

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192      .SBTTL  ACT11 HOOKS
193
194      ;*****
195      ;HOOKS REQUIRED BY ACT11
196      $SVPC=.          ;SAVE PC
197      .=46
198      $ENDAD          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
199      .=52
200      .WORD  0        ;;2)SET LOC.52 TO zERO
201      .=$$VPC        ;; RESTORE PC
202      .=1000
203      .SBTTL  APT PARAMETER BLOCK
204
205      ;*****
206      ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
207      ;*****
208      .SX=.          ;;SAVE CURRENT LOCATION
209      .=24          ;;SET POWER FAIL TO POINT TO START OF PROGRAM
210      200          ;;FOR APT START UP
211      .=44          ;;POINT TO APT INDIRECT ADDRESS PNTR.
212      $APTHDR      ;;POINT TO APT HEADER BLOCK
213      .=.SX        ;;RESET LOCATION COUNTER
214      ;*****
215      ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
216      ;INTERFACE SPEC.
217
218      $APTHD:
219      $HIBTS: .WORD  0          ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
220      $MBADR: .WORD  $MAIL      ;;ADDRESS OF APT MAILBOX (BITS 0-15)
221      $TSTM:  .WORD  30        ;;RUN TIM OF LONGEST TEST
222      $PASTM: .WORD  60        ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
223      $UNITM: .WORD  120       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
224      .WORD  $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)

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225
226
227
228
229
230
231 001100
232 001100
233 001100
234 001102
235 001103
236 001104
237 001106
238 001110
239 001112
240 001114
241 001115
242 001116
243 001120
244 001122
245 001124
246 001126
247 001130
248 001132
249 001134
250 001135
251 001136
252 001140
253 001142
254 001144
255 001146
256 001150
257 001152
258 001154
259 001155
260 001156
261 001157
262 001160
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264 001162
265 001164
266 001166
267 001170
268 001171
269 001172
270
271
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275 001174
276 001174
277 001176
278 001200

.SBTTL COMMON TAGS

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

. =1100

SCMTAG: . =1100 ; START OF COMMON TAGS
 .WORD 0
 STSNM: .BYTE 0 ; CONTAINS THE TEST NUMBER
 SERFLG: .BYTE 0 ; CONTAINS ERROR FLAG
 SICNT: .WORD 0 ; CONTAINS SUBTEST ITERATION COUNT
 SLPADR: .WORD 0 ; CONTAINS SCOPE LOOP ADDRESS
 SLPERR: .WORD 0 ; CONTAINS SCOPE RETURN FOR ERRORS
 SERTTL: .WORD 0 ; CONTAINS TOTAL ERRORS DETECTED
 SITEMB: .BYTE 0 ; CONTAINS ITEM CONTROL BYTE
 SERMAX: .BYTE 1 ; CONTAINS MAX. ERRORS PER TEST
 SERPC: .WORD 0 ; CONTAINS PC OF LAST ERROR INSTRUCTION
 SGDADR: .WORD 0 ; CONTAINS ADDRESS OF 'GOOD' DATA
 SBDADR: .WORD 0 ; CONTAINS ADDRESS OF 'BAD' DATA
 SGDDAT: .WORD 0 ; CONTAINS 'GOOD' DATA
 SBDDAT: .WORD 0 ; CONTAINS 'BAD' DATA
 .WORD 0 ; RESERVED--NOT TO BE USED
 SAUTOB: .BYTE 0 ; AUTOMATIC MODE INDICATOR
 SINTAG: .BYTE 0 ; INTERRUPT MODE INDICATOR
 .WORD 0
 SWR: .WORD DSWR ; ADDRESS OF SWITCH REGISTER
 DISPLAY: .WORD DDI:P ; ADDRESS OF DISPLAY REGISTER
 STKS: 177560 ; TTY KBD STATUS
 STKB: 177562 ; TTY KBD BUFFER
 STPS: 177564 ; TTY PRINTER STATUS REG. ADDRESS
 STPB: 177566 ; TTY PRINTER BUF. ER REG. ADDRESS
 SNULL: .BYTE 0 ; CONTAINS NULL CHARACTER FOR FILLS
 SFILLS: .BYTE 2 ; CONTAINS # OF FILLER CHARACTERS REQUIRED
 SFILLC: .BYTE 12 ; INSERT FILL CHARS. AFTER A "LINE FEED"
 STPFLG: .BYTE 0 ; "TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
 SREGAD: .WORD 0 ; CONTAINS THE ADDRESS FROM WHICH (\$REGO) WAS OBTAINED
 \$REGO: .WORD 0 ; CONTAINS ((\$REGAD)+0)
 \$REG1: .WORD 0 ; CONTAINS ((\$REGAD)+2)
 \$TIMES: 0 ; MAX. NUMBER OF ITERATIONS
 \$QUES: .ASCII /?/ ; QUESTION MARK
 \$CRLF: .ASCII <15> ; CARRIAGE RETURN
 \$LF: .ASCIZ <12> ; LINE FEED

; .SBTTL APT MAILBOX-ETABLE

; EVEN
 \$MAIL: ; APT MAILBOX
 \$MSGTY: .WORD AMSGTY ; MESSAGE TYPE CODE
 \$FATAL: .WORD AFATAL ; FATAL ERROR NUMBER
 \$TESTN: .WORD ATESTN ; TEST NUMBER

279	001202	000000	\$PASS:	.WORD	APASS	::	PASS COUNT
280	001204	000000	\$DEVCT:	.WORD	ADEVCT	::	DEVICE COUNT
281	001206	000000	\$UNIT:	.WORD	AUNIT	::	I/O UNIT NUMBER
282	001210	000000	\$MSGAD:	.WORD	AMSGAD	::	MESSAGE ADDRESS
283	001212	000000	\$MSGLG:	.WORD	AMSGLG	::	MESSAGE LENGTH
284	001214		\$ETABLE:			::	APT ENVIRONMENT TABLE
285	001214	000	\$ENV:	.BYTE	AENV	::	ENVIRONMENT BYTE
286	001215	000	\$ENVM:	.BYTE	AENVM	::	ENVIRONMENT MODE BITS
287	001216	000000	\$SWREG:	.WORD	ASWREG	::	APT SWITCH REGISTER
288	001220	000000	\$USWR:	.WORD	AUSWR	::	USER SWITCHES
289	001222	000000	\$CPUOP:	.WORD	ACPUOP	::	CPU TYPE, OPTIONS
290			*			::	BITS 15-11=CPU TYPE
291			*			::	11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
292			*			::	11/70=06,PDQ=07,Q=10
293			*			::	BIT 10=REAL TIME CLOCK
294			*			::	BIT 9=FLOATING POINT PROCESSOR
295			*			::	BIT 8=MEMORY MANAGEMENT
296	001224	000	\$MAMS1:	.BYTE	AMAMS1	::	HIGH ADDRESS, M.S. BYTE
297	001225	000	\$MTYP1:	.BYTE	AMTYP1	::	MEM. TYPE, BLK#1
298			*			::	MEM. TYPE BYTE -- (HIGH BYTE)
299			*			::	900 NSEC CORE=001
300			*			::	300 NSEC BIPOLAR=002
301			*			::	500 NSEC MOS=003
302	001226	000000	\$MADR1:	.WORD	AMADR1	::	HIGH ADDRESS, BLK#1
303			*			::	MEM. LAST ADDR.=3 BYTES, THIS WORD AND LOW OF "TYPE" ABOVE
304	001230	000	\$MAMS2:	.BYTE	AMAMS2	::	HIGH ADDRESS, M.S. BYTE
305	001231	000	\$MTYP2:	.BYTE	AMTYP2	::	MEM. TYPE, BLK#2
306	001232	000000	\$MADR2:	.WORD	AMADR2	::	MEM. LAST ADDRESS, BLK#2
307	001234	000	\$MAMS3:	.BYTE	AMAMS3	::	HIGH ADDRESS, M.S. BYTE
308	001235	000	\$MTYP3:	.BYTE	AMTYP3	::	MEM. TYPE, BLK#3
309	001236	000000	\$MADR3:	.WORD	AMADR3	::	MEM. LAST ADDRESS, BLK#3
310	001240	000	\$MAMS4:	.BYTE	AMAMS4	::	HIGH ADDRESS, M.S. BYTE
311	001241	000	\$MTYP4:	.BYTE	AMTYP4	::	MEM. TYPE, BLK#4
312	001242	000000	\$MADR4:	.WORD	AMADR4	::	MEM. LAST ADDRESS, BLK#4
313	001244	100360	\$VECT1:	.WORD	AVECT1	::	INTERRUPT VECTOR#1, BUS PRIORITY#1
314	001246	000000	\$VECT2:	.WORD	AVECT2	::	INTERRUPT VECTOR#2, BUS PRIORITY#2
315	001250	170416	\$BASE:	.WORD	ABASE	::	BASE ADDRESS OF EQUIPMENT UNDER TEST
316	001252	000000	\$DEVm:	.WORD	ADEVm	::	DEVICE MAP
317	001254	000000	\$CDW1:	.WORD	ACDW1	::	CONTROLLER DESCRIPTION WORD#1
318	001256		\$ETEND:			::	
319			.MEXIT			::	

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.SBTTL  ERROR POINTER TABLE

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

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

$ERRTB:

;ITEM  1
      EM1      ;AA11-K STATUS REGISTER IN ERROR
      DH1      ;ERRPC IBASE  GOOD  BAD
      DT1      ;$ERRPC STAT  $GDDAT $BDDAT
      DFO

;ITEM  2
      EM2      ;DAC0 REGISTER IN ERROR
      DH1      ;ERRPC IBASE  GOOD  BAD
      DT2      ;$ERRPC DAC0  $GDDAT $BDDAT
      DFO

;ITEM  3
      EM3      ;DAC1 REGISTER IN ERROR
      DH1      ;ERRPC IBASE  GOOD  BAD
      DT3      ;$ERRPC DAC1  $GDDAT $BDDAT
      DFO

;ITEM  4
      EM4      ;DAC #2 REGISTER IN ERROR
      DH1      ;ERRPC IBASE  GOOD  BAD
      DT4      ;$ERRPC DAC2  $GDDAT $BDDAT
      DFO

;ITEM  5
      EM5      ;DAC #3 REGISTER IN ERROR
      DH1      ;ERRPC IBASE  GOOD  BAD
      DT5      ;$ERRPC DAC3  $GDDAT $BDDAT
      DFO

;ITEM  6
      EM6      ;AA11-K FAILED TO INTERRUPT
      DH6      ;ERRPC IBASE
      DT6      ;$ERRPC STAT
      DFO

;ITEM  7

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001256

001256 016547
001260 017370
001262 021006
001264 021122

001266 016600
001270 017370
001272 021020
001274 021122

001276 016627
001300 017370
001302 021032
001304 021122

001306 016656
001310 017370
001312 021044
001314 021122

001316 016705
001320 017370
001322 021056
001324 021122

001326 016734
001330 017424
001332 021070
001334 021122

374	001336	016767	EM7	;AA11-K INTERRUPTED IN ERROR
375	001340	017424	DH6	;ERRPC IBASE
376	001342	021070	DT6	;SERRPC STAT
377	001344	021122	DF0	
378				
379			; ITEM 10	
380	001346	017023	EM10	;BUS TIME-OUT ON AA11-K ADDRESSES
381	001350	017424	DH6	;ERRPC IBASE
382	001352	021070	DT6	;SERRPC STAT
383	001354	021122	DF0	
384				
385			; ITEM 11	
386	001356	017074	EM11	;AA11-K READY BIT ERROR
387	001360	017370	DH1	;ERRPC IBASE GOOD BAD
388	001362	021006	DT1	;SERRPC STAT \$GDDAT \$BDDAT
389	001364	021122	DF0	
390				
391			; ITEM 12	
392	001366	017123	EM12	;POWER SUPPLY VOLTAGE WAS INCORRECT
393	001370	017472	DH14	;ERRPC BASE GOOD BAD
394	001372	021110	DT14	;SERRPC \$BASE \$GDDAT \$BDDAT
395	001374	021122	DF0	
396				
397			; ITEM 13	
398	001376	017166	EM13	;A PREVIOUSLY EXISTING AA11-K DOES NOT RESPOND NOW
399	001400	017440	DH13	;ERRPC BASE FIRST# #NOW
400	001402	021076	DT13	;SERRPC \$BASE EVER \$UNIT
401	001404	021122	DF0	
402				
403			; ITEM 14	
404	001406	017207	EM14	;AA11-K LOGIC SIGNAL HIGH OUTPUT TO LOW
405	001410	017472	DH14	;ERRPC BASE GOOD BAD
406	001412	021110	DT14	;SERRPC \$BASE \$GDDAT \$BDDAT SPREAD
407	001414	021122	DF0	
408				
409			; ITEM 15	
410	001416	017256	EM15	;AA11-K LOGIC LOW OUTPUT TO HIGH
411	001420	017472	DH14	;ERRPC BASE GOOD BAD
412	001422	021110	DT14	;SERRPC \$BASE \$GDDAT \$BDDAT SPREAD
413	001424	021122	DF0	
414				
415			; ITEM 16	
416	001426	017325	EM16	;SELECTED DAC HAS A LINEARITY ERROR
417	001430	017472	DH14	;ERRPC BASE GOOD BAD
418	001432	021110	DT14	;SERRPC \$BASE \$GDDAT \$BDDAT
419	001434	021122	DF0	
420				
421			; ADDRESS OF KMC-11 OF LPA-11	THE ADDR FOR KMADD MAY BE
422			;	CHANGED BY THE USER TO REFLECT
423			;	A DIFFERENT KMC-11 ADDR. THE
424			;	REST OF THE ADDRESSES WILL
425			;	BE CHANGED BY THE PROGRAM.
426			;	
427			;	

```

428 001436          LPCI:
429 001436 170460   KMAD0: .WORD 170460          ;BASE KMC ADDR. MAY BE PATCHED BY USER.
430
431 001440          LPMR:
432 001440 170461   KMAD1: .WORD 170460+1          ;>DO NOT          <;KMC-CSR ADDR
433 001442          LFCO:
434 001442 170462   KMAD2: .WORD 170460+2          ;>PATCH          <;
435 001444          LPSO:
436 001444 170463   KMAD3: .WORD 170460+3          ;>THIS AREA      <
437 001446          LPADL:
438 001446 170464   KMAD4: .WORD 170460+4          ;
439 001450          I PADH:
440 001450 170465   KMAD5: .WORD 170460+5          ;>DO NOT          <
441 001452          LPMS1:
442 001452 170466   KMAD6: .WORD 170460+6          ;>PATCH          <
443 001 54          LPMS2:
444 001454 170467   KMAD7: .WORD 170460+7          ;>THIS AREA      <
445
446 001456 000360   VECTOR: .WORD AVECT1&777          ;BASE VECTOR OF KMC
447 001460 000364   VECTPS: .WORD 4+AVECT1&777          ;VECTR ADDR.+2
448
449 001462 000004   VERSN: .WORD 4          ;CURRENT VERSION NUMBER OF MICROCODE.
450
451 001464 000000   .DVLS: .WORD 0          ;/DEVICE LIST OF I/O ADDR. DEFINED
452 001466 000020   .BLKW 16.          ;/BY INIT.
453
454 001526 000040   VADDR: 40          ;ADJUSTMENT TO NEXT AA11-K'S ADDRESS
455 001530 000040   VVECT: 40          ;ADJUSTMENT TO NEXT AA11-K'S VECTOR
456 001532 000012   DELAY: 10.         ;DELAY COUNTER FOR DELAY LOOPS
457 001534 000000   $TMDAT: 0
458 001536 170416   STAT: 170416
459 001540 170420   DAC0: 170420
460 001542 170422   DAC1: 170422
461 001544 170424   DAC2: 170424
462 001546 170426   DAC3: 170426
463 001550 000350   IV: 350
464 001552 000352   IVS: 352
465
466 001554 005037 021154   BEGIN: CLR TEMP
467 001560 005037 021164   CLR EVER          ;RESET POINTER
468 001564 005037 021166   CLR EVER1
469 001570 000403   BR BEG
470 001572 012737 000001 021154   BEGIN1: MOV #1,TEMP
471 001600 000240   BEG: NOP
472   .SBTTL INITIALIZE THE COMMON TAGS
473   ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
474 001602 012706 001100   MOV #CMTAG,R6          ;;FIRST LOCATION TO BE CLEARED
475 001606 005026   CLR (R6)+          ;;CLEAR MEMORY LOCATION
476 001610 022706 001140   CMP #SWR,R6 ;;DONE?
477 001614 001374   BNE -6          ;;LOOP BACK IF NO
478 001616 012706 001100   MOV #STACK_SP          ;;SETUP THE STACK POINTER
479   ;;INITIALIZE A FEW VECTORS
480 001622 012737 021422 000020   MOV #SCOPE,#IOTVEC          ;;IOT VECTOR FOR SCOPE ROUTINE
481 001630 012737 000340 000022   MOV #340,#IOTVEC+2          ;;LEVEL 7

```

MAINDEC-11-DRLPB-A A11-K DIAGNOSTIC
DRLPB.P11 INITIALIZE THE COMMON TAGS

```

482 001636 012737 021636 000030 MOV #ERROR,@EMTVEC ;; EMT VECTOR FOR ERROR ROUTINE
483 001644 012737 000340 000032 MOV #340,@EMTVEC+2 ;; LEVEL 7
484 001652 012737 024176 000034 MOV #STRAP,@TRAPVEC ;; TRAP VECTOR FOR TRAP CALLS
485 001660 012737 000340 000036 MOV #340,@TRAPVEC+2 ;; LEVEL 7
486 001666 012737 022122 000024 MOV #SPWRDN,@PWRVEC ;; POWER FAILURE VECTOR
487 001674 012737 000340 000026 MOV #340,@PWRVEC+2 ;; LEVEL 7
488 001702 005037 001166 CLR $TIMES ;; INITIALIZE NUMBER OF ITERATIONS
489 001706 012737 001706 001106 MOV #,$LPAOR ;; INITIALIZE THE LOOP ADDRESS FOR SCOPE
490 ;; SIZE FOR A HARDWARE SWITCH REGISTER, IF NOT FOUND OR IT IS
491 ;; EQUAL TO A "-1" SETUP FOR A SOFTWARE SWITCH REGISTER.
492 001714 013746 000004 MOV @ERRVEC,-(SP) ;; SAVE ERROR VECTOR
493 001720 012737 001754 000004 MOV #64$,@ERRVEC ;; SET UP ERROR VECTOR
494 001726 012737 177570 001140 MOV #DSWR,SWR ;; SETUP FOR A HARDWARE SWICH REGISTER
495 001734 012737 177570 001142 MOV #DDISP,DISPLAY ;; AND A HARDWARE DISPLAY REGISTER
496 001742 022777 177777 177170 CMP #-1,@SWR ;; TRY TO REFERENCE HARDWARE SWR
497 001750 001012 BNE 66$ ;; BRANCH IF NO TIMEOUT TRAP OCCURRED
498 ;; AND THE HARDWARE SWR IS NOT = -1
499 001752 000403 BR 65$ ;; BRANCH IF NO TIMEOUT
500 001754 012716 001762 64$: MOV #65$,(SP) ;; SET UP FOR TRAP RETURN
501 001760 000002 RTI
502 001762 012737 000176 001140 65$: MOV #SWREG,SWR ;; POINT TO SOFTWARE SWR
503 001770 012737 000174 001142 MOV #DISPREG,DISPLAY
504 001776 012637 000004 66$: MOV (SP)+,@ERRVEC ;; RESTORE ERROR VECTOR
505
506 002002 005037 001202 CLR $PASS ;; CLEAR PASS COUNT
507 002006 132737 000200 001215 BITB #APTSIZE,$ENVM ;; TEST USER SIZE UNDER APT
508 002014 001403 BEQ 67$ ;; YES,USE NON-APT SWITCH
509 002016 012737 001216 001140 67$: MOV #SSWREG,SWR ;; NO,USE APT SWITCH REGISTER
510
511 ;
512 ; THIS SECTION OF CODE HANDLES INITIALIZING LPA-11 FUNCTIONS
513 ;
514 ;
515 002024 010046 MOV R0,-(SP)
516 002026 010146 MOV R1,-(SP)
517 002030 013700 001436 MOV #KMA0,R0 ;; GET KMC-11 ADDRESS.
518 002034 012701 001440 MOV #KMA1,R1 ;; GET ADDR. OF ADDR. LIST.
519
520 002040 005200 68$: INC R0 ;; UPDATE ADDR.
521 002042 010021 MOV R0,(1)+ ;; WRITE ADDR.
522 002044 020127 001456 CMP R1,#KMA7+2 ;; DONE ALL ADDRESSES?
523 002050 001373 BNE 68$ ;; NO - DO NEXT ADDR.
524 002052 005037 001464 CLR .DVL$ ;; CLR ADDR. LIST.
525 002056 012601 MOV (SP)+,R1
526 002060 012600 MOV (SP)+,R0
527
528 002062 005037 177776 CLR @PS
529 002066 000137 002254 JMP INIT1
530
531 002072 012702 000242 .SBTTL SUBROUTINE TO LOAD A TRAP CATCHER
532 002076 012701 000240 LDTRAP: MOV #242,R2 ;; LOAD R2
533 002102 010221 5$: MOV #240,R1 ;; LOAD R1
534 002104 005021 MOV R2,(R1)+ ;; LOAD .+2
535 002106 010102 CLR (R1)+ ;; LOAD HALT
MOV R1,R2 ;; LOAD R2

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536 002110 005722          TST      (R2)+          ;BUMP R2
537 002112 020227 001002  CMP      R2,#1002      ;TEST FOR LAST
538 002116 001371          BNE      55$           ;BR UNTIL DONE
539                                     .SBTTL  LOAD DEVICE ADDRESSES LOCATIONS
540 002120 012700 001536  MOV      #STAT,R0      ;LOAD POINTER
541 002124 013720 001250 10$:  MOV      $BASE,(R0)+   ;LOAD BASE ADDRESS
542 002130 022700 001550  CMP      #IV,R0        ;TEST FOR DONE
543 002134 001373          BNE      10$          ;BR
544 002136 012700 001540  MOV      #DACC,R0      ;LOAD 2ND ADDRESS
545 002142 012701 000002  MOV      #2,R1         ;LOAD R1
546 002146 060120 12$:  ADD      R1,(R0)+      ;UPDATE REAL DEVICE WORD
547 002150 005721          TST      (R1)+          ;BUMP R1
548 002152 022701 000012  CMP      #12,R1       ;TEST FOR DONE
549 002156 001373          BNE      12$          ;BR
550 002160 013737 001244 001550  MOV      $VECT1,IV     ;LOAD INTR. VECTOR ADDRESS
551 002166 042737 160000 001550  BIC      #160000,IV
552 002174 013737 001550 001552  MOV      IV,IVS
553 002202 062737 000002  ADD      #2,IVS
554 002210 113737 001245 021160  MOVB     $VECT1+1,BRLEV1 ;LOAD BR LEVEL
555 002216 042737 177437 021160  BIC      #177437,BRLEV1
556 002224 013737 021160 021162  MOV      BRLEV1,BRLEV2
557 002232 162737 000040 021162  SUB      #40,BRLEV2
558 002240 000207          RTS      PC             ;EXIT
559
560                                     .SBTTL  INITIAL HEADER TYPEOUT AND WAIT FOR OPERATOR
561 002242 046101  AL:      .ASCII  /AL/
562 002244 042101  AD:      .ASCII  /AD/
563 002246 046115  ML:      .ASCII  /ML/
564 002250 042115  MD:      .ASCII  /MD/
565 002252 041515  MC:      .ASCII  /MC/
566
567 002254 004737 002072  INIT1:  JSR      PC,LDTRAP
568 002260 005737 021154  TST      TEMP          ;TEST IF START OR RESTART
569 002264 001061          BNE      CTRLC        ;RESTART
570 002266 005737 000042  TST      #42          ;TEST IF MONITOR
571 002272 001063          BNE      MTEST        ;BR IF NOT
572 002274 104401          TYPE          ;CALL MESSAGE PRINTER VIA 'EMT'
573 002276 015472          TITLE         ;TYPE PROGRAM HEADER.
574 002300 012706 001100  WAITIN: MOV      #STACK,SP ;RESET STACK
575 002304 104407          CKSWR         ;TEST FOR CTRL G
576 002306 104411          RDLIN        ;READ TWO CHARACTERS
577 002310 013637 021170  MOV      @ (SP)+,OPRIN ;READ THE CHARACTER
578 002314 042737 000000 021170  BIC      #0,OPRIN     ;MASK OTHER CHARACTERS
579
580 002322 023737 002242 021170  CMP      AL,OPRIN     ;TEST FOR "AL"
581 002330 001423          BEQ      10$         ;BR IF YES
582 002332 023737 002244 021170  CMP      AD,OPRIN     ;TEST FOR "AD"
583 002340 001421          BEQ      11$         ;BR IF YES
584 002342 023737 002246 021170  CMP      ML,OPRIN     ;TEST FOR "ML"
585 002350 001421          BEQ      13$         ;BR FI YES
586 002352 023737 002250 021170  CMP      MD,OPRIN     ;TEST FOR "MD"
587 002360 001417          BEQ      14$         ;BR IF YES
588 002362 023737 002252 021170  CMP      MC,OPRIN     ;TEST FOR "MC"
589 002370 001415          BEQ      15$         ;BR IF YES

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590 002372 104401 TYPE
591 002374 017517 QMARK
592 002376 000740 BR WAITIN ;WAIT FOR OPERATOR AGAIN
593
594 002400 000137 002442 10$: JMP MTEST ;RUN THE LOGIC TEST
595 002404 000137 007354 11$: JMP VISUAL ;RUN THE VISUAL PATTERN
596 002410 000137 011456 12$: JMP AUTCAL ;RUN THE AUTO CALIBRATION (FACTORY ONLY)
597 002414 000137 013500 13$: JMP MANUL ;RUN THE MANUAL LOGIC TEST
598 002420 000137 011264 14$: JMP FULRMP ;RUN THE RAMP PATTERN ON FOUR DAC'S
599 002424 000137 014014 15$: JMP CALDAC ;RUN THE MANUAL CAL OF THE DAC
600
601 002430 104401 CTRLC: TYPE
602 002432 017525 CONTC
603 002434 005037 001202 CLR $PASS
604 002440 000717 BR WAITIN
605
606 .SBTTL DETERMINE THE NUMBER OF A11-K ON THIS SYSTEM
607
608 002442 013737 001250 001126 MTEST: MOV $BASE,$BDDAT ;GET THE BASE ADDRESS
609 002450 005037 001464 CLR .DVLS
610 002454 005037 001206 CLR $UNIT ;CLEAR UNIT #
611 002460
612 1$:
613 ;* MOV $BDDAT,$TMDAT ;/READ DEVICE REG $BDDAT,PUT DATA IN $TMDAT.
614 002470 005737 025522 TST $AERR
615 002474 001006 BNE 2$
616 002476 063737 001526 001126 ADD VADDR,$BDDAT ;UPDATE THE BUS ADDRESS
617 002504 005237 001206 INC $UNIT ;UPDATE UNIT COUNT
618 002510 000763 BR 1$
619 002512 000240 2$: NOP
620 002514 005737 001206 TST $UNIT ;TEST IF ANY EXIST
621 002520 001002 BNE 3$ ;BR IF SOME ARE THERE
622 002522 104010 ERROR 10 ;BASE ADDRESS CAUSED AN BUS TRAP
623 002524 000434 BR TST1
624 002526 005737 021164 3$: TST EVER ;TEST IF # HAS BEEN REPORTED
625 002532 100417 BMI 4$ ;BR IF IT HAS
626 002534 104401 TYPE
627 002536 017533 FOUND1 ;TELL OPERATOR THE # OF A11-K'S
628 002540 013746 001206 MOV $UNIT,-(SP)
629 002544 104403 TYPOS
630 002546 002 .BYTE 2
631 002547 000 .BYTE 0
632 002550 104401 TYPE
633 002552 017557 FOUND2
634 002554 013737 001206 021164 MOV $UNIT,EVER ;SAVE THE # OF A11-K'S FOR LATER
635 002562 052737 100000 021164 BIS #BIT15,EVER ;SET "REPORTED # FLAG"
636 002570 000405 BR 5$
637 002572 123737 021164 001206 4$: CMPB EVER,$UNIT ;TEST IF ANY HAVE GONE AWAY
638 002600 001401 BEQ 5$ ;BR IF ALL ARE STILL HERE
639 002602 104013 ERROR 13 ;EXISTING UNIT FAILED TO RESPOND NOW
640 002604 005037 001206 5$: CLR $UNIT ;RESET UNIT POINTER
641 002610 004737 002072 JSR PC,LDTRAP ;LOAD TRAP CATCHER AND BUS ADDRESSES
642
643 002614 000240 LTEST: NOP
    
```

```

644 ;:*****
645 ;*TEST 1 TEST THAT THE AA11-K RESPONDS TO THE CPU
646 ;:*****
647 002616 000004 †ST1: SCOPE
648 002620 012737 002634 001106 MOV #3$, $LPADR
649 002626 012737 002732 000004 MOV #1$, ERRVEC ;LOAD BUS TRAP RETURN
650 002634
651
652 ;* MOV @STAT, $TMDAT ;/READ DEVICE REG STAT, PUT DATA IN $TMDAT.
653 002644 005737 001534 TST $TMDAT
654
655 ;* MOV @DAC0, $TMDAT ;/READ DEVICE REG DAC0, PUT DATA IN $TMDAT.
656 002660 005737 001534 TST $TMDAT
657
658 ;* MOV @DAC1, $TMDAT ;/READ DEVICE REG DAC1, PUT DATA IN $TMDAT.
659 002674 005737 001534 TST $TMDAT
660
661 ;* MOV @DAC2, $TMDAT ;/READ DEVICE REG DAC2, PUT DATA IN $TMDAT.
662 002710 005737 001534 TST $TMDAT
663
664 ;* MOV @DAC3, $TMDAT ;/READ DEVICE REG DAC3, PUT DATA IN $TMDAT.
665 002724 005737 001534 TST $TMDAT
666 002730 000402 BR 2$ ;BR AND RESTORE LOC. 4
667 002732 022626 1$: CMP (SP)+, (SP)+ ;CLEAN THE STACK
668 002734 104010 ERROR 10 ;ERROR, BUS TIMEOUT WHEN ADDRESSING THE AA11-K
669 002736 012737 000006 000004 2$: MOV #6, ERRVEC ;LOAD RETURN
670 ;:*****
671 ;*TEST 2 TEST THAT THE DAC0 REGISTER CAN BE CLEARED
672 ;:*****
673 002744 000004 †ST2: SCOPE
674 002746 005037 001124 CLR $GDDAT ;LOAD EXPECTED
675
676 ;* MOV $GDDAT, @DAC0 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC0
677
678 ;* MOV @DAC0, $BDDAT ;/READ DEVICE REG DAC0, PUT DATA IN $BDDAT.
679 002772 023737 001124 001126 CMP $GDDAT, $BDDAT ;COMPARE
680 003000 001401 BEQ TST3 ;;BR IF EQUAL
681 003002 104002 ERROR 2 ;ERROR, DAC0 REGISTER NOT = 0
682
683 ;:*****
684 ;*TEST 3 TEST THAT THE DAC0 REGISTER CAN BE LOADED WITH #7777
685 ;:*****
686 003004 000004 †ST3: SCOPE
687 003006 012737 007777 001124 MOV #7777, $GDDAT ;LOAD EXPECTED
688
689 ;* MOV $GDDAT, @DAC0 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC0
690
691 ;* MOV @DAC0, $BDDAT ;/READ DEVICE REG DAC0, PUT DATA IN $BDDAT.
692 003034 023737 001124 001126 CMP $GDDAT, $BDDAT ;COMPARE
693 003042 001401 BEQ TST4 ;;BR IF EQUAL
694 003044 104002 ERROR 2 ;ERROR, DAC0 REGISTER NOT = 7777
695
696 ;:*****
697 ;*TEST 4 TEST THAT THE DAC0 REGISTER CAN HOLD A FLOATING 1 PATTERN

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698 .....
699 *ST4: SCOPE
700 003046 000004 MOV #100,$TIMES ;;DO 100 ITERATIONS
701 003050 012737 000100 001166 MOV #BIT11,$GDDAT ;LOAD EXPECTED
702 003056 012737 004000 001124 1$:
703 003064 ;* MOV $GDDAT,$DAC0 ;/ PUT DATA FROM $GDDAT TO DEVICE REG LAC0
704 ;* MOV $DAC0,$BDDAT ;/READ DEVICE REG DAC0,PUT DATA IN $BDDAT.
705 ;* CMP $GDDAT,$BDDAT ;COMPARE THE DATA
706 ;* BEQ 2$ ;;BR IF SAME
707 003104 023737 001124 001126 ;* MOV $DAC0,$BDDAT ;/READ DEVICE REG DAC0,PUT DATA IN $BDDAT.
708 003112 001401 CMP $GDDAT,$BDDAT ;COMPARE THE DATA
709 003114 104002 BEQ 2$ ;;BR IF SAME
710 003116 006237 001124 2$: ASR 2 ;ERROR, DAC0 REGISTER FAILED TO HOLD A FLOATING
711 003122 001360 BNE 1$ ;CHANGE THE DATA
712 ;* BR AND TEST MORE DATA
713 .....
714 *TEST 5 TEST THAT THE DAC #1 REGISTER CAN BE CLEARED
715 .....
716 *ST5: SCOPE
717 003124 000004 CLR $GDDAT ;LOAD EXPECTED
718 003126 005037 001124 ;* MOV $GDDAT,$DAC1 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC1
719 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
720 ;* CMP $GDDAT,$BDDAT ;COMPARE
721 003152 023737 001124 001126 ;* BEQ TST6 ;;BR IF EQUAL
722 003160 001401 BEQ TST6 ;ERROR, DAC1 REGISTER NOT = 0
723 003162 104003 ERROR 3
724 .....
725 *TEST 6 TEST THAT THE Y REGISTER CAN BE LOADED WITH #7777
726 .....
727 *ST6: SCOPE
728 003164 000004 MOV #7777,$GDDAT ;LOAD EXPECTED
729 003166 012737 007777 001124 ;* MOV $GDDAT,$DAC1 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC1
730 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
731 ;* CMP $GDDAT,$BDDAT ;COMPARE
732 ;* BEQ TST7 ;;BR IF EQUAL
733 003214 023737 001124 001126 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
734 003222 001401 BEQ TST7 ;COMPARE
735 003224 104003 ERROR 3 ;ERROR, DAC1 REGISTER NOT = 7777
736 .....
737 *TEST 7 TEST THAT THE Y REGISTER CAN HOLD A FLOATING 1 PATTERN
738 .....
739 *ST7: SCOPE
740 003226 000004 MOV #100,$TIMES ;;DO 100 ITERATIONS
741 003230 012737 000100 001166 MOV #BIT11,$GDDAT ;LOAD EXPECTED
742 003236 012737 004000 001124 1$:
743 003244 ;* MOV $GDDAT,$DAC1 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC1
744 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
745 ;* CMP $GDDAT,$BDDAT ;COMPARE THE DATA
746 ;* BEQ 2$ ;;BR IF DATA IS SAME
747 003264 023737 001124 001126 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
748 003272 001401 BEQ 2$ ;COMPARE THE DATA
749 003274 104003 ERROR 3 ;ERROR, DAC1 REGISTER FAILED TO HOLD A FLOATING

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752 003276 006237 001124 2S: ASR $GDDAT ;CHANGE THE DATA
753 003302 001360 BNE 1S ;BR AND TEST MORE DATA
754
755 ;*****
756 ;*TEST 10 TEST THAT THE DAC #2 REGISTER CAN BE CLEARED
757 ;*****
758 003304 000004
759 003306 005037 001124 †ST10: SCOPE
CLR $GDDAT ;LOAD EXPECTED
760
761 ;* MOV $GDDAT, @DAC2 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC2
762
763 ;* MOV @DAC2, $BDDAT ;/READ DEVICE REG DAC2, PUT DATA IN $BDDAT.
764 003332 023737 001124 001126 CMP $GDDAT, $BDDAT ;COMPARE
765 003340 001401 BEQ TST11 ;;BR IF EQUAL
766 003342 104004 ERROR 4 ;ERROR, DAC #2 REGISTER NOT = 0
767
768 ;*****
769 ;*TEST 11 TEST THAT THE DAC #2 REGISTER CAN BE LOADED WITH #7777
770 ;*****
771 003344 000004
772 003346 012737 007777 001124 †ST11: SCOPE
MOV #7777, $GDDAT ;LOAD EXPECTED
773
774 ;* MOV $GDDAT, @DAC2 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC2
775
776 ;* MOV @DAC2, $BDDAT ;/READ DEVICE REG DAC2, PUT DATA IN $BDDAT.
777 003374 023737 001124 001126 CMP $GDDAT, $BDDAT ;COMPARE
778 003402 001401 BEQ TST12 ;;BR IF EQUAL
779 003404 104004 ERROR 4 ;ERROR, DAC #2 REGISTER NOT = 7777
780
781 ;*****
782 ;*TEST 12 TEST THAT THE DAC #2 REGISTER CAN HOLD A FLOATING 1 PATTERN
783 ;*****
784 003406 000004
785 003410 012737 000100 001166 †ST12: SCOPE
MOV #100, $TIMES ;;DO 100 ITERATIONS
786 003416 012737 004000 001124 MOV #BIT11, $GDDAT ;LOAD EXPECTED
787 003424
788 1S:
789 ;* MOV $GDDAT, @DAC2 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC2
790
791 ;* MOV @DAC2, $BDDAT ;/READ DEVICE REG DAC2, PUT DATA IN $BDDAT.
792 003444 023737 001124 001126 CMP $GDDAT, $BDDAT ;COMPARE THE DATA
793 003452 001401 BEQ 2S ;;BR IF SAME
794 003454 104004 ERROR 4 ;ERROR, DAC #2 REGISTER FAILED TO HOLD A FLOATIN
795 003456 006237 001124 2S: ASR $GDDAT ;CHANGE THE DATA
796 003462 001360 BNE 1S ;BR AND TEST MORE DATA
797
798 ;*****
799 ;*TEST 13 TEST THAT THE DAC #3 REGISTER CAN BE CLEARED
800 ;*****
801
802 003464 000004
803 003466 005037 001124 †ST13: SCOPE
CLR $GDDAT ;LOAD EXPECTED
804
805 ;* MOV $GDDAT, @DAC3 ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC3

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E03

MAINDEC-11-DRLPB-A
DRLPB.P11

AA11-K DIAGNOSTIC MACY11 27(654) 14-DEC-77 20:20 PAGE 17
TEST THAT THE DAC #3 REGISTER CAN BE CLEARED

SEQ 0030

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806
807
808 003512 023737 001124 001126 ;*   MOV   @DAC3,$BDDAT   ;/READ DEVICE REG DAC3,PUT DATA IN $BDDAT.
809 003520 001401           CMP   $GDDAT,$BDDAT   ;COMPARE
810 003522 104005           BEQ   TST14           ;;BR IF EQUAL
811                                     ERROR 5                ;ERROR, DAC #3 REGISTER NOT = 0
812
813 ;:*****
814 ;*TEST 14   TEST THAT THE DAC #3 REGISTER CAN BE LOADED WITH #7777
815 ;:*****
816 003524 000004           †ST14: SCOPE
817 003526 012737 007777 001124           MOV   #7777,$GDDAT           ;LOAD EXPECTED
818
819 ;*   MOV   $GDDAT,@DAC3   ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC3
820
821 ;*   MOV   @DAC3,$BDDAT   ;/READ DEVICE REG DAC3,PUT DATA IN $BDDAT.
822 003554 023737 001124 001126           CMP   $GDDAT,$BDDAT   ;COMPARE
823 003562 001401           BEQ   TST15           ;;BR IF EQUAL
824 003564 104005           ERROR 5                ;ERROR, DAC #3 REGISTER NOT = 7777
825
826 ;:*****
827 ;*TEST 15   TEST THAT THE DAC #3 REGISTER CAN HOLD A FLOATING 1 PATTERN
828 ;:*****
829 003566 000004           †ST15: SCOPE
830 003570 012737 000100 001166           MOV   #100,$TIMES           ;;DO 100 ITERATIONS
831 003576 012737 004000 001124           MOV   #BIT11,$GDDAT           ;LOAD EXPECTED
832
833 1$:
834 ;*   MOV   $GDDAT,@DAC3   ;/ PUT DATA FROM $GDDAT TO DEVICE REG DAC3
835
836 ;*   MOV   @DAC3,$BDDAT   ;/READ DEVICE REG DAC3,PUT DATA IN $BDDAT.
837 003624 023737 001124 001126           CMP   $GDDAT,$BDDAT   ;COMPARE THE DATA
838 003632 001401           BEQ   2$               ;;BR IF SAME
839 003634 104005           ERROR 5                ;ERROR, DAC #3 REGISTER FAILED TO HOLD A FLOATIN
840 003636 006237 001124           ASR   $GDDAT           ;CHANGE THE DATA
841 003642 001360           BNE   1$               ;BR AND TEST MORE DATA
842
843 ;:*****
844 ;*TEST 16   TEST THAT THE FOUR DAC REGISTERS CAN HOLD DIFFERENT DATA
845 ;:*****
846 003644 000004           †ST16: SCOPE
847 003646 012737 001111 001534           MOV   #1111,$TMDAT           ;LOAD DAC #0
848
849 ;*   MOV   $TMDAT,@DAC0   ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
850 003664 012737 002222 001534           MOV   #2222,$TMDAT           ;LOAD DAC #1
851
852 ;*   MOV   $TMDAT,@DAC1   ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
853 003702 012737 004444 001534           MOV   #4444,$TMDAT           ;LOAD DAC #2
854
855 ;*   MOV   $TMDAT,@DAC2   ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC2
856 003720 012737 007777 001534           MOV   #7777,$TMDAT           ;LOAD DAC #3
857
858 ;*   MOV   $TMDAT,@DAC3   ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC3
859 003736 012737 000000 001534           MOV   #0,$TMDAT           ;CLEAR STATUS
860
861 ;*   MOV   $TMDAT,@STAT   ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT

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```

914
915
916 004246 012737 000200 001124 ;*      MOV      $TMDAT, $STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
917                                     MOV      #BIT7, $GDDAT      ;LOAD EXPECTED
918
919 004264 023737 001124 001126 ;*      MOV      $STAT, $BDDAT      ;/READ DEVICE REG STAT, PUT DATA IN $BDDAT.
920 004272 001401                                     CMP      $GDDAT, $BDDAT      ;COMPARE
921 004274 104001                                     BEQ      TST21                ;;BR IF SAME
922                                     ERROR    1                    ;ERROR, STATUS NOT = 200
923
924 ;:*****
925 ;:TEST 21      TEST THAT MODE BIT 2 CAN BE SET AND CLEARED
926 ;:*****
927 004276 000004      †ST21: SCOPE
928 004300 012737 000004 001534      MOV      #BIT2, $TMDAT      ;LOAD DISPLAY STATUS
929
930 004316 012737 000204 001124 ;*      MOV      $TMDAT, $STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
931                                     MOV      #BIT7!BIT2, $GDDAT ;LOAD EXPECTED
932
933 004334 023737 001124 001126 ;*      MOV      $STAT, $BDDAT      ;/READ DEVICE REG STAT, PUT DATA IN $BDDAT.
934 004342 001401                                     CMP      $GDDAT, $BDDAT      ;COMPARE
935 004344 104001                                     BEQ      IS                    ;;BR IF EQUAL
936 004346 012737 000000 001534 1$:      MOV      #0, $TMDAT          ;ERROR, STATUS NOT = 204
937                                     ;CLEAR STATUS
938
939 004364 012737 000200 001124 ;*      MOV      $TMDAT, $STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
940                                     MOV      #BIT7, $GDDAT      ;LOAD EXPECTED
941
942 004402 023737 001124 001126 ;*      MOV      $STAT, $BDDAT      ;/READ DEVICE REG STAT, PUT DATA IN $BDDAT.
943 004410 001401                                     CMP      $GDDAT, $BDDAT      ;COMPARE
944 004412 104001                                     BEQ      TST22                ;;BR IF CLEARED
945                                     ERROR    1                    ;MODE FAILED TO CLEAR
946
947 ;:*****
948 ;:TEST 22      TEST THAT MODE BIT 3 CAN BE SET
949 ;:*****
950 004414 000004      †ST22: SCOPE
951 004416 012737 000010 001534      MOV      #BIT3, $TMDAT      ;LOAD
952
953 004434 012737 000210 001124 ;*      MOV      $TMDAT, $STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
954                                     MOV      #BIT7!BIT3, $GDDAT ;LOAD EXPECTED
955
956 004452 023737 001124 001126 ;*      MOV      $STAT, $BDDAT      ;/READ DEVICE REG STAT, PUT DATA IN $BDDAT.
957 004460 001401                                     CMP      $GDDAT, $BDDAT      ;COMPARE
958 004462 104001                                     BEQ      IS                    ;;BR IF EQUAL
959                                     ERROR    1                    ;ERROR, STATUS NOT = 210
960
961 004464 012737 000000 001534 1$:      MOV      #0, $TMDAT          ;CLEAR REG.
962
963 004502 012737 000200 001124 ;*      MOV      $TMDAT, $STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
964                                     MOV      #BIT7, $GDDAT      ;LOAD EXPECTED
965
966 004520 023737 001124 001126 ;*      MOV      $STAT, $BDDAT      ;/READ DEVICE REG STAT, PUT DATA IN $BDDAT.
967                                     CMP      $GDDAT, $BDDAT      ;COMPARE

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H03

MAINDEC-11-DRLPB-A
DRLPB.P11 T22

AA11-K DIAGNOSTIC MACY11 27(654) 14-DEC-77 20:20 PAGE 20
TEST THAT MODE BIT 3 CAN BE SET

SEQ 0033

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968 004526 001401      BEQ      TST23      ;;BR IF EQUAL
969 004530 104001      ERROR    1          ;ERROR, STATUS NOT = 200
970
971      ;*****
972      ;*TEST 23      TEST THAT EXT. DELAY (BIT 4) CAN BE SET AND CLEARED
973      ;*****
974 004532 000004      †ST23:  SCOPE
975 004534 012737 000020 001534      MOV      #BIT4,$TMDAT      ;LOAD STATUS
976
977      ;*      MOV      $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
978 004552 012737 000220 001124      MOV      #BIT7!BIT4,$GDDAT ;LOAD EXPECTED
979
980      ;*      MOV      $STAT,$BDDAT      ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
981 004570 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
982 004576 001401      BEQ      1$          ;;BR IF SAME
983 004600 104001      ERROR    1          ;ERROR, EXT. DELAY BIT FAILED TO SET
984 004602 012737 000000 001534 1$:      MOV      #0,$TMDAT      ;CLEAR BIT 4
985
986      ;*      MOV      $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
987 004620 012737 000200 001124      MOV      #BIT7,$GDDAT      ;LOAD EXPECTED
988
989      ;*      MOV      $STAT,$BDDAT      ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
990 004636 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
991 004644 001401      BEQ      TST24      ;;BR IF SAME
992 004646 104001      ERROR    1          ;ERROR, EXT. DELAY BIT FAILED TO CLEAR
993
994      ;*****
995      ;*TEST 24      TEST THAT INTERRUPT ENABLE (BIT 6) CAN BE SET
996      ;*****
997 004650 000004      †ST24:  SCOPE
998 004652 012737 000100 001534      MOV      #BIT6,$TMDAT      ;LOAD DISPLAY STATUS
999
1000      ;*      MOV      $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1001      MOV      #BIT7!BIT6,$GDDAT ;LOAD EXPECTED
1002
1003      ;*      MOV      $STAT,$BDDAT      ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1004 004706 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1005 004714 001401      BEQ      TST25      ;;BR IF EQUAL
1006 004716 104001      ERROR    1          ;ERROR, STATUS NOT = 300
1007
1008      ;*****
1009      ;*TEST 25      TEST THAT CHANNEL (BIT 9) CAN BE SET
1010      ;*****
1011 004720 000004      †ST25:  SCOPE
1012 004722 012737 001000 001534      MOV      #BIT9,$TMDAT      ;LOAD DISPLAY STATUS
1013
1014      ;*      MOV      $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1015 004740 012737 001200 001124      MOV      #BIT9!BIT7,$GDDAT ;LOAD EXPECTED
1016
1017      ;*      MOV      $STAT,$BDDAT      ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1018 004756 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1019 004764 001401      BEQ      TST26      ;;BR IF EQUAL
1020 004766 104001      ERROR    1          ;ERROR, STATUS NOT = 1200
1021
      ;*****

```

```

1022 ;*TEST 26 TEST THAT STORE (BIT 10) CAN BE SET
1023 ;*****
1024 004770 000004 ;*ST26: SCOPE
1025 004772 012737 002000 001534 MOV #BIT10,$TMDAT ;LOAD DISPLAY STATUS
1026
1027 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1028 005010 012737 002200 001124 MOV #BIT10!BIT7,$GDDAT ;LOAD EXPECTED
1029
1030 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1031 005026 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1032 005034 001401 BEQ TST27 ;;BR IF EQUAL
1033 005036 104001 ERROR 1 ;ERROR, STATUS NOT = 2200
1034
1035 ;*****
1036 ;*TEST 27 TEST THAT WRITE THRU (BIT 11) CAN BE SET
1037 ;*****
1038 005040 000004 ;*ST27: SCOPE
1039 005042 012737 004000 001534 MOV #BIT11,$TMDAT ;LOAD DISPLAY STATUS
1040
1041 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1042 005060 012737 004200 001124 MOV #BIT11!BIT7,$GDDAT ;LOAD EXPECTED
1043
1044 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1045 005076 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1046 005104 001401 BEQ TST30 ;;BR IF EQUAL
1047 005106 104001 ERROR 1 ;ERROR, STATUS NOT = 4200
1048
1049 ;*****
1050 ;*TEST 30 TEST THAT INTENSIFY BIT SETS THAT THE READY BIT
1051 ;*****
1052 005110 000004 ;*ST30: SCOPE
1053 ; AND THEN SETS AFTER A DELAY
1054 005112 012700 001000 MOV #1000,R0
1055 005116 005037 001124 CLR $GDDAT ;LOAD EXPECTED
1056 005122 012737 000001 001534 MOV #BIT0,$TMDAT ;INTENSIFY
1057
1058 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1059 005140 012737 000200 001124 MOV #BIT7,$GDDAT ;LOAD EXPECTED
1060
1061 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1062 005156 023737 001124 001126 CMP $GDDAT,$BDDAT
1063 005164 001401 BEQ TST31 ;;BR IF EQUAL
1064 005166 104011 ERROR 11 ;READY FAILED TO SET AFTER A DELAY
1065 ; IS STORAGE SCOPE CONNECTED BUT NOT TURNED ON ??
1066 ;*****
1067 ;*TEST 31 TEST THAT MODE 1 (INTENSIFY ON DAC0) SETS THE READY FLAG
1068 ;*****
1069 005170 000004 ;*ST31: SCOPE
1070 ; AND THEN SETS IT
1071 005172 012700 001000 MOV #1000,R0 ;SET UP DELAY
1072 005176 012737 000204 001124 MOV #BIT7!BIT2,$GDDAT ;LOAD EXPECTED
1073 005204 012737 000004 001534 MOV #BIT2,$TMDAT ;LOAD MODE 1
1074
1075 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT

```

J03

MAINDEC-11-DRLPB-A
DRLPB.P11 T31

RA11-K DIAGNOSTIC MACY11 27(654) 14-DEC-77 20:20 PAGE 22
TEST THAT MODE 1 (INTENSIFY ON DAC0) SETS THE READY FLAG

SEQ 0035

```

1076
1077
1078 005232 105737 001126 ;* MOV QSTAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1079 005236 100402 TSTB $BDDAT ;TEST READY
1080 005240 104011 BMI 2$ ;;BR IF READY STILL SET
1081 ERROR 11 ;ERROR, IN MODE 1 READY SHOULD NOT
1082 005242 000425 BR TST32 ;;BR TO CLEAR UNTIL DAC0 IS LOADED
1083
1084 005244 012737 000004 001124 2$: MOV #BIT2,$GDDAT ;LOAD EXPECTED
1085 005252 012737 000000 001534 MOV #0,$TMDAT ;ADDRESS DAC 0
1086
1087 ;* MOV $TMDAT,$DAC0 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
1088
1089 ;* MOV QSTAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1090
1091 005300 105737 001126 TSTB $BDDAT
1092 005304 100404 BMI TST32 ;;NEXT TEST
1093 005306 012737 000204 001124 MOV #BIT7!BIT2,$GDDAT ;LOAD EXPECTED
1094 005314 104011 ERROR 11 ;ERROR, READY FAILED TO SET
1095 ; AFTER MODE 1 OPERATION
1096
1097 ;:*****
1098 ;*TEST 32 TEST THAT MODE 2 (INTENSIFY ON DAC1) SETS THE READY FLAG
1099 ;:*****
1100 005316 000004 †TST32: SCOPE
1101 ; AND THEN SETS IT
1102 005320 012700 001000 MOV #1000,R0 ;SET UP DELAY
1103 005324 012737 000210 001124 MOV #BIT7!BIT3,$GDDAT ;LOAD EXPECTED
1104 005332 012737 000010 001534 MOV #BIT3,$TMDAT ;LOAD MODE 2
1105
1106 ;* MOV $TMDAT,QSTAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1107
1108 ;* MOV QSTAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1109 005360 105737 001126 TSTB $BDDAT ;TEST READY
1110 005364 100402 BMI 2$ ;;BR IF SET
1111 005366 104011 ERROR 11 ;ERROR, IN MODE 2 READY SHOULD NOT CLEAR
1112 ;UNTIL DAC1 IS LOADED
1113 005370 000425 BR TST33 ;;BR TO SCOPE
1114 005372 012737 000010 001124 2$: MOV #BIT3,$GDDAT ;LOAD EXPECTED
1115 005400 012737 000000 001534 MOV #0,$TMDAT ;ADDRESS DAC1
1116
1117 ;* MOV $TMDAT,$DAC1 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
1118
1119 ;* MOV QSTAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1120 005426 105737 001126 TSTB $BDDAT
1121 005432 100404 BMI TST33 ;;NEXT TEST
1122 005434 012737 000210 001124 MOV #BIT7!BIT3,$GDDAT ;LOAD EXPECTED
1123 005442 104011 ERROR 11 ;ERROR, READY FAILED TO SET
1124 ; AFTER MODE 2 OPERATION
1125 ;:*****
1126 ;*TEST 33 TEST WHEN ERASE IS SET, READY BIT CLEARS AND SET AFTER DELAY (SW12=1)
1127 ;:*****
1128 005444 000004 †TST33: SCOPE
1129 005446 012737 000001 001166 MOV #1,$TIMES ;;DO 1 ITERATION

```

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MAINDEC-11-DRLPB-A
DRLPB.P11 T33

AA11-K DIAGNOSTIC
TEST WHEN ERASE IS SET,

MACY11 27(654) 14-DEC-77 20:20 PAGE 23
READY BIT CLEARS AND SET AFTER DELAY (SW12=1)

SEQ 0036

```

1130 005454 032777 010000 173456 BIT #BIT12,$SWR ;TEST BIT 12
1131 005462 001437 BEQ TST34 ;;BYPASS IF NO STORAGE SCOPE
1132 005464 012700 000010 MOV #10,R0
1133 005470 005037 021154 CLR TEMP ;CLEAR DELAY
1134 005474 012737 002000 001534 MOV #BIT10,$TMDAT ;SET STORE MODE
1135
1136 005512 052737 010000 001534 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1137 BIS #BIT12,$TMDAT ;SET ERASE BIT
1138
1139 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1140 005530 ;s:
1141
1142 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1143 005540 105737 001534 TSTB $TMDAT
1144 005544 100406 BMI TST34 ;;BR IF SET
1145 005546 005337 021154 DEC TEMP ;DELAY
1146 005552 001366 BNE $S ;;BR IF NOT READY
1147 005554 005300 DEC R0 ;DECREMENT COUNTER
1148 005556 001364 BNE $S ;;BR IF NOT DONE
1149 005560 104011 ERROR 11 ;ERROR, ERASE CLEARED READY AND FAILED
1150 ;TO SET READY AFTER A DELAY
1151 ;SWR 12 = 1 AND NO STORAGE SCOPE CONNECTED ??
1152 ;*****
1153 ;*TEST 34 TEST THAT RESET CLEARS MODE, EXT. DELAY AND FAST INTENSIFY BITS
1154 ;*****
1155 005562 000004 ST34: SCOPE
1156 005564 012737 000040 001166 MOV #40,$TIMES ;DO 40 ITERATIONS
1157 005572 012737 000036 001534 MOV #BIT4:BIT3:BIT2:BIT1,$TMDAT
1158
1159 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1160 005610 012737 000200 001124 MOV #BIT7,$GDDAT ;LOAD EXPECTED
1161 005616 004737 026474 JSR PC,$RSET
1162
1163 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1164 005632 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1165 005640 001401 BEQ TST35 ;;BR IF EQUAL
1166 005642 104001 ERROR 1 ;ERROR, RESET FAILED TO CLEAR STATUS REG
1167 ;*****
1168 ;*TEST 35 TEST THAT RESET CLEARS INTERRUPT ENABLE, CHANNEL, STORE, WRITE THRU
1169 ;*****
1170 005644 000004 ST35: SCOPE
1171 005646 012737 000040 001166 MOV #40,$TIMES ;DO 40 ITERATIONS
1172 005654 012737 007100 001534 MOV #BIT11:BIT10:BIT9:BIT6,$TMDAT
1173
1174 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1175 005672 012737 000200 001124 MOV #BIT7,$GDDAT ;LOAD EXPECTED
1176 005700 004737 026474 JSR PC,$RSET
1177
1178 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1179 005714 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1180 005722 001401 BEQ TST36 ;;BR IF EQUAL
1181 005724 104001 ERROR 1 ;ERROR, RESET FAILED TO CLEAR STATUS
1182 ;*****
1183 ;*TEST 36 TEST THAT RESET CLEARS DACO REGISTER (SW09=0)

```

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MAINDEC-11-DRLPB-A
DRLPB.P11 T36

AA11-K DIAGNOSTIC MACY11 27(654) 14-DEC-77 20:20 PAGE 24
TEST THAT RESET CLEARS DAC0 REGISTER (SW09=0)

SEQ 0037

```

1184
1185 005726 000004
1186 005730 012737 000040 001166
1187 005736 032777 001000 173174
1188 005744 001024
1189 005746 012737 177777 001534
1190
1191
1192 005764 005037 001124
1193 005770 004737 026474
1194
1195
1196 006004 023737 001124 001126
1197 006012 001401
1198 006014 104002
1199
1200
1201
1202 006016 000004
1203 006020 012737 000040 001166
1204 006026 032777 001000 173104
1205 006034 001024
1206 006036 012737 177777 001534
1207
1208
1209 006054 005037 001124
1210 006060 004737 026474
1211
1212
1213 006074 023737 001124 001126
1214 006102 001401
1215 006104 104003
1216
1217
1218
1219 006106 000004
1220 006110 012737 000040 001166
1221 006116 032777 001000 173014
1222 006124 001023
1223 006126 012737 177777 001534
1224
1225
1226 006144 005037 001124
1227 006150 004737 026474
1228
1229
1230 006164 005737 001126
1231 006170 001401
1232 006172 104004
1233
1234
1235
1236 006174 000004
1237 006176 012737 000040 001166

*****
↑ST36: SCOPE
MOV #40,$TIMES ;;DO 40 ITERATIONS
BIT #SW09,$SWR ;;TEST IF BIT 9 IS SET
BNE TST37 ;;BR IF SET
MOV #-1,$TMDAT
;* MOV $TMDAT,$DAC0 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
CLR $GDDAT ;LOAD EXPECTED
JSR PC,$RESET
;* MOV $DAC0,$BDDAT ;/READ DEVICE REG DAC0,PUT DATA IN $BDDAT.
CMP $GDDAT,$BDDAT ;COMPARE
BEQ TST37 ;;BR IF EQUAL
ERROR 2 ;ERROR, RESET FAILED TO CLEAR DAC 0 REGISTER
*****
;*TEST 37 TEST THAT RESET CLEARS DAC0 REGISTER (SW09=0)
*****
↑ST37: SCOPE
MOV #40,$TIMES ;;DO 40 ITERATIONS
BIT #SW09,$SWR ;;TEST IF BIT 9 IS SET
BNE TST40 ;;BR IF SET
MOV #-1,$TMDAT
;* MOV $TMDAT,$DAC1 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
CLR $GDDAT ;LOAD EXPECTED
JSR PC,$RESET
;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
CMP $GDDAT,$BDDAT ;COMPARE
BEQ TST40 ;;BR IF EQUAL
ERROR 3 ;ERROR, RESET FAILED TO CLEAR DAC1 REGISTER
*****
;*TEST 40 TEST THAT RESET CLEARS DAC #2 REGISTER (SW09=0)
*****
↑ST40: SCOPE
MOV #40,$TIMES ;;DO 40 ITERATIONS
BIT #SW09,$SWR ;;TEST IF BIT 9 IS SET
BNE TST41 ;;BR IF SET
MOV #-1,$TMDAT ;LOAD THE REGISTER
;* MOV $TMDAT,$DAC2 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC2
CLR $GDDAT ;CLEAR EXPECTED
JSR PC,$RESET
;* MOV $DAC2,$BDDAT ;/READ DEVICE REG DAC2,PUT DATA IN $BDDAT.
TST $BDDAT
BEQ TST41 ;;BR IF CLEARED
ERROR 4 ;ERROR, RESET FAILED TO CLEAR DAC #2
*****
;*TEST 41 TEST THAT RESET CLEARS DAC #3 REGISTER (SW09=0)
*****
↑ST41: SCOPE
MOV #40,$TIMES ;;DO 40 ITERATIONS

```

M03

MAINDEC-11-DRLPB-A
DRLPB.P11

T41

AA11-K DIAGNOSTIC
TEST THAT RESET CLEARS DAC #3 REGISTER (SW09=0)

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SEQ 0038

```

1238 006204 032777 001000 172726 BIT #SW09,ASWR ;TEST IF BIT 9 IS SET
1239 006212 001023 BNE TST42 ;;BR IF SET
1240 006214 012737 177777 001534 MOV #-1,$TMDAT ;LOAD THE REGISTER
1241
1242 ;* MOV $TMDAT,$DAC3 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC3
1243 006232 005037 001124 CLR $GDDAT ;CLEAR THE EXPECTED
1244 006236 004737 026474 JSR PC,$RESET
1245
1246 ;* MOV $DAC3,$BDDAT ;/READ DEVICE REG DAC3,PUT DATA IN $BDDAT.
1247 006252 005737 001126 TST $BDDAT
1248 006256 001401 BEQ TST42 ;;BR IF CLEARED
1249 006260 104005 ERROR 5 ;ERROR, RESET FAILED TO CLEAR DAC #3
1250 ;*****
1251 ;*TEST 42 TEST THAT RESET SET DAC0 TO 4000 (SW09=1)
1252 ;*****
1253 006262 000004 $T42: SCOPE
1254 006264 012737 000040 001166 MOV #40,$TIMES ;;DO 40 ITERATIONS
1255 006272 012777 001000 172640 BIT #SW09,ASWR ;TEST BIT 9
1256 006300 001425 BEQ TST43 ;;BR IF CLEARED
1257 006302 012737 003777 001534 MOV #3777,$TMDAT ;LOAD DAC0
1258
1259 ;* MOV $TMDAT,$DAC0 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
1260 006320 012737 004000 001124 MOV #4000,$GDDAT ;LOAD EXPTECTED
1261 006326 004737 026474 JSR PC,$RESET
1262
1263 ;* MOV $DAC0,$BDDAT ;/READ DEVICE REG DAC0,PUT DATA IN $BDDAT.
1264 006342 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1265 006350 001401 BEQ TST43 ;;BR IF SAME
1266 006352 104002 ERROR 2 ;RESET FAILED TO SET DAC0 TO 4000
1267 ;*****
1268 ;*TEST 43 TEST THAT RESET SET DAC1 TO 4000 (SW09=1)
1269 ;*****
1270 006354 000004 $T43: SCOPE
1271 006356 012737 000040 001166 MOV #40,$TIMES ;;DO 40 ITERATIONS
1272 006364 032777 001000 172546 BIT #SW09,ASWR ;TEST BIT 9
1273 006372 001425 BEQ TST44 ;;BR IF CLEARED
1274 006374 012737 003777 001534 MOV #3777,$TMDAT ;LOAD DAC1
1275
1276 ;* MOV $TMDAT,$DAC1 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
1277 006412 012737 004000 001124 MOV #4000,$GDDAT ;LOAD EXPTECTED
1278 006420 004737 026474 JSR PC,$RESET
1279
1280 ;* MOV $DAC1,$BDDAT ;/READ DEVICE REG DAC1,PUT DATA IN $BDDAT.
1281 006434 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1282 006442 001401 BEQ TST44 ;;BR IF SAME
1283 006444 104003 ERROR 3 ;RESET FAILED TO SET DAC1 TO 4000
1284 ;*****
1285 ;*TEST 44 TEST THAT RESET SET DAC2 TO 4000 (SW09=1)
1286 ;*****
1287 006446 000004 $T44: SCOPE
1288 006450 012737 000040 001166 MOV #40,$TIMES ;;DO 40 ITERATIONS
1289 006456 032777 001000 172454 BIT #SW09,ASWR ;TEST BIT 9
1290 006464 001425 BEQ TST45 ;;BR IF CLEARED
1291 006466 012737 003777 001534 MOV #3777,$TMDAT ;LOAD DAC2

```

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MAINDEC-11-DRLPB-A
DRLPB.P11 T44

AA11-K DIAGNOSTIC MACY11 27(654) 14-DEC-77 20:20 PAGE 26
TEST THAT RESET SET DAC2 TO 4000 (SW09=1)

SEQ 0039

```

1292
1293
1294 006504 012737 004000 001124 ;* MOV $TMDAT,$DAC2 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC2
1295 006512 004737 026474 ;* MOV #4000,$GDDAT ;LOAD EXPTECTED
1296 JSR PC,$RRESET
1297
1298 006526 023737 001124 001126 ;* MOV $DAC2,$BDDAT ;/READ DEVICE REG DAC2,PUT DATA IN $BDDAT.
1299 006534 001401 ;* CMP $GDDAT,$BDDAT ;COMPARE
1300 006536 104004 ;* BEQ TST45 ;;BR IF SAME
1301 ;* ERROR 4 ;RESET FAILED TO SET DAC2 TO 4000
1302 ;*****
1303 ;*TEST 45 TEST THAT RESET SET DAC3 TO 4000 (SW09=1)
1304 ;*****
1305 †ST45: SCOPE
1306 MOV #40,$TIMES ;;DO 40 ITERATIONS
1307 BIT #SW09,$SWR ;TEST BIT 9
1308 BEQ TST46 ;;BR IF CLEARED
1309 MOV #3777,$TMDAT ;LOAD DAC3
1310
1311 006576 012737 004000 001124 ;* MOV $TMDAT,$DAC3 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC3
1312 006604 004737 026474 ;* MOV #4000,$GDDAT ;LOAD EXPTECTED
1313 JSR PC,$RRESET
1314
1315 006620 023737 001124 001126 ;* MOV $DAC3,$BDDAT ;/READ DEVICE REG DAC3,PUT DATA IN $BDDAT.
1316 006626 001401 ;* CMP $GDDAT,$BDDAT ;COMPARE
1317 006630 104005 ;* BEQ TST46 ;;BR IF SAME
1318 ;* ERROR 5 ;RESET FAILED TO SET DAC3 TO 4000
1319 ;*****
1320 ;*TEST 46 TEST THAT EXTERNAL DELAY DOES NOT SET DISPLAY READY SW10=0
1321 ;*****
1322 †ST46: SCOPE
1323 MOV #10,$TIMES ;;DO 10 ITERATIONS
1324 BIT #SW10,$SWR ;TEST IF SW 10 IS SET
1325 BNE TST47 ;;BR IF EXT. DELAY SWITCH IS SET
1326 MOV #BIT4,$TMDAT ;LOAD EXT. DELAY ENABLE
1327
1328 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1329
1330 006700 105237 001534 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1331 INCB $TMDAT
1332
1333 006714 012700 000000 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1334 006720 1$: MOV #0,R0 ;LOAD DELAY
1335
1336 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1337 006730 105737 001534 ;* TSTB $TMDAT
1338 006734 100403 ;* BMI 2$ ;BR IF SET
1339 006736 005300 ;* DEC R0 ;DELAY
1340 006740 001367 ;* BNE 1$ ;BR IF NOT FINISHED
1341 006742 000414 ;* BR TST47 ;;
1342 006744 012737 000020 001124 2$: MOV #BIT4,$GDDAT ;LOAD EXPECTED
1343
1344
1345 006762 023737 001124 001126 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1345 006762 023737 001124 001126 ;* CMP $GDDAT,$BDDAT

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```

1346 006770 001401          BEQ     TST47          ;;BRANCH IF EQ
1347 006772 104011          ERROR   11           ;EXT. DELAY CAUSED READY TO SET
1348                                     ;WHEN THE OPERATOR (VIA SW10) SAID NO EXT. DELAY WAS CON
1349
1350                                     ;*****
1351                                     ;*TEST 47          TEST THE EXTERNAL DELAY DOES SET DISPLAY READY SW10=1
1352                                     ;*****
1353 006774 000004          †ST47:  SCOPE
1354 006776 012737 000010 001166      MOV     #10,$TIMES          ;;DO 10 ITERATIONS
1355 007004 032777 002000 172126      BIT     #SW10,$SWR          ;TEST SR BIT 10
1356 007012 001442          BEQ     TST50          ;;BR IF CLEARED
1357 007014 012737 000020 001534      MOV     #BIT4,$TMDAT        ;ENABLE EXT. DELAY
1358
1359                                     ;*      MOV     $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1360 007032 012700 000000          MOV     #0,R0              ;LOAD COUNTER
1361 007036 005237 001534          INC     $TMDAT              ;ENABLE DISPLAY
1362
1363                                     ;*      MOV     $TMDAT,$STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1364 007052          1$:
1365
1366                                     ;*      MOV     @STAT,$TMDAT      ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1367 007062 105737 001536          TSTB   STAT
1368 007066 100412          BMI     2$                ;BR IF DONE
1369 007070 005300          DEC     R0                  ;DELAY
1370 007072 001367          BNE    1$                  ;BR IF NOT DONE
1371 007074 012737 000220 001124      MOV     #BIT7:BIT4,$GDDAT   ;LOAD EXPECTED VALUE
1372
1373                                     ;*      MOV     @STAT,$BDDAT      ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1374 007112 104011          ERROR   11           ;EXT. DELAY FAILED TO SET READY
1375                                     ;WHEN THE OPERATOR (VIA SW 10=1) SAID AN EXT. DELAY WAS
1376 007114 004737 026474          2$:      JSR     PC,$RESET          ;ENSURE CLEARED AA11-K
1377
1378                                     ;*****
1379                                     ;*TEST 50          DETERMINE IF MORE AA11-K'S REMAIN TO BE TESTED
1380                                     ;*****
1381 007120 000004          †ST50:  SCOPE
1382 007122 012737 000001 001166      MOV     #1,$TIMES          ;;DO 1 ITERATION
1383 007130 004737 026474          JSR     PC,$RESET
1384 007134 005237 001206          INC     $UNIT
1385 007140 123737 001206 021164      CMPB   $UNIT,EVER          ;MORE UNITS?
1386 007146 001431          BEQ     $EOB              ;;BR IF NONE
1387 007150 063737 001526 001536      ADD     VADDR,$STAT        ;UPDATE ADDRESS
1388 007156 063737 001526 001540      ADD     VADDR,DAC0
1389 007164 063737 001526 001542      ADD     VADDR,DAC1
1390 007172 063737 001526 001544      ADD     VADDR,DAC2
1391 007200 063737 001526 001546      ADD     VADDR,DAC3
1392 007206 063737 001530 001550      ADD     VVECT,IV           ;UPDATE VECTOR
1393 007214 063737 001530 001552      ADD     VVECT,IVS
1394 007222 005037 001102          CLR     $STSTN
1395 007226 000137 002614          JMP     LTEST              ;TEST ANOTHER AA11-K
1396
1397 .SBTTL  END OF PASS ROUTINE
1398
1399                                     ;*****

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1400 ;*INCREMENT THE PASS NUMBER ($PASS)
1401 ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
1402 ;*IF THERES A MONITOR GO TO IT
1403 ;*IF THERE ISN'T JUMP TO MTEST
1404
1405 $EOP:
1406 007232 000004 SCOPE CLR $STINM ;: ZERO THE TEST NUMBER
1407 007234 005037 001102 CLR $TIMES ;: ZERO THE NUMBER OF ITERATIONS
1408 007240 005037 001166 CLR $PASS ;: INCREMENT THE PASS NUMBER
1409 007244 005237 001202 INC $PASS ;: INCREMENT THE PASS NUMBER
1410 007250 042737 100000 001202 BIC #100000,$PASS ;: DON'T ALLOW A NEG. NUMBER
1411 007256 005327 (PC)+ DEC ;: LOOP?
1412 007260 000001 $EOPCT: .WORD 1
1413 007262 003022 BGT $DOAGN ;: YES
1414 007264 012737 MOV (PC)+,a(PC)+ ;: RESTORE COUNTER
1415 007266 000001 $ENDCT: .WORD 1
1416 007270 007260 $EOPCT
1417 007272 104401 TYPE $ENDMG ;: TYPE "ENC PASS #"
1418 007276 013746 001202 MOV $PASS,-(SP) ;: SAVE $PASS FOR TYPEOUT
1419 007302 104405 TYPDS ;: GO TYPE--DECIMAL ASCII WITH SIGN
1420 007304 104401 007334 TYPE $ENULL ;: TYPE A NULL CHARACTER
1421 007310 013700 000042 $GET42: MOV a#42,RO ;: GET MONITOR ADDRESS
1422 007314 001405 BEQ $DOAGN ;: BRANCH IF NO MONITOR
1423 007316 000005 RESET ;: CLEAR THE WORLD
1424 007320 004710 $ENDAD: JSR PC,(RO) ;: GO TO MONITOR
1425 007322 000240 NOP ;: SAVE ROOM
1426 007324 000240 NOP ;: FOR
1427 007326 000240 NOP ;: ACT11
1428 007330 $DOAGN:
1429 007330 000137 JMP a(PC)+ ;: RETURN
1430 007332 002442 $RTNAD: .WORD MTEST
1431 007334 377 377 000 $ENULL: .BYTE -1,-1,0 ;: NULL CHARACTER STRING
1432 007337 015 042412 042116 $ENDMG: .ASCIIZ <15><12>/END PASS #/
1433 007344 050040 051501 020123
1434 007352 000043
1435 007354 012706 001100 VISUAL: MOV #STACK,SP ;: LOAD SP
1436 007360 005737 021166 TST EVER1 ;: TEST IF TYPED ONCE
1437 007364 001006 BNE PICO ;: BR IF YES
1438 007366 104401 TYPE ;:
1439 007370 016202 MES6 ;: HEADER ABOUT SCOPE ADJ.
1440 007372 104401 TYPE ;:
1441 007374 016232 MES15 ;: TEXT ABOUT SWR
1442 007376 005237 021166 INC EVER1 ;: SET FLAG
1443 .SBTTL DISPLAY HORIZONTAL LINE
1444 007402 013737 001540 007470 PICO: MOV DAC0,ROX
1445 007410 013737 001542 007472 MOV DAC1,RIY
1446 007416 032777 000010 171514 BIT #SW03,aSWR ;: TEST SR BIT 3
1447 007424 001406 BEQ 2$ ;: BR IF DAC #0 AND #1
1448 007426 013737 001544 007470 MOV DAC2,ROX ;: USE DAC #2 AND 3
1449 007434 013737 001546 007472 MOV DAC3,RIY
1450 007442 012737 000005 021152 2$: MOV #5,TICKS ;: LOAD TIMER FOR CP TYPE
1451 007450 004737 015064 JSR PC,CHTIME ;: CHANGE TIMER FOR CP TYPE
1452 007454 004737 007570 1$: JSR PC,PBB
1453 007460 004737 014756 JSR PC,TIMER ;: DONE ?

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1454 007464 000773 BR 1$
1455 007466 000405 BR PIC1
1456 007470 000000 ROX: .WORD 0
1457 007472 000000 R1Y: .WORD 0
1459 007474 000000 ROY: .WORD 0
1459 007476 000000 R1X: .WORD 0
1460 007500 000000 R2Y: .WORD 0
1461 .SBTTL DISPLAY A VERTICAL LINE
1462 007502 013737 001542 007470 PIC1: MOV DAC1,ROX
1463 007510 013737 001540 007472 MOV DAC0,R1Y
1464 007516 032777 000010 171414 BIT #SW03,SWR ;TEST SR BIT 3
1465 007524 001406 BEQ 2$ ;BR IF DAC #0 AND 1
1466 007526 013737 001546 007470 MOV DAC3,ROX ;USE DAC #2 AND 3
1467 007534 013737 001544 007472 MOV DAC2,R1Y
1468 007542 012737 000005 021152 2$: MOV #5,TICKS ;LOAD TIME
1469 007550 004737 015064 JSR PC,CHTIME ;CHANGE TIMER FOR CP TYPE
1470 007554 004737 007570 1$: JSR PC,PBB
1471 007560 004737 014756 JSR PC,TIMER ;DONE ?
1472 007564 000773 BR 1$
1473 007566 000516 BR PIC3
1474 007570 012737 000000 001534 PBB: MOV #0,$TMDAT
1475
1476 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1477 007606 032777 002000 171324 BIT #SW10,SWR ;TEST IS SW10 =1
1478 007614 001413 BEQ 10$ ;BR IF NOT
1479
1480 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1481 007626 052737 000020 001534 BIS #BIT4,$TMDAT
1482
1483 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1484 007644 013704 001536 10$: MOV STAT,R4
1485 007650 012703 007777 MOV #777,R3 ;SET HIGH LIMIT
1486 007654 012702 000001 MOV #1,R2 ;INITIALIZE INCREMENTS BETWEEN POINTS
1487 007660 032777 001000 171252 BIT #SW09,SWR ;TEST SW 9 = 1
1488 007666 001042 BNE 2$ ;BR IF YES
1489 007670 012737 000400 001534 MOV #400,$TMDAT
1490
1491 ;* MOV $TMDAT,R1Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1Y
1492 007706 012737 000000 001534 MOV #0,$TMDAT
1493
1494 ;* MOV $TMDAT,R0X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R0X
1495 007724 060237 001534 1$: ADD R2,$TMDAT ;INCREMENT
1496
1497 ;* MOV $TMDAT,R0X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R0X
1498
1499 ;* MOV $STAT,$GDDAT ;/READ DEVICE REG STAT,PUT DATA IN $GDDAT.
1500 007750 005237 001124 INC $GDDAT
1501
1502 ;* MOV $GDDAT,$STAT ;/ PUT DATA FROM $GDDAT TO DEVICE REG STAT
1503 007764 023703 001534 CMP $TMDAT,R3 ;DONE ALL POINTS?
1504 007770 001355 BNE 1$ ;NO
1505 007772 000207 RTS PC
1506 007774 012737 000000 001534 2$: MOV #0,$TMDAT ;LOAD TWO'S COMP. ORIGIN
1507

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1508 ;* MOV $TMDAT,@R1Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1Y
1509
1510 ;* MOV $TMDAT,@R0X ;/ PUT DATA FROM $TMDAT TO DEVICE REG RCX
1511 010022 000740 BR 1$
1512 .SBTTL PINCUSHION TEST (DISPLAY SQUARE)
1513
1514 010024 012737 000000 001534 PIC3: MOV #0,$TMDAT
1515
1516 ;* MOV $TMDAT,@STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1517 010042 012737 000030 021152 MOV #30,TICKS
1518 010050 004737 015064 JSR PC,CHTIME
1519 010054 013737 001540 007476 MOV DAC0,R1X
1520 010062 013737 001542 007500 MOV DAC1,R2Y
1521 010070 032777 000010 171042 BIT #SW03,@SWR ;TEST SR BIT 3
1522 010076 001406 BEQ 1$ ;BR IF DAC #0 AND 1
1523 010100 013737 001544 007476 MOV DAC2,R1X ;USE DAC #2 AND 3
1524 010106 013737 001546 007500 MOV DAC3,R2Y
1525 010114 013703 001536 1$: MOV STAT,R3
1526 010120 012704 000020 MOV #20,R4
1527 010124 032777 001000 171006 P3: BIT #SW09,@SWR ;TEST BIT 9
1528 010132 001414 BEQ 1$
1529 010134 012737 004000 001534 MOV #4000,$TMDAT ;LOAD TWO'S COMP ORIGIN
1530
1531 ;* MOV $TMDAT,@R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1532
1533 ;* MOV $TMDAT,@R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1534 010162 000412 BR 2$
1535 010164 005037 001534 1$: CLR $TMDAT ;CLEAR AXIS
1536
1537 ;* MOV $TMDAT,@R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1538
1539 ;* MOV $TMDAT,@R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1540 ;DRAW BOTTOM LINE
1541 010210 012700 000377 2$: MOV #377,R0
1542 010214 032777 002000 170716 BIT #SW10,@SWR ;TEST IF SW10 =1
1543 010222 001413 BEQ P3A ;BR IF NOT
1544
1545 ;* MOV @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1546 010234 052737 040000 001534 BIS #BIT14,$TMDAT
1547
1548 ;* MOV $TMDAT,@STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1549 010252 P3A:
1550
1551 ;* MOV @R1X,$TMDAT ;/READ DEVICE REG R1X,PUT DATA IN $TMDAT.
1552 010262 060437 001534 ADD R4,$TMDAT
1553
1554 ;* MOV $TMDAT,@R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1555
1556 ;* MOV @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1557 010306 005237 001534 INC $TMDAT
1558
1559 ;* MOV $TMDAT,@STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1560 ;WAIT FOR READY
1561 010322 005300 DEC R0

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1562 010324 001352          BNE      P3A          ;NO
1563          ;DRAW RIGHT LINE
1564 010326 012700 000377  MOV      #377,R0
1565 010332          P3B:
1566
1567          ;*      MOV      @R2Y,$TMDAT  ;/READ DEVICE REG R2Y,PUT DATA IN $TMDAT.
1568 010342 060437 001534  ADD      R4,$TMDAT
1569
1570          ;*      MOV      $TMDAT,@R2Y  ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1571
1572          ;*      MOV      @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1573 010366 005237 001534  INC      $TMDAT
1574
1575          ;*      MOV      $TMDAT,@STAT  ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1576          ;WAIT FOR READY
1577 010402 005300          DEC      R0
1578 010404 001352          BNE      P3B          ;NO
1579          ;DRAW TOP LINE
1580 010406 012700 000377  MOV      #377,R0
1581 010412          P3C:
1582
1583          ;*      MOV      @R1X,$TMDAT  ;/READ DEVICE REG R1X,PUT DATA IN $TMDAT.
1584 010422 160437 001534  SUB      R4,$TMDAT
1585
1586          ;*      MOV      $TMDAT,@R1X  ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1587
1588          ;*      MOV      @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1589 010446 005237 001534  INC      $TMDAT
1590
1591          ;*      MOV      $TMDAT,@STAT  ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1592          ;WAIT FOR READY
1593 010462 005300          DEC      R0
1594 010464 001352          BNE      P3C          ;NO
1595          ;DRAW LEFT LINE
1596 010466 012700 000377  MOV      #377,R0
1597 010472          P3D:
1598
1599          ;*      MOV      @R2Y,$TMDAT  ;/READ DEVICE REG R2Y,PUT DATA IN $TMDAT.
1600 010502 160437 001534  SUB      R4,$TMDAT
1601
1602          ;*      MOV      $TMDAT,@R2Y  ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1603
1604          ;*      MOV      @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1605 010526 005237 001534  INC      $TMDAT
1606
1607          ;*      MOV      $TMDAT,@STAT  ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1608          ;WAIT FOR READY
1609
1610 010542 005300          DEC      R0
1611 010544 001352          BNE      P3D          ;NO
1612 010546 004737 014756  JSR     PC,TIMER
1613 010552 000401          BR      1$
1614 010554 000402          BR      PIC4
1615 010556 000137 010124  JS:     JMP     P3
    
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1616 .SBTTL PLOT AN X
1617
1618 010562 012737 000000 001534 PIC4: MOV #0,$TMDAT
1619
1620 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1621 010600 012737 000030 021152 MOV #30,TICKS
1622 010606 004737 015064 JSR PC,CHTIME ;CHANGE TIMER FOR CP TYPE
1623 010612 013737 001540 007476 PIC4B: MOV DAC0,R1X
1624 010620 013737 001542 007500 MOV DAC1,R2Y
1625 010626 032777 000010 170304 BIT #SW03,$SWR ;TEST SWR BIT 3
1626 010634 001406 BEQ 1$ ;BR IF DAC #0 AND 1
1627 010636 013737 001544 007476 MOV DAC2,R1X ;USE DAC #2 AND 3
1628 010644 013737 001546 007500 MOV DAC3,R2Y
1629 010652 013703 001536 1$: MOV STAT,R3
1630 010656 012704 000004 MOV #4,R4
1631 010662 032777 001000 170250 P4: BIT #SW09,$SWR ;TEST BIT 9
1632 010670 001414 BEQ 1$
1633 010672 012737 004000 001534 MOV #4000,$TMDAT
1634
1635 ;* MOV $TMDAT,$R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1636
1637 ;* MOV $TMDAT,$R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1638 010720 000412 BR 2$
1639 010722 005037 001534 1$: CLR $TMDAT
1640
1641 ;* MOV $TMDAT,$R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1642
1643 ;* MOV $TMDAT,$R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1644
1645 ;PLOT LINE BEGINNING IN LOWER LEFT CORNER
1646 010746 012700 001777 2$: MOV #1777,R0
1647 010752 032777 002000 170160 BIT #SW10,$SWR ;TEST IF SW10 =1
1648 010760 001413 BEQ P4A ;BR IF NOT
1649
1650 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1651 010772 052737 000020 001534 BIS #BIT4,$TMDAT
1652
1653 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1654 011010 P4A:
1655
1656 ;* MOV $STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1657 011020 005237 001534 INC $TMDAT
1658
1659 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1660
1661 ;* MOV $R2Y,$TMDAT ;/READ DEVICE REG R2Y,PUT DATA IN $TMDAT.
1662 011044 060437 001534 ADD R4,$TMDAT
1663
1664 ;* MOV $TMDAT,$R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1665
1666 ;* MOV $TMDAT,$R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1667 ;+4 TO X
1668 011070 005300 DEC R0
1669 011072 001346 BNE P4A ;NO

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1670 ;PLOT LINE BEGINNING IN UPPER LEFT CORNER
1671 011074 012737 007774 001534 MOV #7774,$TMDAT
1672
1673 ;* MOV $TMDAT,@R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1674 011112 005037 001534 CLR $TMDAT
1675
1676 ;* MOV $TMDAT,@R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1677 011126 012700 001777 MOV #1777,R0
1678 011132 P4B:
1679
1680 ;* MOV @STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1681 011142 005237 001534 INC $TMDAT
1682
1683 ;* MOV $TMDAT,@STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1684
1685 ;* MOV @R2Y,$TMDAT ;/READ DEVICE REG R2Y,PUT DATA IN $TMDAT.
1686 011166 160437 001534 SUB R4,$TMDAT
1687
1688 ;* MOV $TMDAT,@R2Y ;/ PUT DATA FROM $TMDAT TO DEVICE REG R2Y
1689
1690 ;* MOV @R1X,$TMDAT ;/READ DEVICE REG R1X,PUT DATA IN $TMDAT.
1691 011212 060437 001534 ADD R4,$TMDAT
1692
1693 ;* MOV $TMDAT,@R1X ;/ PUT DATA FROM $TMDAT TO DEVICE REG R1X
1694 011226 005300 DEC R0
1695 011230 001340 BNE P4B ;NO
1696 011232 004737 014756 JSR PC,TIMER
1697 011236 000402 BR 1$
1698 011240 000137 007402 JMP PICO
1699 011244 000137 010662 1$: JMP P4
1700

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1701
1702 011250 000000 VCXTMP: 0
1703 011252 000000 VCYTMP: 0
1704 011254 000000 YPOS: 0 ;CONTAINS Y POSITION AT ANY GIVEN TIME
1705 011256 000000 XPOS: 0 ;CONTAINS X POSITION AT ANY GIVEN TIME
1706 011260 000000 CHRCOL: 0
1707 011262 000000 YPT: 0
1708
1709
1710 .SBTTL MANUAL DISPLAY ROUTINE
1711
1712 011264 PIC6:
1713 011264 012706 001100 FULRMP: MOV #STACK,SP ;LOAD POINTER
1714 011270 004737 002072 JSR PC,LDTRAP ;LOAD BUS ADDRESS
1715 011274 032777 002000 167636 BIT #SW10,#SWR ;TEST SR 10=1
1716 011302 001413 BEQ 15 ;BR IF NOT
1717
1718 ;* MOV #STAT,$TMDAT ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1719 011314 052737 000020 001534 BIS #BIT4,$TMDAT
1720
1721 ;* MOV $TMDAT,#STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1722 011332 013737 001540 007470 15: MOV DAC0,ROX ;GET BUS ADDRESS
1723 011340 004737 011404 JSR PC,10$ ;LOAD THE RAMP ON DAC #1
1724 011344 013737 001542 007470 MOV DAC1,ROX ;GET BUS ADDRESS
1725 011352 004737 011404 JSR PC,10$ ;LOAD THE RAMP ON DAC #1
1726 011356 013737 001544 007470 MOV DAC2,ROX ;GET BUS ADDRESS
1727 011364 004737 011404 JSR PC,10$ ;LOAD THE RAMP ON DAC #2
1728 011370 013737 001546 007470 MOV DAC3,ROX ;GET THE BUS ADDRESS
1729 011376 004737 011404 JSR PC,10$ ;LOAD THE RAMP ON DAC #3
1730 011402 000753 BR 15 ;BR BACK
1731
1732 011404 005037 001534 10$: CLR $TMDAT
1733
1734 ;* MOV $TMDAT,#ROX ;/ PUT DATA FROM $TMDAT TO DEVICE REG ROX
1735 011420 062737 000010 001534 11$: ADD #10,$TMDAT
1736
1737 ;* MOV $TMDAT,#ROX ;/ PUT DATA FROM $TMDAT TO DEVICE REG ROX
1738 011436 005737 001534 TST $TMDAT ;TEST IF DON#
1739 011442 001366 BNE 11$ ;BR IF NOT
1740 011444 004737 013672 JSR PC,ACTRLC ;TEST FOR CTRL C
1741 011450 000207 RTS PC ;EXIT
1742 011452 000240 NOP
1743 011454 000240 NOP
1744
1745 .SBTTL AUTO CALIBRATION
1746 011456 012706 001100 AUTCAL: MOV #STACK,SP ;LOAD STACK POINTER
1747 011462 004737 002072 JSR PC,LDTRAP ;LOAD TRAN AND ADDRESSES
1748 011466 104401 TYPE
1749 011470 020076 AUTOCL ;TELL OPERATOR
1750 011472 104401 TYPE
1751 011474 017604 SELD01
1752
1753 ;LOAD BUS TRAP FOR OPERTUR FALSE SELECTION
1754

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1755 011476 012737 013460 000004      MOV      #AUTRAP,ERRVEC
1756 011504 012737 000050 001102      MOV      #STN-1,$STNM          ;LOAD TEST NUMBER
1757 011512 012737 011536 001110      MOV      #PSUPPLY,$LPERR       ;LOAD LOOP RETURN
1758 011520 012737 011536 001106      MOV      #PSUPPLY,$LPADR       ;LOAD LOOP ADDRESS
1759                                     ;~~~~~
1760 011526 004537 014704      JSR      R5,CROSS              ;CHANGE RELAYS
1761 011532 020000      BIT13                          ;USING BIT 13 FOR CRISS-CROSS WRAP MODE
1762                                     ;~~~~~
1763                                     ;*****
1764                                     ;*TEST 51      TEST THAT CH 3 IS AT +2.5 BIPOLAR
1765                                     ;*****
1766 011534 000004      †ST51:  SCOPE
1767 011536 013737 015400 001124      PSUPPLY: MOV      V1754,$GDDAT   ;LOAD EXPECTED VALUE
1768 011544 004537 015204      JSR      R5,CONVRT            ;CONVERT
1769 011550 000003      CH3                          ;CH 3
1770 011552 013737 015412 001126      MOV      ADEND,$BDDAT        ;LOAD VALUE READ
1771 011560 013737 015402 015420      MOV      V24,$SPREAD        ;LOAD + OR - COUNT SPREAD
1772 011566 004737 015422      JSR      PC,COMPAR           ;COMPARE $GDDAT AND $BDDAT
1773 011572 000402      BR      NSUPPLY              ;;BR IF WITHIN TOL,RANCE
1774 011574 104012      ERROR      12                ;CH 3 FAILED TO EQUAL EXPECTED VALUE
1775
1776                                     ;*****
1777                                     ;*TEST 52      TEST THAT CH 4 IS AT -2.5 BIPOLAR
1778                                     ;*****
1779 011576 000004      †ST52:  SCOPE
1780 011600 013737 015402 001124      NSUPPLY: MOV      V24,$GDDAT   ;LOAD EXPECTED VALUE
1781 011606 004537 015204      JSR      R5,CONVRT            ;CONVERT
1782 011612 000004      CH4                          ;CH 4
1783 011614 013737 015412 001126      MOV      ADEND,$BDDAT        ;LOAD VALUE READ
1784 011622 013737 015402 015420      MOV      V24,$SPREAD        ;LOAD + OR - COUNT SPREAD
1785 011630 004737 015422      JSR      PC,COMPAR           ;COMPARE $GDDAT AND $BDDAT
1786 011634 000402      BR      SUPOK                ;;BR IF WITHIN TOLERANCE
1787 011636 104012      ERROR      12                ;CH 4 FAILED TO EQUAL EXPECTED VALUE
1788 011640 000422      BR      TST53                ;;
1789 011642      SUPOK:
1790 011642 004537 014704      JSR      R5,CROSS              ;LOAD THE RELAYS WITH BIT13
1791 011646 020000      BIT13
1792 011650 104401 011656      TYPE      65$                ;;TYPE ASCIZ STRING
1793 011654 000414      BR      64$                  ;;GET OVER THE ASCIZ
1794                                     ;65$: .ASCIZ <15><12>/ANALOG SUPPLIES OK/<15><12>
1795 011706      64$:
1796                                     ;*****
1797                                     ;*TEST 53      TEST THAT ERASE L (CH 53) IS GREATER THAN +3 VOLTS WHEN HIGH
1798                                     ;*****
1799 011706 000004      †ST53:  SCOPE
1800 011710 012737 000000 001534      MOV      #0,$TMDAT           ;LOAD STATUS
1801
1802 ;*      MOV      $TMDAT,$STAT    ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1803 011726 012737 001146 001124      MOV      #1146,$GDDAT       ;LOAD EXPECTED VALUE
1804 011734 004537 015204      JSR      R5,CONVRT            ;CONVERT
1805 011740 000053      CH53                         ;CH 53
1806 011742 013737 015412 001126      MOV      ADEND,$BDDAT        ;LOAD VALUE READ
1807 011750 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1808 011756 003401      BLE      TST54                ;;BR IF LESS THAN OR EQUAL

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1809 011760 104014          ERROR 14          ;CH 53 FAILED TO EQUAL EXPECTED VALUE
1810
1811 ;*****
1812 ;*TEST 54          TEST THAT ERASE L (CH 53) IS LESS THAN +400 MVOLTS WHEN LOW
1813 ;*****
1814 011762 000004          †ST54: SCOPE
1815
1816 ;*      MOV      $TMDAT,2STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1817 011774 012737 012000 001534      MOV      #BIT12!BIT10,$TMDAT      ;SET ERASE
1818
1819 ;*      MOV      $TMDAT,2STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1820 012012 012737 000120 001124      MOV      #120,$GDDAT      ;LOAD EXPECTED VALUE
1821 012020 004537 015204              JSR      R5,CONVRT      ;CONVERT
1822 012024 000053              CH53      ;CH 53
1823 012026 013737 015412 001126      MOV      ADEND,$BDDAT      ;LOAD VALUE READ
1824 012034 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1825 012042 002001              BGE      TST55      ;;BR IF GREATER THAN OR EQUAL
1826 012044 104015          ERROR 15          ;CH 53 FAILED TO EQUAL EXPECTED VALUE
1827
1828 ;*****
1829 ;*TEST 55          TEST THAT WRITE-THRU (CH 53) IS LESS THAN +400 MVOLTS WHEN LOW
1830 ;*****
1831 012046 000004          †ST55: SCOPE
1832 012050 012737 006000 001534      MOV      #BIT11!BIT10,$TMDAT      ;SET WRITE-THRU
1833
1834 ;*      MOV      $TMDAT,2STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1835 012066 012737 000120 001124      MOV      #120,$GDDAT      ;LOAD EXPECTED VALUE
1836 012074 004537 015204              JSR      R5,CONVRT      ;CONVERT
1837 012100 000053              CH53      ;CH 54
1838 012102 013737 015412 001126      MOV      ADEND,$BDDAT      ;LOAD VALUE READ
1839 012110 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1840 012116 002001              BGE      TST56      ;;BR IF GREATER THAN OR EQUAL
1841 012120 104015          ERROR 15          ;CH 54 FAILED TO EQUAL EXPECTED VALUE
1842
1843 ;*****
1844 ;*TEST 56          TEST THAT NON-STORE (CH 55) IS LESS THAN +400 MVOLTS WHEN LOW
1845 ;*****
1846 012122 000004          †ST56: SCOPE
1847 012124 013737 000030 001534      MOV      30,$TMDAT      ;CLEAR STORE MODE
1848
1849 ;*      MOV      $TMDAT,2STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1850 012142 012737 000120 001124      MOV      #120,$GDDAT      ;LOAD EXPECTED VALUE
1851 012150 004537 015204              JSR      R5,CONVRT      ;CONVERT
1852 012154 000055              CH55      ;CH 55
1853 012156 013737 015412 001126      MOV      ADEND,$BDDAT      ;LOAD VALUE READ
1854 012164 023737 001124 001126      CMP      $GDDAT,$BDDAT      ;COMPARE
1855 012172 002001              BGE      TST57      ;;BR IF GREATER THAN OR EQUAL
1856 012174 104015          ERROR 15          ;CH 53 FAILED TO EQUAL EXPECTED VALUE
1857
1858 ;*****
1859 ;*TEST 57          TEST THAT NON-STORE L (CH 55) IS GREATER THAN +3 VOLTS WHEN HIGH
1860 ;*****
1861 012176 000004          †ST57: SCOPE
1862 012200 012737 017000 001534      MOV      #BIT12!BIT11!BIT10!BIT9,$TMDAT      ;SET STORE MODE
;*      MOV      $TMDAT,2STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT

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1863 012216 012737 001146 001124      MOV      #1146,$GDDAT      ;LOAD EXPECTED VALUE
1864 012224 004537 015204      JSR      RS,CONVRT        ;CONVERT
1865 012230 000055      CH55                ;CH 55
1866 012232 013737 015412 001126      MOV      ADEND,$BDDAT     ;LOAD VALUE READ
1867 012240 023737 001124 001126      CMP      $GDDAT,$BDDAT    ;COMPARE
1868 012246 003401      BLE     TST60          ;;BR IF LESS THAN OR EQUAL
1869 012250 104014      ERROR    14           ;CH 55 FAILED TO EQUAL EXPECTED VALUE
1870
1871      ;*****
1872      ;*TEST 60      TEST THAT DELAY RETURN SETS READY
1873      ;*****
1873 012252 000004      †ST60: SCOPE
1874 012254 012737 000020 001534      MOV      #BIT4,$TMDAT     ;LOAD EXT DELAY BIT
1875
1876      ;*      MOV      $TMDAT,$STAT    ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1877 012272 012737 000020 001124      MOV      #BIT4,$GDDAT     ;LOAD EXPECTED
1878 012300 005237 001534      INC      $TMDAT          ;MAKE READY GO AWAY
1879
1880      ;*      MOV      $STAT,$BDDAT    ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1881 012314 023737 001124 001126      CMP      $GDDAT,$BDDAT    ;COMPARE
1882 012322 001401      BEQ     1$             ;;BR IF EXPECTED
1883 012324 104001      ERROR    1           ;READY FAILED TO CLEAR
1884 012326
1885      1$:
1886      ;*      MOV      $STAT,$TMDAT    ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
1887 012336 052737 002000 001534      BIS      #BIT10,$TMDAT
1888
1889      ;*      MOV      $TMDAT,$STAT    ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1890 012354 012737 002220 001124      MOV      #BIT10!BIT7!BIT4,$GDDAT ;LOAD EXPECTED
1891
1892      ;*      MOV      $STAT,$BDDAT    ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1893 012372 023737 001124 001126      CMP      $GDDAT,$BDDAT    ;COMPARE
1894 012400 001401      BEQ     2$             ;;BR IF SAME
1895 012402 104001      ERROR    1           ;EXT. DELAY RETURN FAILED TO SET READY
1896 012404 012737 000000 001534      2$:      MOV      #0,$TMDAT
1897
1898      ;*      MOV      $TMDAT,$STAT    ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1899      ;*****
1900      ;*TEST 61      TEST THAT CHANNEL 02 L (CH 56) IS GREATER THAN +3 VOLTS WHEN HIGH
1901      ;*****
1902 012422 000004      †ST61: SCOPE
1903 012424 012737 014000 001534      MOV      #BIT12!BIT11,$TMDAT ;LOAD STATUS
1904
1905      ;*      MOV      $TMDAT,$STAT    ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1906 012442 012737 001100 001124      MOV      #1100,$GDDAT     ;LOAD EXPECTED VALUE
1907 012450 004537 015204      JSR      RS,CONVRT        ;CONVERT
1908 012454 000056      CH56                ;CH 56
1909 012456 013737 015412 001126      MOV      ADEND,$BDDAT     ;LOAD VALUE READ
1910 012464 023737 001124 001126      CMP      $GDDAT,$BDDAT    ;COMPARE
1911 012472 003401      BLE     TST62          ;;BR IF LESS THAN OR EQUAL
1912 012474 104014      ERROR    14           ;CH 56 FAILED TO EQUAL EXPECTED
1913                          ; VALUE
1914
1915      ;*****
1916      ;*TEST 62      TEST THAT CHANNEL 02 L (CH 56) IS LESS THAN +400 MVOLTS WHEN LOW

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1917 ;:*****
1918 012476 000004 †ST62: SCOPE
1919 012500 012737 003000 001534 MOV #BIT9!BIT10,$TMDAT ;SET CHANNEL 2
1920
1921 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1922 012516 012737 000120 001124 MOV #120,$GDDAT ;LOAD EXPECTED VALUE
1923 012524 004537 015204 JSR RS,CONVRT ;CONVERT
1924 012530 000056 CH56 ;CH 56
1925 012532 013737 015412 001126 MOV AEND,$BDDAT ;LOAD VALUE READ
1926 012540 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1927 012546 002001 BGE 15 ;;BR IF GREATER THAN
1928 012550 104015 ERROR 15 ;CH 56 FAILED TO EQUAL EXPECTED
1929 ; VALUE
1930 012552 012737 000000 001534 1$: MOV #0,$TMDAT ;CLEAR BIT 9
1931
1932 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1933
1934 ;:*****
1935 ;*TEST 63 TEST THAT "ERASE" AND DONE CAN BE CLEARED AND SET
1936 ;:*****
1937 012570 000004 †ST63: SCOPE
1938 012572 012737 000000 001534 MOV #0,$TMDAT ;CLEAR
1939
1940 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1941 012610 005037 001124 CLR $GDDAT ;CLEAR EXPECTED
1942 012614 012737 010000 001534 MOV #BIT12,$TMDAT ;LOAD EXPECTED
1943
1944 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
1945
1946 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1947 012642 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1948 012650 001401 BEQ 15 ;;BR IF SET
1949 012652 104001 ERROR 1 ;ERASE FAILED TO CLEAR READY, CHECK G5036-
1950 ;BCOBR CONNECTION: A-VV, VV-A
1951 012654 1$:
1952
1953 ;* MOV $GSTAT,$TMDAT ;/READ DEVICE REG GSTAT,PUT DATA IN $TMDAT.
1954 012664 053737 001000 001534 BIS BIT9,$TMDAT
1955
1956 ;* MOV $TMDAT,$GSTAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG GSTAT
1957 012702 005037 001124 CLR $GDDAT ;LOAD EXPECTED
1958
1959 ;* MOV $STAT,$BDDAT ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1960 012716 023737 001124 001126 CMP $GDDAT,$BDDAT ;COMPARE
1961 012724 001401 BEQ 25 ;;BR IF CLEARED
1962 012726 104001 ERROR 1 ;ERASE BIT FAILED TO CLEAR BY ERASE
1963 ;RETURN (SETTING OF THE CH 2 BIT)
1964
1965 012730 2$:
1966
1967 ;* MOV $GSTAT,$TMDAT ;/READ DEVICE REG GSTAT,PUT DATA IN $TMDAT.
1968 012740 042737 001000 001534 BIC #BIT9,$TMDAT
1969
1970 ;* MOV $TMDAT,$GSTAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG GSTAT

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1971 012756 012737 000200 001124      MOV      #BIT7,$GDDAT      ;LOAD EXPECTED
1972
1973
1974 012774 023737 001124 001126  ;*      MOV      @STAT,$BDDAT  ;/READ DEVICE REG STAT,PUT DATA IN $BDDAT.
1975 013002 001401      CMP      $GDDAT,$BDDAT  ;COMPARE
1976 013004 104001      BEQ      3$              ;;BR IF EQUAL
1977
1978
1979 013006      3$:      JSR      R5,CROSS        ;LOAD THE RELAYS WITH 0
1980 013006 004537 014704      0
1981 013012 000000
1982
1983 ;*****
1984 ;*TEST 64      ADJUSTMENT ROUTINES FOR DAC 0 ~ 1
1985 ;*****
1986 013014 000004      †$T64:  SCOPE
1987 013016 012737 000001 001166      MOV      #1,$TIMES      ;;DO 1 ITERATION
1988 013024 004537 014532      ;OFFSET ADJUST FOR DAC 0
1989 013030 020760      JSR      R5,$NDVLT      ;LOAD THE VOLTAGE
1990 013032 012737 000000 001534      NS0000
1991
1992
1993 013050 004537 014704      ;*      MOV      $TMDAT,@DAC0  ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
1994 013054 060000      JSR      R5,CROSS        ;LOAD THE RELAYS WITH BIT14!BIT13
1995 013056 104401      BIT14!BIT13
1996 013060 020310      TYPE
1997 013062 004737 013734      R38
1998
1999      JSR      PC,CSPACE      ;TELL OPR. TO ADJUST R38
2000 013066 004537 014704      ;OFFSE ADJUSTMENT FOR DAC 1
2001 013072 020000      JSR      R5,CROSS        ;LOAD THE RELAYS WITH BIT13
2002
2003
2004 013104 104401      ;*      MOV      $TMDAT,@DAC1  ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
2005 013106 020355      TYPE
2006 013110 004737 013734      R40
2007
2008      JSR      PC,CSPACE      ;TELL OPR. TO ADJUST R40
2009 013114 004537 014532      ;GAIN ADJUST FOR DAC 0
2010 013120 020773      JSR      R5,$NDVLT
2011 013122 012737 007777 001534      P49976
2012
2013      MOV      #7777,$TMDAT  ;LOAD DAC 0
2014 013140 004537 014704      ;*      MOV      $TMDAT,@DAC0  ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
2015 013144 060000      JSR      R5,CROSS        ;LOAD THE RELAYS WITH BIT14!BIT13
2016 013146 104401      BIT14!BIT13
2017 013150 020534      TYPE
2018 013152 004737 013734      R37
2019
2020      JSR      PC,CSPACE      ;TELL OPR. TO ADJUST R37
2021 013156 004537 014704      ;GAIN ADJUST FOR DAC 1
2022 013162 020000      JSR      R5,CROSS        ;LOAD THE RELAYS WITH BIT13
2023
2024      BIT13
2025
2026      ;*      MOV      $TMDAT,@DAC1  ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1

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2025 013174 104401 TYPE
2026 013176 020601 R39 ; TELL OPR. TO ADJUST R39
2027 013200 004737 013734 JSR PC,CSPACE ; WAIT FOR OPR. TO TYPE "SPACE"
2028
2029 ; DAC 0 D/A FUNCTION CHECK
2030 013204 004537 015112 JSR R5,FUNDAC ; GO TO DAC FUNCTION SUB.
2031 013210 001540 DAC0
2032 013212 000051 CH51
2033
2034 ; DAC 1 D/A FUNCTION CHECK
2035 013214 004537 015112 JSR R5,FUNDAC
2036 013220 001542 DAC1
2037 013222 000052 CH52
2038
2039 ; *****
2040 ; *TEST 65 ADJUSTMEI. ROUTINES FOR DAC 2 - 3
2041 ; *****
2042 013224 000004 †ST65: SCOPE
2043 013226 012737 000001 001166 MOV #1,$TIMES ; DO 1 ITERATION
2044 ; NOW DO DAC 2 AND 3
2045 013234 104401 TYPE
2046 013236 017651 SELD23
2047 ; OFFSET ADJUST TOR DAC 2
2048 013240 004537 014532 JSR R5,SNDVLT ; LOAD E.D.C
2049 013244 020760 N50000
2050 013246 012737 000000 001534 MOV #0,$TMDAT ; LOAD DAC VALUE
2051
2052 ; * MOV $TMDAT,@DAC2 ; / PUT DATA FROM $TMDAT TO DEVICE REG DAC2
2053 013264 004537 014704 JSR R5,CROSS ; LOAD THE RELAYS WITH BIT14!BIT13
2054 013270 060000 BIT14!BIT13
2055
2056 013272 104401 TYPE
2057 013274 000042 42 ; TELL OPR. TO ADJUST R42
2058 013276 004737 013734 JSR PC,CSPACE ; WAIT FOR OPR. TO TYPE "SPACE"
2059
2060 ; OFFSET ADJUST FOR DAC 3
2061
2062 ; * MOV $TMDAT,@DAC3 ; / PUT DATA FROM $TMDAT TO DEVICE REG DAC3
2063 013312 004537 014704 JSR R5,CROSS ; LOAD THE RELAYS WITH BIT13
2064 013316 020000 BIT13
2065
2066 ; * MOV $TMDAT,@DAC3 ; / PUT DATA FROM $TMDAT TO DEVICE REG DAC3
2067 013330 104401 TYPE
2068 013332 020467 R44 ; TELL OPR. TO ADJUST R44
2069 013334 004737 013734 JSR PC,CSPACE ; WAIT FOR OPR. TO TYPE "SPACE"
2070
2071 ; GAIN ADJUST FOR DAC 2
2072 013340 004537 014532 JSR R5,SNDVLT
2073 013344 020773 P49976
2074 013346 012737 007777 001534 MOV #7777,$TMDAT ; LOAD DAC 2
2075
2076 ; * MOV $TMDAT,@DAC2 ; / PUT DATA FROM $TMDAT TO DEVICE REG DAC2
2077 013364 004537 014704 JSR R5,CROSS ; LOAD THE RELAYS WITH BIT14!BIT13
2078 013370 060000 BIT14!BIT13

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2079
2080 013372 104401 TYPE
2081 013374 020646 R41 ; TELL OPR. TO ADJUST R41
2082 013376 004737 013734 JSR PC,CSPACE ; WAIT FOR OPR. TO TYPE "SPACE"
2083
2084 ; GAIN ADJUST FOR DAC 3
2085
2086 ; * MOV $TMDAT, @DAC3 ; / PUT DATA FROM $TMDAT TO DEVICE REG DAC3
2087 013412 004537 014704 JSR R5,CROSS ; LOAD THE RELAYS WITH BIT13
2088 013416 020000 BIT13
2089
2090 TYPE
2091 013422 020713 R43 ; TELL OPR. TO ADJUST R43
2092 013424 004737 013734 JSR PC,CSPACE ; WAIT FOR OPR. TO TYPE "SPACE"
2093
2094 ; DAC 2 D/A FUNCTION CHECK
2095
2096 013430 004537 015112 JSR R5,FUNDAC
2097 013434 001544 DAC2
2098 013436 000051 CH51
2099
2100 ; DAC 3 D/A FUNCTION CHECK
2101
2102 013440 004537 015112 JSR R5,FUNDAC
2103 013444 001546 DAC3
2104 013446 000052 CH52
2105
2106 TYPE
2107 013452 017716 CALDON
2108 013454 000137 011456 JMP AUTCAL
2109
2110 AUTRAP: CMP (SP)+,(SP)+
2111 013462 012737 000006 000004 MOV #6,ERRVEC
2112 013470 104401 TYPE
2113 013472 020162 AUTOER
2114 013474 000137 002430 JMP CTRLC
2115 .SBTTL MANUAL LOGIC TEST
2116
2117 013500 012706 001100 MANUL: MOV #STACK,SP ; LOAD STACK
2118 013504 004737 002072 JSR PC,LDTRAP ; LOAD BUS ADDRESS
2119 013510 104401 TYPE
2120 013512 017755 MANHED
2121 013514 004737 013672 1$: JSR PC,ACTRLC ; TEST FOR CTRL C
2122 013520 104407 CKSWR
2123 013522 017700 165412 MOV @SWR,R0 ; READ THE SWITCHES
2124 013526 010001 MOV R0,R1 ; COPY
2125 013530 042700 017777 BIC #17777,R0 ; MASK OFF BITS
2126 013534 001003 BNE 2$ ; BR IF NOT DAC 0
2127 013536 013702 001540 MOV DAC0,R2 ; LOAD DAC 0 BUS ADDRESS
2128 013542 000424 BR 10$
2129 013544 022700 020000 2$: CMP #BIT13,R0 ; TEST FOR DAC 1
2130 013550 001003 BNE 3$ ; BR IF NOT
2131 013552 013702 001542 MOV DAC1,R2 ; LOAD DAC 1 BUS ADDRESS
2132 013556 000416 BR 10$

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2133 013560 022700 040000 3$: CMP #BIT14,R0 ;TEST FOR DAC 2
2134 013564 001003 4$: BNE ;BR IF NOT
2135 013566 013702 001544 MOV DAC2,R2 ;LOAD DAC 2 BUS ADDRESS
2136 013572 000410 BR 10$
2137 013574 022700 060000 4$: CMP #BIT14!BIT13,R0 ;TEST FOR DAC 3
2138 013600 001003 5$: BNE ;BR IF NOT
2139 013602 013702 001546 MOV DAC3,R2 ;LOAD DAC 3 BUS ADDRESS
2140 013606 000402 BR 10$
2141 013610 013702 001536 5$: MOV STAT,R2 ;LOAD STATUS REG BUS ADDRESS
2142
2143 013614 010137 001124 10$: MOV R1,$GDDAT
2144 013620 010237 001126 MOV R2,$BDDAT
2145
2146 ;* MOV $GDDAT,$BDDAT ;/ PUT DATA FROM $GDDAT TO DEVICE REG $BDDAT
2147 013634 013703 001532 MOV DELAY,R3 ;PRESET THE DELAY
2148 013640 005303 11$: DEC R3 ;DELAY
2149 013642 001376 BNE 11$
2150 013644 005037 001124 CLR $GDDAT ;CLEAR THE REGISTER
2151
2152 ;* MOV $GDDAT,$BDDAT ;/ PUT DATA FROM $GDDAT TO DEVICE REG $BDDAT
2153 013660 013703 001532 MOV DELAY,R3 ;LOAD THE PRESET
2154 013664 005303 12$: DEC R3 ;DELAY
2155 013666 001376 BNE 12$
2156 013670 000711 BR 1$
2157
2158 ;TEST FOR CTRL C -- DONT WAIT
2159
2160 013672 105777 165246 ACTRLC: TSTB @STKS ;INPUT FLAG ?
2161 013676 100014 BPL 1$ ;NO
2162 013700 017737 165242 013732 MOV @STKB,10$ ;READ THE CHARACTER
2163 013706 042737 177600 013732 BIC #177600,10$
2164 013714 022737 000003 013732 CMP #3,10$ ;TEST FOR CTRL C
2165 013722 001002 BNE 1$ ;BR IF NOT
2166 013724 000137 002430 JMP CTRLC
2167 013730 000207 1$: RTS PC ;EXIT
2168 013732 000000 10$: O
2169
2170 ;WAIT FOR A "SPACE" CHARACTER
2171
2172 013734 105777 165204 CSPACE: TSTB @STKS ;WAIT FOR CHAR
2173 013740 100375 BPL CSPACE
2174 013742 017737 165200 014012 MOV @STKB,10$ ;READ CHAR
2175 013750 042737 177600 014012 BIC #177600,10$ ;MASK
2176 013756 022737 000003 014012 CMP #3,10$ ;TEST FOR CTRL C
2177 013764 001002 BNE 1$
2178 013766 000137 002430 JMP CTRLC
2179 013772 022737 000040 014012 1$: CMP #40,10$ ;TEST FOR SPACE
2180 014000 001001 BNE 2$
2181 014002 000207 RTS PC ;EXIT
2182 014004 104401 2$: TYPE
2183 014006 017517 QMARK
2184 014010 000751 BR CSPACE
2185
2186 014012 000000 10$: O

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2187
2188
2189
2190 014014 012706 001100 CALDAC: MOV #STACK,SP ;LOAD STACK POINTER
2191 014020 004737 002072 JSR PC,LDTRAP ;LOAD BUS ADDRESSES
2192 014024 104407 1$: CKSWR ;TEST FOR CTRL G
2193 014026 004737 013672 JSR PC,ACTRLC ;TEST FOR CTRL C
2194 014032 017700 165102 MOV #SWR,RO ;READ SWITCHES
2195 014036 010037 001534 MOV RO,$TMDAT ;LOAD DAC #0
2196
2197 ;* MOV $TMDAT,$DAC0 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
2198
2199 ;* MOV $TMDAT,$DAC1 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
2200
2201 ;* MOV $TMDAT,$DAC2 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC2
2202
2203 ;* MOV $TMDAT,$DAC3 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC3
2204 014102 000750 BR 1$
2205
2206 .SBTTL DYNAMIC DAC CALIBRATION
2207
2208 014104 012706 001100 DYNCAL: MOV #STACK,SP ;LOAD STACK POINTER
2209 014110 004737 002072 JSR PC,LDTRAP ;LOAD BUS ADDRESSES
2210 014114 104407 1$: CKSWR ;TEST FOR CTRL G
2211 014116 004737 013672 JSR PC,ACTRLC ;TEST FOR CTRL C
2212 014122 017700 165012 MOV #SWR,RO ;READ SWR
2213 014126 004737 014142 JSR PC,10$ ;LOAD THE SWR VALUE TO ALL DACS
2214 014132 005000 CLR RO ;CLEAR RO
2215 014134 004737 014142 JSR PC,10$ ;LOAD ALL DAC'S WITH 0
2216 014140 000765 BR 1$
2217
2218 014142 10$:
2219
2220 ;* MOV $TMDAT,$DAC0 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC0
2221
2222 ;* MOV $TMDAT,$DAC1 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC1
2223
2224 ;* MOV $TMDAT,$DAC2 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC2
2225
2226 ;* MOV $TMDAT,$DAC3 ;/ PUT DATA FROM $TMDAT TO DEVICE REG DAC3
2227 014202 012700 000020 MOV #20,RO ;LOAD DELAY COUNTER
2228 014206 005300 11$: DEC RO ;DELAY
2229 014210 100376 BPL 11$ ;WAIT
2230 014212 000207 RTS PC ;EXIT
2231
2232
2233 .SBTTL SUBROUTINE TO ERASE STORAGE SCOPE SCREEN
2234 014214 104407 CLRVC: CKSWR
2235 014216 032777 000040 164714 BIT #BIT5,$SWR ;TEST SR BIT 5
2236 014224 001461 BEQ 3$ ;BR IF NOT A STORAGE SCOPE
2237 014226 012737 002000 001534 MOV #BIT10,$TMDAT ;ERASE THE SCREEN
2238
2239 ;* MOV $TMDAT,$STAT ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
2240

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F05

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2241      ;*      MOV      @STAT,$TMDAT      ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
2242 014254 052737 010000 001534      BIS      #BIT12,$TMDAT
2243
2244      ;*      MOV      $TMDAT,@STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
2245 014272 012700 000020      MOV      #20,R0      ;SET UP DELAY
2246 014276 005001      CLR      R1
2247 014300 032777 000040 164632 1$:      BIT      #BITS,@SWR      ;TEST IF NOT STORAGE SCOPE
2248 014306 001430      BEQ      3$
2249
2250      ;*      MOV      @STAT,$TMDAT      ;/READ DEVICE REG STAT,PUT DATA IN $TMDAT.
2251 014320 105737 001534      TSTB    $TMDAT
2252 014324 100421      BMI     3$      ;BRANCH IF SET
2253 014326 005301      DEC     R1      ;DELAY
2254 014330 001363      BNE     1$
2255 014332 004737 013672      JSR     PC,ACTRLC      ;TEST FOR CTRL C
2256 014336 005300      DEC     R0      ;DELAY
2257 014340 001357      BNE     1$
2258 014342 037727 164572 010000      BIT     @SWR,#SW12      ;TEST INHIBIT PRINTOUT
2259 014350 001002      BNE     2$
2260 014352 104401      TYPE
2261 014354 016135      MES3
2262 014356 104407      2$:      CKSWR      ;TEST FOR CTRL C
2263 014360 005777 164554      TST     @SWR      ;TEST @SWR
2264 014364 100001      BPL     3$
2265 014366 000000      HALT
2266 014370 000207      3$:      RTS      PC      ;ERASE RETURN FAILED TO SET READY
2267
2268      .SETTL  SUBROUTINE TO DRAW A HORIZONTAL LINE
2269 014372 012737 000000 001534 LOADVC: MOV      #0,$TMDAT      ;CLEAR STATUS
2270
2271      ;*      MOV      $TMDAT,@STAT      ;/ PUT DATA FROM $TMDAT TO DEVICE REG STAT
2272 014410 012737 007777 021156      MOV      #7777,TEMP1
2273 014416 013700 001536      MOV      STAT,R0
2274 014422 032777 000010 164510      BIT     #SW03,@SWR      ;TEST SR BIT 3
2275 014430 001405      BEQ     4$      ;BR IF DAC #0 AND 1
2276 014432 013701 001544      MOV     DAC2,R1 ;LOAD X AXIS
2277 014436 013702 001546      MOV     DAC3,R2 ;LOAD Y AXIS
2278 014442 000404      BR      5$
2279 014444 013701 001540      4$:      MOV     DAC0,R1
2280 014450 013702 001542      MOV     DAC1,R2
2281 014454 012710 002000      5$:      MOV     #BIT10,(0)      ;SET STORE MODE
2282 014460 013712 021156      MOV     TEMP1,(2)
2283 014464 012711 007777      1$:      MOV     #7777,(1)
2284 014470 000402      BR      3$
2285 014472 162711 000010      2$:      SUB     #10,(1)
2286 014476 005210      3$:      INC     (0)
2287 014500 105710      TSTB   (0)
2288 014502 100376      BPL     -2
2289 014504 022711 000007      CMP     #7,(1)
2290 014510 001370      BNE     2$
2291 014512 104407      CKSWR
2292 014514 004737 013672      JSR     PC,ACTRLC      ;TEST FOR CTRL G
2293 014520 162712 000010      SUB     #10,(2)      ;TEST FOR CTRL C
2294 014524 100357      BPL     1$
  
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2295 014526 000207          RTS      PC
2296
2297 014530 167772          FILZ:   167772          ;DR11-C OUTPUT CONTROL REGISTER
2298
2299          ;SUBROUTINE TO LOAD THE EDC VOLTAGE
2300          ;DATA FORMAT IS:
2301          ;
2302          ;
2303          ;
2304          ;
2305          ;
2306          ;
2307          ;
2308          ;
2309          ;
2310          ;
2311 014532 012500          SNDVLT:  MOV      (R5)+,R0          ;LOAD POINTER
2312 014534 112001          2$:      MOVB     (R0)+,R1          ;GET A BYTE
2313 014536 001446          BEQ      3$              ;BR IF TERM.
2314 014540 005101          COM     R1              ;CONVERT IT
2315 014542 110137 001534  MOVB     R1,$TMDAT        ;LOAD FUNNY DATA BYTE
2316
2317          ;*      MOV      $TMDAT,$FILZ          ;/ PUT DATA FROM $TMDAT TO DEVICE REG FILZ
2318 014556 012701 001000          ;*      MOV      #1000,R1          ;LOAD DELAY
2319 014562 005301          5$:      DEC     R1              ;DELAY
2320 014564 001376          BNE     5$
2321
2322          ;*      MOV      $FILZ,$TMDAT          ;/READ DEVICE REG FILZ,PUT DATA IN $TMDAT.
2323 014576 042737 000200 001534          ;*      BIC     #BIT7,$TMDAT
2324
2325          ;*      MOV      $TMDAT,$FILZ          ;/ PUT DATA FROM $TMDAT TO DEVICE REG FILZ
2326 014614 012701 001000          ;*      MOV      #1000,R1          ;LOAD DELAY COUNT
2327 014620 005301          1$:      DEC     R1              ;DELAY
2328 014622 001376          BNE     1$
2329
2330          ;*      MOV      $FILZ,$TMDAT          ;/READ DEVICE REG FILZ.PUT DATA IN $TMDAT.
2331 014634 052737 000200 001534          ;*      BIS     #BIT7,$TMDAT
2332
2333          ;*      MOV      $TMDAT,$FILZ          ;/ PUT DATA FROM $TMDAT TO DEVICE REG FILZ
2334 014652 000730          ;*      BR      2$              ;DO MORE DATA
2335
2336 014654 012701 000000          3$:      MOV     #0,R1              ;LOAD DELAY
2337 014660 012737 000177 001534          3$:      MOV     #177,$TMDAT        ;SET BITS 0-6
2338
2339          ;*      MOV      $TMDAT,$FILZ          ;/ PUT DATA FROM $TMDAT TO DEVICE REG FILZ
2340 014676 005301          4$:      DEC     R1              ;DELAY
2341 014700 001376          BNE     4$
2342 014702 000205          RTS     R5              ;EXIT
2343
2344 014704 012537 014754          CROSS:  MOV     (R5)+,10$        ;READ REG.
2345 014710 052737 000177 014754          CROSS:  BIS     #177,10$        ;LOAD LOW 7 BITS
2346 014716 013737 014754 001534          CROSS:  MOV     10,$TMDAT        ;LOAD RELAYS
2347
2348          ;*      MOV      $TMDAT,$FILZ          ;/ PUT DATA FROM $TMDAT TO DEVICE REG FILZ
    
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2349 014734 012700 000001      MOV      #1,RO      ;LOAD DELAY
2350 014740 005001      CLR      R1
2351 014742 005301      1$:     DEC      R1      ;DELAY
2352 014744 001376      BNE     1$
2353 014746 005300      DEC     RO      ;DELAY
2354 014750 001374      BNE     1$      ;DONE ?
2355 014752 000205      RTS     RS      ;EXIT
2356 014754 000000      10$:    0
2357      .SBTTL  TIMER ROUTINE FOR VISUAL TEST PATTERNS
2358      ; ENTER VIA JSR PC,TIMER
2359
2360 014756 104407      TIMER:  CKSWR
2361 014760 004737 013672      JSR     PC,ACTRLC ;TEST FOR CTRL C
2362 014764 017737 164150 021150      MOV     @SWR,TIMSV
2363
2364 014772 032737 300450 021150  TIMERA:  BIT     #BIT8,TIMSV
2365 015000 001006      BNE     TIMER2    ;BIT 8 SET ?
2366 015002 005337 021152      DEC     TICKS     ;NO, DECREMENT TICKS
2367 015006 001002      BNE     TIMER1
2368 015010 062716 000002      ADD     #2,(6)    ;ADD 2 TO $TACK POINTER
2369 015014 000207      TIMER1: RTS     PC ;RETURN
2370
2371      ; SWR 8=1 SELECT TEST TO LOCK ON
2372      ; SWR 2-0= TEST NUMBER
2373
2374 015016 042737 177770 021150  TIMER2:  BIC     #177770,TIMSV
2375 015024 006337 021150      ASL     TIMSV
2376 015030 062737 015052 021150      ADD     #ROUTPT,TIMSV
2377 015036 017737 004106 021150      MOV     @TIMSV,TIMSV
2378 015044 022600      CMP     (SP)+,RO
2379 015046 000177 004076      TIMER4: JMP     @TIMSV
2380
2381 015052 007402      ROUTPT: PICO     ;DISPLAY A HORIZONTAL LINE
2382 015054 007502      PIC1     ;DISPLAY A VERTICAL LINE
2383 015056 010024      PIC3     ;DISPLAY A SQUARE
2384 015060 010562      PIC4     ;DISPALY A "X"
2385 015062 011264      PIC6     ;DISPLAY CHARACTER SET
2386
2387 015064 013737 015110 021160  CHTIME:  MOV     CPTYPE,BRLEVI
2388 015072 005337 021160      1$:     DEC     BRLEVI
2389 015076 001403      BEQ     2$
2390 015100 006337 021152      ASL     TICKS
2391 015104 000772      BR     1$
2392 015106 000207      2$:     RTS     PC
2393
2394 015110 000001      CPTYPE: 1
2395
2396      ;DO 32 CONVERSIONS ON EACH PRESET VALUE OF THE DAC'S
2397      ;AND SUBTRACT THE FIRST RESULT FROM EACH OF THE RESULTS
2398
2399 015112 013537 015202      FUNDAC: MOV     @R5+,XDACUT ;GET BUS ADDRESS OF ARUT DAC
2400 015116 012537 015142      MOV     (R5)+,60$ ;GET CHANNEL INPUT FOR ARKG
2401 015122 012777 007600 000052      MOV     #7600,@XDACUT ;PRESET THE DAC
2402 015130 012737 007600 001124      MOV     #7600,$GDDAT ;LOAD EXPECTED
    
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2403
2404 015136 004537 015204 1$: JSR R5,CONVRT ; CONVERT USING ARKG
2405 015142 000051 60$: CH51 ;
2406
2407 015144 012737 000010 015420 MOV #10,SPREAD ; LOAD LIMIT
2408 015152 004737 015422 JSR PC,COMPAR ; TEST IF WITHIN LIMIT
2409 015156 000401 BR 2$ ;; BR IF WITHIN
2410 015160 104016 ERROR 16 ; SELECTED DAC HAS A LINEARITY ERROR
2411
2412 015162 162777 000400 000012 2$: SUB #400,@XDACUT ; UPDATE DAC
2413 015170 162737 000400 001124 SUB #400,$GDDAT ; UPDATE GOOD VALUE
2414 015176 001357 BNE 1$ ;; BR IF NOT FINISHED
2415
2416 015200 000000 10$: 0
2417 015202 000000 XDACUT: 0
2418 ; SUBROUTINE TO GET AVERAGE OF 32 CONVERSIONS FROM THE KNOWN GOOD AR 11
2419
2420 015204 012537 015374 CONVRT: MOV (R5)+,10$
2421 015210 013737 015374 015416 MOV 10$,CHANL
2422 015216 000337 015374 SWAB 10$
2423 015222 012737 000020 015376 MOV #16,,11$
2424 015230 005037 015412 CLR ADEND
2425 015234 013737 015374 001534 MOV 10$, $TMDAT
2426
2427 ; * MOV $TMDAT,@GADCS ; / PUT DATA FROM $TMDAT TO DEVICE REG GADCS
2428 015252 005237 001534 2$: INC $TMDAT
2429
2430 ; * MOV $TMDAT,@GADCS ; / PUT DATA FROM $TMDAT TO DEVICE REG GADCS
2431 015266 1$:
2432
2433 ; * MOV @GADCS,$TMDAT ; / READ DEVICE REG GADCS, PUT DATA IN $TMDAT.
2434 015276 105737 001534 ; * TSTB $TMDAT
2435 015302 100371 BPL 1$
2436
2437 ; * MOV @GADDBR,$TMDAT ; / READ DEVICE REG GADDBR, PUT DATA IN $TMDAT.
2438 015314 063737 001534 015412 ; * ADD $TMDAT,@ADEND
2439
2440 ; * MOV $TMDAT,@GADDBR ; / PUT DATA FROM $TMDAT TO DEVICE REG GADDBR
2441 015332 005337 015376 ; * DEC 11$
2442 015336 001345 BNE 2$
2443 015340 006237 015412 ASR ADEND
2444 015344 006237 015412 ASR ADEND
2445 015350 006237 015412 ASR ADEND
2446 015354 006237 015412 ASR ADEND
2447 015360 005537 015412 ADC ADEND ; ROUND UP
2448 015364 013737 015412 001126 MOV ADEND,$BDDAT
2449 015372 000205 RTS R5
2450
2451 015374 000000 10$: 0
2452 015376 000000 11$: 0
2453 015400 001754 V1754: 1754
2454 015402 000024 V24: 24
2455 015404 170460 GADCS: 170460
2456 015406 170462 GADDBR: 170462

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2457 015410 170470          GSTAT: 170470
2458 015412 000000          ADEND: 0
2459 015414 000000          FCHANL: 0
2460 015416 000000          CHANL: 0
2461 015420 000000          SPREAD: 0
2462
2463 015422 010046          COMPAR: MOV      RO, -(SP)
2464 015424 010146          MOV      R1, -(SP)
2465 015426 013700 001124    MOV      $GDDAT, RO          ;LOAD RO
2466 015432 013701 001126    MOV      $BDDAT, R1         ;LOAD R1
2467 015436 160100          SUB      R1, RO              ;SUBTRACT
2468 015440 100001          BPL      8$                  ;
2469 015442 005400          NEG      RO
2470 015444 020037 015420    8$:     CMP      RO, SPREAD    ;MAGNITUDE OF DIFF. IN RO
2471 015450 003405          BLE     10$
2472 015452 012601          9$:     MOV      (SP)+, R1
2473 015454 012600          MOV      (SP)+, RO
2474 015456 062716 000002    ADD      #2, (SP)
2475 015462 000207          RTS      PC
2476
2477 015464 012601          10$:    MOV      (SP)+, R1
2478 015466 012600          MOV      (SP)+, RO
2479 015470 000207          RTS      PC
2480
2481          .SBTTL  ASCII MESSAGES
2482
2483 015472 005015 040412 030501  TITLE:  .ASCII <15><12><12>'AA11-K DIAGNOSTIC TEST. (MAINDEC-11-DRLPB-AD)'<<15><12>
2484 015500 026461 020113 044504
2485 015506 043501 047516 052123
2486 015514 041511 052040 051505
2487 015522 026124 024040 040515
2488 015530 047111 042504 026503
2489 015536 030461 042055 046122
2490 015544 041120 040455 024460
2491 015552 005015
2492 015554 042523 042514 052103  .ASCII /SELECT TESTS BY TYPING A TWO LETTER I.D./<15><12>
2493 015562 052040 051505 051524
2494 015570 041040 020131 054524
2495 015576 044520 043516 040440
2496 015604 052040 047527 046040
2497 015612 052105 042524 020122
2498 015620 027111 027104 005015
2499 015626 046101 035011 052501  .ASCII /AL      :AUTO LOGIC TEST/<15><12>
2500 015634 047524 046040 043517
2501 015642 041511 052040 051505
2502 015650 006524 012
2503 015653 101 004504 040472  .ASCII /AD      :AUTO DISPLAY TEST (DISPLAY SCOPE CONNECTED)/<15><12>
2504 015660 052125 020117 044504
2505 015666 050123 040514 020131
2506 015674 042524 052123 024040
2507 015702 044504 050123 040514
2508 015710 020131 041523 050117
2509 015716 020105 047503 047116
2510 015724 041505 042524 024504

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K05

MAINDEC-11-DRLPB-A
DRLPB.P11

AA11-K
ASCII MESSAGES

DIAGNOSTIC

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SEQ 0062

2511	015732	005015		
2512	015734	046115	035011	040515
2513	015742	052516	046101	046040
2514	015750	043517	041511	052040
2515	015756	051505	020124	051450
2516	015764	051127	030440	026465
2517	015772	031461	036440	051040
2518	016000	043505	051511	042524
2519	016006	020122	030440	026462
2520	016014	020060	020075	040504
2521	016022	040524	006451	012
2522	016027	115	004504	046472
2523	016034	047101	040525	020114
2524	016042	044504	050123	040514
2525	016050	020131	047050	020117
2526	016056	044504	050123	040514
2527	016064	020131	041523	050117
2528	016072	024505	005015	
2529	016076	041515	035011	040515
2530	016104	052516	046101	041440
2531	016112	046101	041111	040522
2532	016120	044524	047117	046040
2533	016126	047517	006520	012
2534	016133	056	000	
2535	016135	015	042412	040522
2536	016142	042523	051040	052105
2537	016150	051125	020116	040506
2538	016156	046111	042105	052040
2539	016164	020117	042523	020124
2540	016172	042522	042101	006531
2541	016200	000012		
2542	016202	005015	041523	050117
2543	016210	020115	042101	052512
2544	016216	052123	042515	052116
2545	016224	052040	051505	000124
2546	016232	005015	053523	034122
2547	016240	040440	042116	030040
2548	016246	052040	051110	020125
2549	016254	020062	047503	052116
2550	016262	047522	020114	040520
2551	016270	052124	051105	006516
2552	016276	012		
2553	016277	123	051127	041040
2554	016304	052111	031440	051440
2555	016312	046105	041505	051524
2556	016320	042040	041501	030040
2557	016326	030453	047440	020122
2558	016334	040504	020103	025462
2559	016342	006463	012	
2560	016345	123	051127	041040
2561	016352	052111	032440	051440
2562	016360	046105	041505	051524
2563	016366	051440	047524	040522
2564	016374	042507	051440	047503

.ASCII /ML :MANUAL LOGIC TEST (SWR 15-13 = REGISTER 12-0 = DATA)/<15><12>

.ASCII /MD :MANUAL DISPLAY (NO DISPLAY SCOPE)/<15><12>

.ASCII /MC :MANUAL CALIBRATION LOOP/<15><12>

MES3: .ASCIZ /./
.ASCIZ <15><12>"ERASE RETURN FAILED TO SET READY"<15><12>

MES6: .ASCIZ <15><12>'SCOPE ADJUSTMENT TEST'

MES15: .ASCII <15><12>/SWRB AND 0 THRU 2 CONTROL PATTERN/<15><12>

.ASCII 'SWR BIT 3 SELECTS DAC 0+1 OR DAC 2+3'<15><12>

.ASCII /SWR BIT 5 SELECTS STORAGE SCOPE MODE/<15><12>

2565	016402	042520	046440	042117	
2566	016410	006505	012		
2567	016413	123	051127	041040	.ASCII /SWR BIT 7 ENABLES VERTICAL SETTling TEST/<<15><12>
2568	016420	052111	033440	042440	
2569	016426	040516	046102	051505	
2570	016434	053040	051105	044524	
2571	016442	040503	020114	042523	
2572	016450	052124	044514	043516	
2573	016456	052040	051505	006524	
2574	016464	012			
2575	016465	123	051127	041040	.ASCIZ /SWR BIT 9 SELECTS TWO'S COMPLEMENT DISPLAY MODE/<<15><12>
2576	016472	052111	034440	051440	
2577	016500	046105	041505	051524	
2578	016506	052040	047527	051447	
2579	016514	041440	046517	046120	
2580	016522	046505	047105	020124	
2581	016530	044504	050123	040514	
2582	016536	020131	047515	042504	
2583	016544	005015	000		
2584	016547	123	040524	052524	EM1: .ASCIZ /STATUS REGISTER IN ERROR/
2585	016554	020123	042522	044507	
2586	016562	052123	051105	044440	
2587	016570	020116	051105	047522	
2588	016576	000122			
2589	016600	040504	030103	051040	EM2: .ASCIZ /DAC0 REGISTER IN ERROR/
2590	016606	043505	051511	042524	
2591	016614	020122	047111	042440	
2592	016622	051122	051117	000	
2593	016627	104	041501	020061	EM3: .ASCIZ /DAC1 REGISTER IN ERROR/
2594	016634	042522	044507	052123	
2595	016642	051105	044440	020116	
2596	016650	051105	047522	000122	
2597	016656	040504	031103	051040	EM4: .ASCIZ /DAC2 REGISTER IN ERROR/
2598	016664	043505	051511	042524	
2599	016672	020122	047111	042440	
2600	016700	051122	051117	000	
2601	016705	104	041501	020063	EM5: .ASCIZ /DAC3 REGISTER IN ERROR/
2602	016712	042522	044507	052123	
2603	016720	051105	044440	020116	
2604	016726	051105	047522	000122	
2605	016734	040501	030461	045455	EM6: .ASCIZ /AA11-K FAILED TO INTERRUPT/
2606	016742	043040	044501	042514	
2607	016750	020104	047524	044440	
2608	016756	052116	051105	052522	
2609	016764	052120	000		
2610	016767	101	030501	026461	EM7: .ASCIZ /AA11-K INTERRUPTED IN ERROR/
2611	016774	020113	047111	042524	
2612	017002	051122	050125	042524	
2613	017010	020104	047111	042440	
2614	017016	051122	051117	000	
2615	017023	102	051525	052040	EM10: .ASCIZ /BUS TIME-OUT WHEN REFERENCING THE AA11-K/
2616	017030	046511	026505	052517	
2617	017036	020124	044127	047105	
2618	017044	051040	043105	051105	

MOS

MAINDEC-11-DRLPB-A

AA11-K

DIAGNOSTIC

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SEQ 0064

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ASCII MESSAGES

2619	017052	047105	044503	043516				
2620	017060	052040	042510	040440				
2621	017066	030501	026461	000113				
2622	017074	040501	030461	045455	EM11:	.ASCIZ	/AA11-K READY BIT ERROR/	
2623	017102	051040	040505	054504				
2624	017110	041040	052111	042440				
2625	017116	051122	051117	000				
2626	017123	120	053517	051105	EM12:	.ASCIZ	/POWER SUPPLY VOLTAGE WAS INCORRECT/	
2627	017130	051440	050125	046120				
2628	017136	020131	047526	052114				
2629	017144	043501	020105	040527				
2630	017152	020123	047111	047503				
2631	017160	051122	041505	000124				
2632	017166	047117	020105	044502	EM13:	.ASCIZ	/ONE BIT THE DUST/	
2633	017174	020124	044124	020105				
2634	017202	052504	052123	000				
2635	017207	101	030501	026461	EM14:	.ASCIZ	/AA11-K LOGIC SIGNAL HIGH OUTPUT TO LOW/	
2636	017214	020113	047514	044507				
2637	017222	020103	044523	047107				
2638	017230	046101	044040	043511				
2639	017236	020110	052517	050124				
2640	017244	052125	052040	020117				
2641	017252	047514	000127					
2642	017256	040501	030461	045455	EM15:	.ASCIZ	/AA11-K LOGIC SIGNAL LOW OUTPUT TO HIGH/	
2643	017264	046040	043517	041511				
2644	017272	051440	043511	040516				
2645	017300	020114	047514	020127				
2646	017306	052517	050124	052125				
2647	017314	020104	020117	044510				
2648	017322	044107	000					
2649	017325	123	046105	041505	EM16:	.ASCIZ	/SELECTED DAC HAS A LINEARITY ERROR/	
2650	017332	042524	020104	040504				
2651	017340	020103	040510	020123				
2652	017346	020101	044514	042516				
2653	017354	051101	052111	020131				
2654	017362	051105	047522	000122				
2655	017370	051105	050122	004503	DH1:	.ASCIZ	/ERRPC IBASE EXPECT BAD/	
2656	017376	041111	051501	020105				
2657	017404	020040	054105	042520				
2658	017412	052103	020040	020040				
2659	017420	040502	000104					
2660	017424	051105	050122	004503	DH6:	.ASCIZ	/ERRPC IBASE/	
2661	017432	041111	051501	000105				
2662	017440	051105	050122	004503	DH13:	.ASCIZ	/ERRPC IBASE # FIRST # NOW/	
2663	017446	041111	051501	004505				
2664	017454	020043	044506	051522				
2665	017462	004524	020043	047516				
2666	017470	000127						
2667	017472	051105	050122	004503	DH14:	.ASCIZ	/ERRPC IBASE GOOD BAD/	
2668	017500	041111	051501	004505				
2669	017506	047507	042117	041011				
2670	017514	042101	000					
2671								
2672	017517	015	012	077	QMARK:	.BYTE	15,12,77,15,12,0	

N05

MAINDEC-11-DRLPB-A
DRLPB.P11

AA11-K
ASCII MESSAGES

DIAGNOSTIC

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SEQ 0065

2673	017522	015	012	000	
2674	017525	136	103	015	CONT : .BYTE 136,103,15,12,56,0
2675	017530	012	056	000	
2676	017533	015	012		FOUND1: .BYTE 15,12
2677	017535	120	047522	051107	.ASCIZ /PROGRAM DETECTED /
2678	017542	046501	042040	052105	
2679	017550	041505	042524	020104	
2680	017556	000			
2681	017557	050	024470	020040	FOUND2: .ASCIZ /(8) AA11-K(S) /
2682	017564	040440	030501	026461	
2683	017572	024113	024523	020040	
2684	017600	000			
2685	017601	015	012	000	SELD01: .BYTE 15,12,0
2686	017604	015	012		.BYTE 15,12
2687	017606	042523	020124	053523	.ASCIZ /SET SWITCH TO SELECT DAC 0 AND 1/<15><12>
2688	017614	052111	044103	052040	
2689	017622	020117	042523	042514	
2690	017630	052103	042040	041501	
2691	017636	030040	040440	042116	
2692	017644	030440	005015	000	
2693	017651	015	012		SELD23: .BYTE 15,12
2694	017653	123	052105	051440	.ASCIZ /SET SWITCH TO SELECT DAC 2 AND 3/<15><12>
2695	017660	044527	041524	020110	
2696	017666	047524	051440	046105	
2697	017674	041505	020124	040504	
2698	017702	020103	020062	047101	
2699	017710	020104	006463	000012	
2700	017716	015	012		CALDON: .BYTE 15,12
2701	017720	052501	047524	041440	.ASCIZ /AUTO CALIBRATION COMPLETED/<15><12>
2702	017726	046101	041111	040522	
2703	017734	044524	047117	041440	
2704	017742	046517	046120	052105	
2705	017750	042105	005015	000	
2706	017755	015	012		MANHED: .BYTE 15,12
2707	017757	123	020127	032461	.ASCIZ /SW 15-13 SELECT THE REGISTER/<15><12>
2708	017764	030455	020063	042523	
2709	017772	042514	052103	052040	
2710	020000	042510	051040	043505	
2711	020006	051511	042524	006522	
2712	020014	012			
2713	020015	123	020127	031061	.ASCIZ /SW 12-00 ARE LOADED INTO THE SELECTED REGISTER/<15><12>
2714	020022	030055	020060	051101	
2715	020030	020105	047514	042101	
2716	020036	042105	044440	052116	
2717	020044	020117	044124	020105	
2718	020052	042523	042514	052103	
2719	020060	042105	051040	043505	
2720	020066	051511	042524	006522	
2721	020074	012			
2722	020075	000			
2723	020076	015	012		AUTOCL: .BYTE 0
2724	020100	052501	047524	041440	.BYTE 15,12
2725	020106	046101	041111	040522	.ASCIZ /AUTO CALIBRATION (AA11-K OPTION TEST AREA ONLY)/
2726	020114	044524	047117	024040	

2727	020122	040501	030461	045455
2728	020130	047440	052120	047511
2729	020136	020116	042524	052123
2730	020144	040440	042522	020101
2731	020152	047117	054514	051
2732	020157	015	012	000
2733	020162	005015	052502	020123
2734	020170	051124	050101	053440
2735	020176	042510	020116	047514
2736	020204	042101	047111	020107
2737	020212	047526	052114	043501
2738	020220	020105	051117	041440
2739	020226	040510	043516	047111
2740	020234	020107	020101	042522
2741	020242	040514	006531	012
2742	020247	077	004477	040501
2743	020254	030461	045115	047440
2744	020262	052120	047	020116
2745	020270	042524	052123	040440
2746	020276	042522	020101	037477
2747	020304	006411	000012	
2748				
2749	020310	005015	042101	052512
2750	020316	052123	051040	034063
2751	020324	043040	051117	040440
2752	020332	047040	046125	020114
2753	020340	047117	052040	042510
2754	020346	046440	052105	051105
2755	020354	000		
2756	020355	015	040412	045104
2757	020362	051525	020124	032122
2758	020370	020060	047506	020122
2759	020376	020101	052516	046114
2760	020404	047440	020116	044124
2761	020412	020105	042515	042524
2762	020420	000122		
2763	020422	005015	042101	052512
2764	020430	052123	051040	031062
2765	020436	043040	051117	040440
2766	020444	047040	046125	020114
2767	020452	047117	052040	042510
2768	020460	046440	052105	051105
2769	020466	000		
2770	020467	015	040412	045104
2771	020474	051525	020124	032122
2772	020502	020064	047506	020122
2773	020510	020101	052516	046114
2774	020516	047440	020116	044124
2775	020524	020105	042515	042524
2776	020532	000122		
2777	020534	005015	042101	052512
2778	020542	052123	051040	033463
2779	020550	043040	051117	040440
2780	020556	047040	046125	020114

AUTOER: .BYTE 15,12,0
.ASCII <15><12>/BUS TRAP WHEN LOADING VOLTAGE OR CHANGING A RELAY/<15><12>

.ASCIZ ?? AA11-K OPTION TEST AREA ?? /<15><12>

R38: .ASCIZ <15><12>/ADJUST R38 FOR A NULL ON THE METER/

R40: .ASCIZ <15><12>/ADJUST R40 FOR A NULL ON THE METER/

R22: .ASCIZ <15><12>/ADJUST R22 FOR A NULL ON THE METER/

R44: .ASCIZ <15><12>/ADJUST R44 FOR A NULL ON THE METER/

R37: .ASCIZ <15><12>/ADJUST R37 FOR A NULL ON THE METER/

2781	020564	047117	052040	042510	
2782	020572	046440	052105	051105	
2783	020600	000			
2784	020601	015	040412	045104	R39: .ASCIZ <15><12>/ADJUST R39 FOR A NULL ON THE METER/
2785	020606	051525	020124	031522	
2786	020614	020071	047506	020122	
2787	020622	020101	052516	046114	
2788	020630	047440	020116	044124	
2789	020636	020105	042515	042524	
2790	020644	000122			
2791	020646	005015	042101	052512	R41: .ASCIZ <15><12>/ADJUST R41 FOR A NULL ON THE METER/
2792	020654	052123	051040	030464	
2793	020662	043040	051117	040440	
2794	020670	047040	046125	020114	
2795	020676	047117	052040	042510	
2796	020704	046440	052105	051105	
2797	020712	000			
2798	020713	015	040412	045104	R43: .ASCIZ <15><12>/ADJUST R43 FOR A NULL ON THE METER/
2799	020720	051525	020124	032122	
2800	020726	020063	047506	020122	
2801	020734	020101	052516	046114	
2802	020742	047440	020116	044124	
2803	020750	020105	042515	042524	
2804	020756	000122			
2805		000001			
2806		000003			
2807	020760	001			N50000: STX=1 ETX=3 .BYTE STX .ASCII /N500000V/
2808	020761	116	030065	030060	
2809	020766	030060	126		
2810	020771	003	000		
2811	020773	001			P49976: .BYTE ETX,0 .BYTE STX .ASCII /P499760V/
2812	020774	032120	034471	033067	
2813	021002	053060			
2814	021004	003	000		.BYTE ETX,0
2815					.EVEN
2816	021006	001116	001536	001124	DT1: \$ERRPC, STAT, \$GDDAT, \$BDDAT, 0
2817	021014	001126	000000		
2818	021020	001116	001540	001124	DT2: \$ERRPC, DAC0, \$GDDAT, \$BDDAT, 0
2819	021026	001126	000000		
2820	021032	001116	001542	001124	DT3: \$ERRPC, DAC1, \$GDDAT, \$BDDAT, 0
2821	021040	001126	000000		
2822	021044	001116	001544	001124	DT4: \$ERRPC, DAC2, \$GDDAT, \$BDDAT, 0
2823	021052	001126	000000		
2824	021056	001116	001546	001124	DT5: \$ERRPC, DAC3, \$GDDAT, \$BDDAT, 0
2825	021064	001126	000000		
2826	021070	001116	001536	000000	DT6: \$ERRPC, STAT, 0
2827	021076	001116	001536	021164	DT13: \$ERRPC, STAT, EVER, \$UNIT, 0
2828	021104	001206	000000		
2829	021110	001116	001536	001124	DT14: \$ERRPC, STAT, \$GDDAT, \$BDDAT, 0
2830	021116	001126	000000		
2831	021122	000000	000000	000000	DF0: 0,0,0,0,0,0,0,0
2832	021130	000000	000000	000000	
2833	021136	000000	000000		
2834	021142	000000			LOW: 0

2835	021144	000000
2836	021146	000010
2837	021150	000000
2838	021152	000000
2839	021154	000000

HIGH:	0
INCR:	10
TIMSV:	0
TICKS:	0
TEMP:	0

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2840 021156 000000
2841 021160 000000
2842 021162 000000
2843 021164 000000
2844 021166 000000
2845 021170 000000
2846 021172 000000
2847 021174 000000
2848
2849
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2861 021176
2862 021176 010046
2863 021200 010146
2864 021202 010246
2865 021204 010346
2866 021206 010546
2867 021210 012746 020200
2868 021214 016605 000020
2869 021220 100004
2870 021222 005405
2871 021224 112766 000055 000001
2872 021232 005000
2873 021234 012703 021412
2874 021240 112723 000040
2875 021244 005002
2876 021246 016001 021402
2877 021252 160105
2878 021254 002402
2879 021256 005202
2880 021260 000774
2881 021262 060105
2882 021264 005702
2883 021266 001002
2884 021270 105716
2885 021272 100407
2886 021274 106316
2887 021276 103003
2888 021300 116663 000001 177777
2889 021306 052702 000060
2890 021312 052702 000040
2891 021316 110223
2892 021320 005720
2893 021322 020027 000010

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TEMP1: 0 ;TEMPORARY STORAGE
BRLEV1: 0
BRLEV2: 0
EVER: 0
EVER1: 0
OPRIN: 0
P7CNT: 0
P7PNT: 0

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

$TYPDS:
MOV R0,-(SP) ;PUSH R0 ON STACK
MOV R1,-(SP) ;PUSH R1 ON STACK
MOV R2,-(SP) ;PUSH R2 ON STACK
MOV R3,-(SP) ;PUSH R3 ON STACK
MOV R5,-(SP) ;PUSH R5 ON STACK
MOV #20200,-(SP) ;SET BLANK SWITCH AND SIGN
MOV 20(SP),R5 ;GET THE INPUT NUMBER
BPL 1$ ;BR IF INPUT IS POS.
NEG R5 ;MAKE THE BINARY NUMBER POS.
MOVB #'-,1(SP) ;MAKE THE ASCII NUMBER NEG.
CLR R0 ;ZERO THE CONSTANTS INDEX
MOV #SDBLK,R3 ;SETUP THE OUTPUT POINTER
MOVB #' ,(R3)+ ;SET THE FIRST CHARACTER TO A BLANK
CLR R2 ;CLEAR THE BCD NUMBER
MOV $OTBL(R0),R1 ;GET THE CONSTANT
SUB R1,R5 ;FORM THIS BCD DIGIT
BLT 4$ ;BR IF DON
INC R2 ;INCREASE THE BCD DIGIT BY 1
BR 3$
4$: ADD R1,R5 ;ADD BACK THE CONSTANT
TST R2 ;CHECK IF BCD DIGIT=0
BNE 5$ ;FALL THROUGH IF 0
TSTB (SP) ;STILL DOING LEADING 0'S?
BMI 7$ ;BR IF YES
ASLB (SP) ;MSD?
BCC 6$ ;BR IF NO
MOVB 1(SP),-1(R3) ;YES--SET THE SIGN
BIS #'0,R2 ;MAKE THE BCD DIGIT ASCII
BIS #' ,R2 ;MAKE IT A SPACE IF NOT ALREADY A DIGIT
MOVB R2,(R3)+ ;PUT THIS CHARACTER IN THE OUTPUT BUFFER
TST (R0)+ ;JUST INCREMENTING
CMP R0,#10 ;CHECK THE TABLE INDEX

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2894 021326 002746          BLT      2$          ;; GO DO THE NEXT DIGIT
2895 021330 003002          BGT      8$          ;; GO TO EXIT
2896 021332 010502          MOV      R5,R2      ;; GET THE LSD
2897 021334 000764          BR       6$          ;; GO CHANGE TO ASCII
2898 021336 105726          8$: TSTB   (SP)+     ;; WAS THE LSD THE FIRST NON-ZERO?
2899 021340 100003          BPL      9$          ;; BR IF NO
2900 021342 116663 177777 177776  MOVB   -1(SP),-2(R3) ;; YES--SET THE SIGN FOR TYPING
2901 021350 105013          9$: CLRB   (R3)      ;; SET THE TERMINATOR
2902 021352 012605          MOV     (SP)+,R5    ;; POP STACK INTO R5
2903 021354 012603          MOV     (SP)+,R3    ;; POP STACK INTO R3
2904 021356 012602          MOV     (SP)+,R2    ;; POP STACK INTO R2
2905 021360 012601          MOV     (SP)+,R1    ;; POP STACK INTO R1
2906 021362 012600          MOV     (SP)+,R0    ;; POP STACK INTO R0
2907 021364 104401 021412  TYPE     $DBLK      ;; NOW TYPE THE NUMBER
2908 021370 016666 000002 000004  MOV     2(SP),4(SP) ;; ADJUST THE STACK
2909 021376 012616          MOV     (SP)+,(SP)
2910 021400 000002          RTI                      ;; RETURN TO USER
2911 021402 023420          $DTBL: 10000.
2912 021404 001750          1000.
2913 021406 000144          100.
2914 021410 000012          10.
2915 021412 000004          $DBLK: .BLKW 4
2916                                     .SBTTL SCOPE HANDLER ROUTINE
2917
2918                                     ; *****
2919                                     ; *THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
2920                                     ; *AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
2921                                     ; *AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
2922                                     ; *THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
2923                                     ; *SW14=1 LOOP ON TEST
2924                                     ; *SW11=1 INHIBIT ITERATIONS
2925                                     ; *SW08=1 LOOP ON TEST IN SWR<7:0>
2926                                     ; *CALL
2927                                     ; * SCOPE ;;SCOPE=IOT
2928
2929                                     $SCOPE:
2930 021422 104407          CKSWR          ;; TEST FOR CHANGE IN SOFT-SWR
2931 021424 004737 013672          JSR     PC,ACTRLC
2932 021430 032777 040000 157502 1$: BIT     #BIT14,@SWR ;; LOOP ON PRESENT TEST?
2933 021436 001070          BNE     $OVER     ;; YES IF SW14=1
2934                                     ; *****START OF CODE FOR THE XOR TESTER*****
2935 021440 000416          $XTSTR: BR     6$   ;; IF RUNNING ON THE "XOR" TESTER CHANGE
2936                                     ;; THIS INSTRUCTION TO A "NOP" (NOP=240)
2937 021442 013746 000004          MOV     @#ERRVEC, -(SP) ;; SAVE THE CONTENTS OF THE ERROR VECTOR
2938 021446 012737 021466 000004  MOV     #55,@#ERRVEC   ;; SET FOR TIMEOUT
2939 021454 005737 177060          TST     @#177060      ;; TIME OUT ON XOR?
2940 021460 012637 000004          MOV     (SP)+,@#ERRVEC ;; RESTORE THE ERROR VECTOR
2941 021464 000446          BR       $$VLAD      ;; GO TO THE NEXT TEST
2942 021466 022626          5$: CMP     (SP)+,(SP)+ ;; CLEAR THE STACK AFTER A TIME OUT
2943 021470 012637 000004          MOV     (SP)+,@#ERRVEC ;; RESTORE THE ERROR VECTOR
2944 021474 000451          BR       $OVER      ;; LOOP ON THE PRESENT TEST
2945 021476          6$: ; *****END OF CODE FOR THE XOR TESTER*****
2946 021476 032777 000400 157434  BIT     #BIT08,@SWR   ;; LOOP ON SPEC. TEST?
2947 021504 001404          BEQ     2$          ;; BR IF NO

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2948 021506 127737 157426 001102  CMPB  @SWR,$STSTNM  ;; ON THE RIGHT TEST? SWR<7:0>
2949 021514 001441  BEQ  $OVER  ;; BR IF YES
2950 021516 105737 001103 2$:  TSTB  $ERFLG  ;; HAS AN ERROR OCCURRED?
2951 021522 001404  BEQ  3$  ;; BR IF NO
2952 021524 105037 001103 4$:  CLRB  $ERFLG  ;; ZERO THE ERROR FLAG
2953 021530 005037 001166  CLR  $TIMES  ;; CLEAR THE NUMBER OF ITERATIONS TO MAKE
2954 021534 032777 004000 157376 3$:  BIT  #BIT11,@SWR  ;; INHIBIT ITERATIONS?
2955 021542 001011  BNE  1$  ;; BR IF YES
2956 021544 005737 001202  TST  $PASS  ;; IF FIRST PASS OF PROGRAM
2957 021550 001406  BEQ  1$  ;; INHIBIT ITERATIONS
2958 021552 005237 001104  INC  $ICNT  ;; INCREMENT ITERATION COUNT
2959 021556 023737 001166 001104  CMP  $TIMES,$ICNT  ;; CHECK THE NUMBER OF ITERATIONS MADE
2960 021564 002015  BGE  $OVER  ;; BR IF MORE ITERATION REQUIRED
2961 021566 012737 000001 001104 1$:  MOV  #1,$ICNT  ;; REINITIALIZE THE ITERATION COUNTER
2962 021574 013737 021634 001166  MOV  $MXCNT,$TIMES  ;; SET NUMBER OF ITERATIONS TO DO
2963 021602 105237 001102  $SVLAD: INCB  $STSTNM  ;; COUNT TEST NUMBERS
2964 021606 113737 001102 001200  MOVB  $STSTNM,$TESTN  ;; SET TEST NUMBER IN APT MAILBOX
2965 021614 011637 001106  MOV  (SP),$LPADR  ;; SAVE SCOPE LOOP ADDRESS
2966 021620 013777 001102 157314 $OVER: MOV  $STSTNM,@DISPLAY  ;; DISPLAY TEST NUMBER
2967 021626 013716 001106  MOV  $LPADR,(SP)  ;; FUDGE RETURN ADDRESS
2968 021632 000002  RTI  ;; FIXES PS
2969 021634 003720  $MXCNT: 2000  ;; MAX. NUMBER OF ITERATIONS
2970  .SBTTL  ERROR HANDLER ROUTINE
2971
2972  ;; *****
2973  ;; *THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
2974  ;; *SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
2975  ;; *AND GO TO $ERRTYP ON ERROR
2976  ;; *THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
2977  ;; *SW15=1 HALT ON ERROR
2978  ;; *SW13=1 INHIBIT ERROR TYPEOUTS
2979  ;; *CALL
2980  ;; *
2981  ERROR N ;;ERROR=EMT AND N=ERROR ITEM NUMBER
2982  $ERROR:
2983 021636 104407  CKSWR  ;; TEST FOR CHANGE IN SOFT-SWR
2984 021640 004737 013672  JSR  PC,$ACTRLC
2985 021644 105237 001103 7$:  INCB  $ERFLG  ;; SET THE ERROR FLAG
2986 021650 001775  BEQ  7$  ;; DON'T LET THE FLAG GO TO ZERO
2987 021652 013777 001102 157262  MOV  $STSTNM,@DISPLAY  ;; DISPLAY TEST NUMBER AND ERROR FLAG
2988 021660 005237 001112  INC  $ERRCNT  ;; INC THE ERROR COUNT
2989 021664 011637 001116  MOV  (SP),$ERRPC  ;; GET ADDRESS OF ERROR INSTRUCTION
2990 021670 162737 000002 001116  SUB  #2,$ERRPC
2991 021676 117737 157214 001114  MOVB  @ERRPC,$ITEMB  ;; STRIP AND SAVE THE ERROR ITEM CODE
2992 021704 032777 020000 157226  BIT  #BIT13,@SWR  ;; SKIP TYPEOUT IF SET
2993 021712 001004  BNE  20$  ;; SKIP TYPEOUTS
2994 021714 004737 021766  JSR  PC,$ERRTYP  ;; GO TO USER ERROR ROUTINE
2995 021720 104401 001171  TYPE  , $CRLF
2996 021724
2997 021724 122737 000001 001214 20$:  CMPB  #APTENV,$ENV  ;; RUNNING IN APT MODE
2998 021732 001007  BNE  2$  ;; NO SKIP APT ERROR REPORT
2999 021734 113737 001114 021746  MOVB  $ITEMB,21$  ;; SET ITEM NUMBER AS ERROR NUMBER
3000 021742 004737 023746  JSR  PC,$ATY4  ;; REPORT FATAL ERROR TO APT
3001 021746 000 21$:  .BYTE  0

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3002 021747 000
3003 021750 000777
3004 021752 005777 157162
3005 021756 100002
3006 021760 000000
3007 021762 104407
3008 021764
3009 021764 000002
3010
3011
3012
3013
3014
3015
3016
3017 021766
3018 021766 104401 001171
3019 021772 010046
3020 021774 005000
3021 021776 153700 001114
3022 022002 001004
3023
3024 022004 013746 001116
3025
3026 022010 104402
3027 022012 000426
3028 022014 005300
3029 022016 006300
3030 022020 006300
3031 022022 006300
3032 022024 062700 001256
3033 022030 012037 022040
3034 022034 001404
3035 022036 104401
3036 022040 000000
3037 022042 104401 001171
3038 022046 012037 022056
3039 022052 001404
3040 022054 104401
3041 022056 000000
3042 022060 104401 001171
3043 022064 011000
3044 022066 001004
3045 022070 012600
3046 022072 104401 001171
3047 022076 000207
3048 022100
3049 022100 013046
3050 022102 104402
3051 022104 005710
3052 022106 001770
3053 022110 104401 022116
3054 022114 000771
3055 022116 020040 000

```

```

      .BYTE 0
22$: BR 22$          ;; APT ERROR LOOP
2$:  TST 2$SWR      ;; HALT ON ERROR
      BPL 3$        ;; SKIP IF CONTINUE
      HALT          ;; HALT ON ERROR!
      CKSWR        ;; TEST FOR CHANGE IN SOFT-SWR
3$:
      RTI          ;; RETURN
.SBTTL ERRCR MESSAGE TYPEOUT ROUTINE
;*****
; *THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
; *ERROR IS TO BE REPORTED. IT THEN OBTAINS FROM THE "ERROR TABLE" ($ERRTB),
; *AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
$ERRTYP:
      TYPE $CRLF          ;; "CARRIAGE RETURN" & "LINE FEED"
      MOV RO, -(SP)      ;; SAVE RO
      CLR RO             ;; PICKUP THE ITEM INDEX
      BISB 2*$ITEMB, RO
      BNE 1$
      MOV $ERRPC, -(SP)  ;; IF ITEM NUMBER IS ZERO, JUST
                          ;; TYPE THE PC OF THE ERROR
                          ;; SAVE $ERRPC FOR TYPEOUT
                          ;; ERROR ADDRESS
      TYPOC              ;; GO TYPE--OCTAL ASCII(ALL DIGITS)
      BR 6$              ;; GET OUT
1$:  DEC RO              ;; ADJUST THE INDEX SO THAT IT WILL
      ASL RO              ;; WORK FOR THE ERROR TABLE
      ASL RO
      ASL RO
      ADD #$ERRTB, RO    ;; FORM TABLE POINTER
      MOV (RO)+, 2$      ;; PICKUP "ERROR MESSAGE" POINTER
      BEQ 3$             ;; SKIP TYPEOUT IF NO POINTER
      TYPE "ERROR MESSAGE"
                          ;; "ERROR MESSAGE" POINTER GOES HERE
                          ;; "CARRIAGE RETURN" & "LINE FEED"
2$:  .WORD 0
      TYPE $CRLF
      MOV (RO)+, 4$      ;; PICKUP "DATA HEADER" POINTER
      BEQ 5$             ;; SKIP TYPEOUT IF 0
      TYPE "DATA HEADER"
                          ;; "DATA HEADER" POINTER GOES HERE
                          ;; "CARRIAGE RETURN" & "LINE FEED"
3$:  .WORD 0
      TYPE $CRLF
      MOV (RO), RO       ;; PICKUP "DATA TABLE" POINTER
      BNE 7$             ;; GO TYPE THE DATA
      MOV (SP)+, RO      ;; RESTORE RO
      TYPE $CRLF        ;; "CARRIAGE RETURN" & "LINE FEED"
      RTS PC            ;; RETURN
4$:  .WORD 0
      TYPE $CRLF
      MOV (RO), RO
      BNE 7$
6$:  MOV (SP)+, RO
      TYPE $CRLF
      RTS PC
7$:  MOV 2(RO)+, -(SP)   ;; SAVE 2(RO)+ FOR TYPEOUT
      TYPOC              ;; GO TYPE--OCTAL ASCII(ALL DIGITS)
      TST (RO)           ;; IS THERE ANOTHER NUMBER?
      BEQ 6$             ;; BR IF NO
      TYPE 2(2) SPACES  ;; TYPE TWO(2) SPACES
      BR 7$              ;; LOOP
8$:  .ASCIZ / /         ;; TWO(2) SPACES

```

```

3056      022122      .EVEN
3057      .SBTTL     POWER DOWN AND UP ROUTINES
3058
3059      ::*****
3060      :POWER DOWN ROUTINE
3061      022122      012737      022266      000024      $PWRDN:  MOV      #SILLUP,@#PWRVEC      ;;SET FOR FAST UP
3062      022130      012737      000340      000026      MOV      #340,@#PWRVEC+2      ;;PRIO:7
3063      022136      010046      MOV      R0,-(SP)      ;;PUSH R0 ON STACK
3064      022140      010146      MOV      R1,-(SP)      ;;PUSH R1 ON STACK
3065      022142      010246      MOV      R2,-(SP)      ;;PUSH R2 ON STACK
3066      022144      010346      MOV      R3,-(SP)      ;;PUSH R3 ON STACK
3067      022146      010446      MOV      R4,-(SP)      ;;PUSH R4 ON STACK
3068      022150      010546      MOV      R5,-(SP)      ;;PUSH R5 ON STACK
3069      022152      017746      156762      MOV      @SWR,-(SP)      ;;PUSH @SWR ON STACK
3070      022156      010637      022272      MOV      SP,$SAVR6      ;;SAVE SP
3071      022162      012737      022174      000024      MOV      #PWRUP,@#PWRVEC      ;;SET UP VECTOR
3072      022170      000000      HALT
3073      022172      000776      BR      .-2      ;;HANG UP
3074
3075      ::*****
3076      :POWER UP ROUTINE
3077      022174      012737      022266      000024      $PWRUP:  MOV      #SILLUP,@#PWRVEC      ;;SET FOR FAST DOWN
3078      022202      013706      022272      MOV      $SAVR6,SP      ;;GET SP
3079      022206      005037      022272      CLR      $SAVR6      ;;WAIT LOOP FOR THE TTY
3080      022212      005237      022272      1$:      INC      $SAVR6      ;;WAIT FOR THE INC
3081      022216      001375      BNE      1$      ;;OF WORD
3082      022220      012677      156714      MOV      (SP)+,@SWR      ;;POP STACK INTO @SWR
3083      022224      012605      MOV      (SP)+,R5      ;;POP STACK INTO R5
3084      022226      012604      MOV      (SP)+,R4      ;;POP STACK INTO R4
3085      022230      012603      MOV      (SP)+,R3      ;;POP STACK INTO R3
3086      022232      012602      MOV      (SP)+,R2      ;;POP STACK INTO R2
3087      022234      012601      MOV      (SP)+,R1      ;;POP STACK INTO R1
3088      022236      012600      MOV      (SP)+,R0      ;;POP STACK INTO R0
3089      022240      012737      022122      000024      MOV      #PWRDN,@#PWRVEC      ;;SET UP THE POWER DOWN VECTOR
3090      022246      012737      000340      000026      MOV      #340,@#PWRVEC+2      ;;PRIO:7
3091      022254      104401      TYPE      PWRMSG      ;;REPORT THE POWER FAILURE
3092      022256      022274      $PWRMG:  .WORD      PWRMSG      ;;POWER FAIL MESSAGE POINTER
3093      022260      012716      MOV      (PC)+,(SP)      ;;RESTART AT BEGIN
3094      022262      001554      $PWRAD:  .WORD      BEGIN      ;;RESTART ADDRESS
3095      022264      000002      RTI
3096      022266      000000      $ILLUP:  HALT      ;;THE POWER UP SEQUENCE WAS STARTED
3097      022270      000776      BR      .-2      ;;BEFORE THE POWER DOWN WAS COMPLETE
3098      022272      000000      $SAVR6:  0      ;;PUT THE SP HERE

```

```

3099 022274 005015 042522 052123 PWRMSG: .ASCIZ  '15'<'12'>/RESTARTING AFTER A POWER FAILURE/'15'<'12'>
3100 022302 051101 044524 043516
3101 022310 040440 052106 051105
3102 022316 040440 050040 053517
3103 022324 051105 043040 044501
3104 022332 052514 042522 005015
3105 022340 000012
3106 .EVEN
3107 .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
3108
3109
3110
3111
3112
3113
3114
3115
3116
3117
3118
3119
3120
3121
3122
3123
3124
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3126
3127
3128
3129
3130
3131
3132
3133 022342 017646 000000
3134 022346 116637 000001 022565
3135 022354 112637 022567
3136 022360 062716 000002
3137 022364 000406
3138 022366 112737 000001 022565
3139 022374 112737 000006 022567
3140 022402 112737 000005 022564
3141 022410 010346
3142 022412 010446
3143 022414 010546
3144 022416 113704 022567
3145 022422 005404
3146 022424 062704 000006
3147 022430 110437 022566
3148 022434 113704 022565
3149 022440 016605 000012
3150 022444 005003
3151 022446 006105
3152 022450 000404

*****
*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
*OCTAL (ASCII) NUMBER AND TYPE IT.
*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
*CALL:
*      MOV      NUM,-(SP)      ;;NUMBER TO BE TYPED
*      TYPOS    ;;CALL FOR TYPEOUT
*      .BYTE   N              ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
*      .BYTE   M              ;;M=1 OR 0
*                               ;;1=TYPE LEADING ZEROS
*                               ;;0=SUPPRESS LEADING ZEROS
*$TYPON---ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
*$TYPOS OR $TYPOC
*CALL:
*      MOV      NUM,-(SP)      ;;NUMBER TO BE TYPED
*      TYPON    ;;CALL FOR TYPEOUT
*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
*CALL:
*      MOV      NUM,-(SP)      ;;NUMBER TO BE TYPED
*      TYPOC    ;;CALL FOR TYPEOUT
*$TYPOS: MOV      2(SP),-(SP)    ;;PICKUP THE MODE
        MOVVB    1(SP),%SOFILL    ;;LOAD ZERO FILL SWITCH
        MOVVB    (SP)+,%SOMODE+1  ;;NUMBER OF DIGITS TO TYPE
        ADD     #2,(SP)          ;;ADJUST RETURN ADDRESS
        BR      $TYPON
*$TYPOC: MOVVB    #1,%SOFILL     ;;SET THE ZERO FILL SWITCH
        MOVVB    #6,%SOMODE+1    ;;SET FOR SIX(6) DIGITS
*$TYPON: MOVVB    #5,%SOCNT     ;;SET THE ITERATION COUNT
        MOV     R3,-(SP)         ;;SAVE R3
        MOV     R4,-(SP)         ;;SAVE R4
        MOV     R5,-(SP)         ;;SAVE R5
        MOVVB    %SOMODE+1,R4    ;;GET THE NUMBER OF DIGITS TO TYPE
        NEG     R4
        ADD     #6,R4            ;;SUBTRACT IT FOR MAX. ALLOWED
        MOVVB    R4,%SOMODE     ;;SAVE IT FOR USE
        MOVVB    %SOFILL,R4     ;;GET THE ZERO FILL SWITCH
        MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
        CLR     R3              ;;CLEAR THE OUTPUT WORD
        ROL     R5              ;;ROTATE MSB INTO "C"
        BR      3$              ;;GO DO MSB
1$:
        ROL     R5
        BR      3$

```

```

3153 022452 006105          2$:  ROL      R5          ;;FORM THIS DIGIT
3154 022454 006105          ROL      R5
3155 022456 006105          ROL      R5
3156 022460 010503          MOV      R5,R3
3157 022462 006103          3$:  ROL      R3          ;;GET LSB OF THIS DIGIT
3158 022464 105337 022566  DECB     $CMODE      ;;TYPE THIS DIGIT?
3159 022470 100016          BPL      7$          BR IF NO
3160 022472 042703 177770  BIC      #177770,R3  ;;GET RID OF JUNK
3161 022476 001002          BNE      4$          TEST FOR 0
3162 022500 005704          TST      R4          SUPPRESS THIS 0?
3163 022502 001403          BEQ      5$          BR IF YES
3164 022504 005204          4$:  INC      R4          DON'T SUPPRESS ANYMORE 0'S
3165 022506 052703 000060  BIS      #'0,R3     MAKE THIS DIGIT ASCII
3166 022512 052703 000040  5$:  BIS      #' ,R3   MAKE ASCII IF NOT ALREADY
3167 022516 110337 022562  MOVB     R3,8$      SAVE FOR TYPING
3168 022522 104401 022562  TYPE     8$          GO TYPE THIS DIGIT
3169 022526 105337 022564  7$:  DECB     $OCNT     COUNT BY 1
3170 022532 003347          BGT      2$          BR IF MORE TO DO
3171 022534 002402          BLT      6$          BR IF DONE
3172 022536 005204          INC      R4          INSURE LAST DIGIT ISN'T A BLANK
3173 022540 000744          BR       2$          GO DO THE LAST DIGIT
3174 022542 012605          6$:  MOV      (SP)+,R5  RESTORE R5
3175 022544 012604          MOV      (SP)+,R4  RESTORE R4
3176 022546 012603          MOV      (SP)+,R3  RESTORE R3
3177 022550 016666 000002 000004  MOV      2(SP),4(SP) SET THE STACK FOR RETURNING
3178 022556 012616          MOV      (SP)+,(SP)
3179 022560 000002          RTI
3180 022562 000          8$:  .BYTE    0          RETURN
3181 022563 000          .BYTE    0          STORAGE FOR ASCII DIGIT
3182 022564 000          .BYTE    0          TERMINATOR FOR TYPE ROUTINE
3183 022565 000          $OCNT:  .BYTE    0          OCTAL DIGIT COUNTER
3184 022566 000000          $OFILL: .BYTE    0          ZERO FILL SWITCH
3185          $OMODE: .WORD    0          NUMBER OF DIGITS TO TYPE
3186          .SBTTL  TYPE ROUTINE
3187          ;*****
3188          ;*ROUTINE TO TYPE ASCII MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
3189          ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
3190          ;*NOTE1:  $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
3191          ;*NOTE2:  $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
3192          ;*NOTE3:  $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
3193          ;*
3194          ;*CALL:
3195          ;*1) USING A TRAP INSTRUCTION
3196          ;*      TYPE      ,MESADR          ;;MESADR IS FIRST ADDRESS OF AN ASCII STRING
3197          ;*OR
3198          ;*      TYPE
3199          ;*      MESADR
3200          ;*
3201          ;*
3202 022570 105737 001157  $TYpE:  TSTB     $TPFLG  ;; IS THERE A TERMINAL?
3203 022574 100002          BPL      1$          BR IF YES
3204 022576 000000          HALT
3205 022600 000430          BR       3$          HALT HERE IF NO TERMINAL
3206 022602 010046          1$:  MOV      R0,-(SP)  LEAVE
          ;;SAVE R0

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3207	022604	017600	000002		MOV	22(SP),RO	;; GET ADDRESS OF ASCIZ STRING
3208	022610	122737	000001	001214	CMPB	#APTENV,\$ENV	;; RUNNING IN APT MODE
3209	022616	001011			BNE	62\$;; NO GO CHECK FOR APT CONSOLE
3210	022620	132737	000100	001215	BITB	#APTSPool,\$ENVm	;; SPOOL MESSAGE TO APT
3211	022626	001405			BEQ	62\$;; NO GO CHECK FOR CONSOLE
3212	022630	010037	022640		MOV	RO,61\$;; SETUP MESSAGE ADDRESS FOR APT
3213	022634	004737	023736		JSR	PC,\$ATY3	;; SPOOL MESSAGE TO APT
3214	022640	000000			.WORD	0	;; MESSAGE ADDRESS
3215	022642	132737	000040	001215	61\$: BITB	#APTCsUP,\$ENVm	;; APT CONSOLE SUPPRESSED
3216	022650	001003			BNE	60\$;; YES, SKIP TYPE OUT
3217	022652	112046			2\$: MOVb	(RO)+,-(SP)	;; PUSH CHARACTER TO BE TYPED ONTO STACK
3218	022654	001005			BNE	4\$;; BR IF IT ISN'T THE TERMINATOR
3219	022656	005726			TST	(SP)+	;; IF TERMINATOR POP IT OFF THE STACK
3220	022660	012600			60\$: MOV	(SP)+,RO	;; RESTORE RO
3221	022662	062716	000002		3\$: ADD	#2,(SP)	;; ADJUST RETURN PC
3222	022666	000002			RTI		;; RETURN
3223	022670	122716	000011		4\$: CMPB	#HT,(SP)	;; BRANCH IF <HT>
3224	022674	001430			BEQ	8\$	
3225	022676	122716	000200		CMPB	#CRLF,(SP)	;; BRANCH IF NOT <CRLF>
3226	022702	001006			BNE	5\$	
3227	022704	005726			TST	(SP)+	;; POP <CR><LF> EQUIV
3228	022706	104401			TYPE		;; TYPE A CR AND LF
3229	022710	001171			\$CRLF		
3230	022712	105037	023046		CLRB	\$CHARCNT	;; CLEAR CHARACTER COUNT
3231	022716	000755			BR	2\$;; GET NEXT CHARACTER
3232	022720	004737	023002		5\$: JSR	PC,\$TYPEc	;; GO TYPE THIS CHARACTER
3233	022724	123726	001156		6\$: CMPB	\$FILLc,(SP)+	;; IS IT TIME FOR FILLER CHARS.?
3234	022730	001350			BNE	2\$;; IF NO GO GET NEXT CHAR.
3235	022732	013746	001154		MOV	\$NULL,-(SP)	;; GET # OF FILLER CHARS. NEEDED
3236							;; AND THE NULL CHAR.
3237	022736	105366	000001		7\$: DECB	1(SP)	;; DOES A NULL NEED TO BE TYPED?
3238	022742	002770			BLT	6\$;; BR IF NO--GO POP THE NULL OFF OF STACK
3239	022744	004737	023002		JSR	PC,\$TYPEc	;; GO TYPE A NULL
3240	022750	105337	023046		DECB	\$CHARCNT	;; DO NOT COUNT AS A COUNT
3241	022754	000770			BR	7\$;; LOOP
3242							
3243							
3244							
3245	022756	112716	000040		8\$: MOVb	#' ,(SP)	;; REPLACE TAB WITH SPACE
3246	022762	004737	023002		9\$: JSR	PC,\$TYPEc	;; TYPE A SPACE
3247	022766	132737	000007	023046	BITB	#7,\$CHARCNT	;; BRANCH IF NOT AT
3248	022774	001372			BNE	9\$;; TAB STOP
3249	022776	005726			TST	(SP)+	;; POP SPACE OFF STACK
3250	023000	000724			BR	2\$;; GET NEXT CHARACTER
3251	023002	105777	156142		\$TYPEc: TSTb	2\$TPS	;; WAIT UNTIL PRINTER IS READY
3252	023006	100375			BPL	\$TYPEc	
3253	023010	116677	000002	156134	MOVB	2(SP),2\$TPB	;; LOAD CHAR TO BE TYPED INTO DATA REG.
3254	023016	122766	000015	000002	CMPB	#CR,2(SP)	;; IS CHARACTER A CARRIAGE RETURN?
3255	023024	001003			BNE	1\$;; BRANCH IF NO
3256	023026	105037	023046		CLRB	\$CHARCNT	;; YES--CLEAR CHARACTER COUNT
3257	023032	000406			BR	\$TYPEX	;; EXIT
3258	023034	122766	000012	000002	1\$: CMPB	#LF,2(SP)	;; IS CHARACTER A LINE FEED?
3259	023042	001402			BEQ	\$TYPEX	;; BRANCH IF YES
3260	023044	105227			INCB	(PC)+	;; COUNT THE CHARACTER

;HORIZONTAL TAB PROCESSOR

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3261 023046 000000 $CHARCNT: .WORD 0 ;; CHARACTER COUNT STORAGE
3262 023050 000207 $TYPEX: RTS PC
3263
3264 .SBTTL TTY INPUT ROUTINE
3265
3266 ;:*****
3267 .ENABL LSB
3268
3269 ;:*****
3270 ;:SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
3271 ;:ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
3272 ;:SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
3273 ;:WHEN OPERATING IN TTY FLAG MODE.
3274 023052 022737 000176 001140 $CKSWR: CMP #SWREG, SWR ;; IS THE SOFT-SWR SELECTED?
3275 023060 001074 BNE 15$ ;; BRANCH IF NO
3276 023062 105777 156056 TSTB 2$TKS ;; CHAR THERE?
3277 023066 100071 BPL 15$ ;; IF NO, DON'T WAIT AROUND
3278 023070 117746 156052 MOVB 2$TKB, -(SP) ;; SAVE THE CHAR
3279 023074 042716 177600 BIC #1C177, (SP) ;; STRIP-OFF THE ASCII
3280 023100 022726 000007 CMP #7, (SP)+ ;; IS IT A CONTROL G?
3281 023104 001062 BNE 15$ ;; NO, RETURN TO USER
3282 023106 123727 001134 000001 CMPB $AUTOB, #1 ;; ARE WE RUNNING IN AUTO-MODE?
3283 023114 001456 BEQ 15$ ;; BRANCH IF YES
3284
3285 023116 104401 023577 $GTSWR: TYPE , $CNTLG ;; ECHO THE CONTROL-G (↑G)
3286 023122 104401 023604 TYPE $MSWR ;; TYPE CURRENT CONTENTS
3287 023126 013746 000176 MOV SWREG, -(SP) ;; SAVE SWREG FOR TYPEOUT
3288 023132 104402 TYPEPOC ;; GO TYPE--OCTAL ASCII(ALL DIGITS)
3289 023134 104401 023615 TYPE , $MNEW ;; PROMPT FOR NEW SWR
3290 023140 005046 19$: CLR -(SP) ;; CLEAR COUNTER
3291 023142 005046 CLR -(SP) ;; THE NEW SWR
3292 023144 105777 155774 7$: TSTB 2$TKS ;; CHAR THERE?
3293 023150 100375 BPL 7$ ;; IF NOT TRY AGAIN
3294
3295 023152 117746 155770 MOVB 2$TKB, -(SP) ;; PICK UP CHAR
3296 023156 042716 177600 BIC #1C177, (SP) ;; MAKE IT 7-BIT ASCII
3297
3298
3299
3300 023162 021627 000025 9$: CMP (SP), #25 ;; IS IT A CONTROL-U?
3301 023166 001005 BNE 10$ ;; BRANCH IF NOT
3302 023170 104401 023572 TYPE , $CNTLU ;; YES, ECHO CONTROL-U (↑U)
3303 023174 062706 000006 20$: ADD #6, SP ;; IGNORE PREVIOUS INPUT
3304 023200 000757 BR 19$ ;; LET'S TRY IT AGAIN
3305
3306
3307 023202 021627 000015 10$: CMP (SP), #15 ;; IS IT A <CR>?
3308 023206 001022 BNE 16$ ;; BRANCH IF NO
3309 023210 005766 000004 TST 4(SP) ;; YES, IS IT THE FIRST CHAR?
3310 023214 001403 BEQ 11$ ;; BRANCH IF YES
3311 023216 016677 000002 155714 MOV 2(SP), 2SWR ;; SAVE NEW SWR
3312 023224 062706 000006 11$: ADD #6, SP ;; CLEAR UP STACK
3313 023230 104401 001171 14$: TYPE $CRLF ;; ECHO <CR> AND <LF>
3314 023234 123727 001135 000001 CMPB $INTAG, #1 ;; RE-ENABLE TTY KBD INTERRUPTS?

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3315 023242 001003          BNE      15$          ;; BRANCH IF NOT
3316 023244 012777 000100 155672  MOV     #100,2$TKS  ;; RE-ENABLE TTY KBD INTERRUPTS
3317 023252 000002          RTI                      ;; RETURN
3318 023254 004737 023002 15$:   JSR     PC,$TYPEC    ;; ECHO CHAR
3319 023260 021627 000060 16$:   CMP     (SP),#60     ;; CHAR < 0?
3320 023264 002420          BLT     12$          ;; BRANCH IF YES
3321 023266 021627 000067          CMP     (SP),#67     ;; CHAR > 7?
3322 023272 003015          BGT     18$          ;; BRANCH IF YES
3323 023274 042726 000060          BIC     #60,(SP)+    ;; STRIP-OFF ASCII
3324 023300 005766 000002          TST     2(SP)        ;; IS THIS THE FIRST CHAR
3325 023304 001403          BEQ     17$          ;; BRANCH IF YES
3326 023306 006316          ASL     (SP)         ;; NO, SHIFT PRESENT
3327 023310 006316          ASL     (SP)         ;; CHAR OVER TO MAKE
3328 023312 006316          ASL     (SP)         ;; ROOM FOR NEW ONE.
3329 023314 005266 000002 17$:   INC     2(SP)        ;; KEEP COUNT OF CHAR
3330 023320 056616 177776          BIS     -2(SP),(SP)  ;; SET IN NEW CHAR
3331 023324 000707          BR      7$          ;; GET THE NEXT ONE
3332 023326 104401 001170 18$:   TYPE   $QUES       ;; TYPE ?<CR><LF>
3333 023332 000720          BR      20$        ;; SIMULATE CONTROL-U
3334          .DSABL  LSB
3335
3336
3337          ;; *****
3338          ;; THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
3339          ;; CALL:
3340          ;; * RDCHR          ;; INPUT A SINGLE CHARACTER FROM THE TTY
3341          ;; * RETURN HERE   ;; CHARACTER IS ON THE STACK
3342          ;; *                ;; WITH PARITY BIT STRIPPED OFF
3343          ;;
3344
3345 023334 011646          $RDCHR: MOV     (SP),-(SP)  ;; PUSH DOWN THE PC
3346 023336 016666 000004 000002  MOV     4(SP),2(SP)  ;; SAVE THE PS
3347 023344 105777 155574 1$:   TSTB   2$TKS        ;; WAIT FOR
3348 023350 100375          BPL     1$          ;; A CHARACTER
3349 023352 117766 155570 000004  MOVB   2$TKB,4(SP)  ;; READ THE TTY
3350 023360 042766 177600 000004  BIC     #1C<177>,4(SP) ;; GET RID OF JUNK IF ANY
3351 023366 026627 000004 000023  CMP     4(SP),#23   ;; IS IT A CONTROL-S?
3352 023374 001013          BNE     3$          ;; BRANCH IF NO
3353 023376 105777 155542 2$:   TSTB   2$TKS        ;; WAIT FOR A CHARACTER
3354 023402 100375          BPL     2$          ;; LOOP UNTIL ITS THERE
3355 023404 117746 155536          MOVB   2$TKB,-(SP)  ;; GET CHARACTER
3356 023410 042716 177600          BIC     #1C177,(SP) ;; MAKE IT 7-BIT ASCII
3357 023414 022627 000021          CMP     (SP)+,#21   ;; IS IT A CONTROL-Q?
3358 023420 001366          BNE     2$          ;; IF NOT DISCARD IT
3359 023422 000750          BR      1$          ;; YES, RESUME
3360 023424 026627 000004 000140 3$:   CMP     4(SP),#140  ;; IS IT UPPER CASE?
3361 023432 002407          BLT     4$          ;; BRANCH IF YES
3362 023434 026627 000004 000175          CMP     4(SP),#175  ;; IS IT A SPECIAL CHAR?
3363 023442 003003          BGT     4$          ;; BRANCH IF YES
3364 023444 042766 000040 000004  BIC     #40,4(SP)   ;; MAKE IT UPPER CASE
3365 023452 000002          RTI                      ;; GO BACK TO USER
3366          ;; *****
3367          ;; THIS ROUTINE WILL INPUT A STRING FROM THE TTY
3368          ;; CALL:

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3369          ;*      RDLIN          ;: INPUT A STRING FROM THE TTY
3370          ;*      RETURN HERE    ;: ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
3371          ;*                    ;: TERMINATOR WILL BE A BYTE OF ALL 0'S
3372
3373 023454 010346          $RDLIN: MOV      R3,-(SP)      ;: SAVE R3
3374 023456 012703 023562 1$:      MOV      $TTYIN,R3      ;: GET ADDRESS
3375 023462 022703 023572 2$:      CMP      $TTYIN+8.,R3    ;: BUFFER FULL?
3376 023466 101405          BLOS     4$              ;: BR IF YES
3377 023470 104410          RDCHR          ;: GO READ ONE CHARACTER FROM THE TTY
3378 023472 112613          MOVB     (SP)+,(R3)      ;: GET CHARACTER
3379 023474 122713 000177 10$:     CMPB     #177,(R3)      ;: IS IT A RUBOUT
3380 023500 001003          BNE     3$              ;: SKIP IF NOT
3381 023502 104401 001170 4$:      TYPE     $QUES      ;: TYPE A '?'
3382 023506 000763          BR      1$              ;: CLEAR THE BUFFER AND LOOP
3383 023510 111337 02356C 3$:      MOVB     (R3),9$      ;: ECHO THE CHARACTER
3384 023514 104401 02356G          TYPE     9$              ;:
3385 023520 122723 000015          CMPB     #15,(R3)+      ;: CHECK FOR RETURN
3386 023524 001356          BNE     2$              ;: LOOP IF NOT RETURN
3387 023526 105063 177777          CLRB     -1(R3)        ;: CLEAR RETURN (THE 15)
3388 023532 104401 001172          TYPE     $LF          ;: TYPE A LINE FEED
3389 023536 012603          MOV      (SP)+,R3      ;: RESTORE R3
3390 023540 011646          MOV      (SP)-,(SP)    ;: ADJUST THE STACK AND PUT ADDRESS OF THE
3391 023542 016666 000004 000002 MOV      4(SP),2(SP)    ;: FIRST ASCII CHARACTER ON IT
3392 023550 012766 023562 000004 MOV      $TTYIN,4(SP)
3393 023556 000002          RTI                    ;: RETURN
3394 023560          000          9$:      .BYTE     0              ;: STORAGE FOR ASCII CHAR. TO TYPE
3395 023561          000          .BYTE     0              ;: TERMINATOR
3396 023562 000010          .BLKB     8.          ;: RESERVE 8 BYTES FOR TTY INPUT
3397 023572 052536 005015 000          $CNTLU: .ASCIZ  /↑U/<15><12> ;: CONTROL "U"
3398 023577          136 006507 000012 $CNTLG: .ASCIZ  /↑G/<15><12> ;: CONTROL "G"
3399 023604 005015 053523 020122 $MSWR:  .ASCIZ  <15><12>/SWR = /
3400 023612 020075          000
3401 023615          040 047040 053505 $MNEW:  .ASCIZ  / NEW = /
3402 023622 036440 000040          .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
3403
3404
3405          ;: *****
3406          ;: *THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
3407          ;: *CHANGE IT TO BINARY.
3408          ;: *CALL:
3409          ;: *
3410          ;: *      RDOCT          ;: READ AN OCTAL NUMBER
3411          ;: *      RETURN HERE    ;: LOW ORDER BITS ARE ON TOP OF THE STACK
3412          ;: *                    ;: HIGH ORDER BITS ARE IN $HIOCT
3413 023626 011646          $RDOCT: MOV      (SP)-,(SP)      ;: PROVIDE SPACE FOR THE
3414 023630 016666 000004 000002 MOV      4(SP),2(SP)    ;: INPUT NUMBER
3415 023636 010046          MOV      R0,-(SP)      ;: PUSH R0 ON STACK
3416 023640 010146          MOV      R1,-(SP)      ;: PUSH R1 ON STACK
3417 023642 010246          MOV      R2,-(SP)      ;: PUSH R2 ON STACK
3418 023644 104411          1$:      RDLIN          ;: READ AN ASCII LINE
3419 023646 012600          MOV      (SP)+,R0      ;: GET ADDRESS OF 1ST CHARACTER
3420 023650 005001          CLR      R1              ;: CLEAR DATA WORD
3421 023652 005002          CLR      R2              ;:
3422 023654 112046          2$:      MOVB     (R0)+,-(SP)    ;: PICKUP THIS CHARACTER

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3423 023656 001412 BEQ 3$ ;; IF ZERO GET OUT
3424 023660 006301 ASL R1 ;; *2
3425 023662 006102 ROL R2
3426 023664 006301 ASL R1 ;; *4
3427 023666 006102 ROL R2
3428 023670 006301 ASL R1 ;; *8
3429 023672 006102 ROL R2
3430 023674 042716 177770 BIC #1C7,(SP) ;; STRIP THE ASCII JUNK
3431 023700 062601 ADD (SP)+,R1 ;; ADD IN THIS DIGIT
3432 023702 000764 BR 2$ ;; LOOP
3433 023704 005726 3$: TST (SP)+ ;; CLEAN TERMINATOR FROM STACK
3434 023706 010166 000012 MOV R1,12(SP) ;; SAVE THE RESULT
3435 023712 010237 023726 MOV R2,$HI OCT
3436 023716 012602 MOV (SP)+,R2 ;; POP STACK INTO R2
3437 023720 012601 MOV (SP)+,R1 ;; POP STACK INTO R1
3438 023722 012600 MOV (SP)+,R0 ;; POP STACK INTO R0
3439 023724 000002 RTI ;; RETURN
3440 023726 000000 $HI OCT: .WORD 0 ;; HIGH ORDER BITS GO HERE
3441 .SBTTL APT COMMUNICATIONS ROUTINE
3442
3443 ..*****
3444 023730 112737 000001 024174 $ATY1: MOVB #1,$FFLG ;; TO REPORT FATAL ERROR
3445 023736 112737 000001 024172 $ATY3: MOVB #1,$MFLG ;; TO TYPE A MESSAGE
3446 023744 000403 BR $ATYC
3447 023746 112737 000001 024174 $ATY4: MOVB #1,$FFLG ;; TO ONLY REPORT FATAL ERROR
3448 023754 $ATYC:
3449 023754 010046 MOV R0,-(SP) ;; PUSH R0 ON STACK
3450 023756 010146 MOV R1,-(SP) ;; PUSH R1 ON STACK
3451 023760 105737 024172 TSTB $MFLG ;; SHOULD TYPE A MESSAGE?
3452 023764 001450 BEQ 5$ ;; IF NOT: BR
3453 023766 122737 000001 001214 CMPB #APTENV,$ENV ;; OPERATING UNDER APT?
3454 023774 001031 BNE 3$ ;; IF NOT: BR
3455 023776 132737 000100 001215 BITB #APTPOOL,$ENVM ;; SHOULD SPOOL MESSAGES?
3456 024004 001425 BEQ 3$ ;; IF NOT: BR
3457 024006 017600 000004 MOV #4(SP),R0 ;; GET MESSAGE ADDR.
3458 024012 062766 000002 000004 ADD #2,4(SP) ;; BUMP RETURN ADDR.
3459 024020 005737 001174 1$: TST $MSGTYPE ;; SEE IF DONE W/ LAST XMISSION?
3460 024024 001375 BNE 1$ ;; IF NOT: WAIT
3461 024026 010037 001210 MOV R0,$MSGAD ;; PUT ADDR IN MAILBOX
3462 024032 105720 2$: TSTB (R0)+ ;; FIND END OF MESSAGE
3463 024034 001376 BNE 2$
3464 024036 163700 001210 SUB $MSGAD,R0 ;; SUB START OF MESSAGE
3465 024042 006200 ASR R0 ;; GET MESSAGE LNGTH IN WORDS
3466 024044 010037 001212 MOV R0,$MSGGLT ;; PUT LENGTH IN MAILBOX
3467 024050 012737 000004 001174 MOV #4,$MSGTYPE ;; TELL APT TO TAKE MSG.
3468 024056 000413 BR 5$
3469 024060 017637 000004 024104 3$: MOV #4(SP),4$ ;; PUT MSG ADDR IN JSR LINKAGE
3470 024066 062766 000002 000004 ADD #2,4(SP) ;; BUMP RETURN ADDRESS
3471 024074 013746 177776 MOV 177776,-(SP) ;; PUSH 177776 ON STACK
3472 024100 004737 022570 JSR PC,$TYPE ;; CALL TYPE MACRO
3473 024104 000000 4$: .WORD 0
3474 5$:
3475 024106 105737 024174 10$: TSTB $FFLG ;; SHOULD REPORT FATAL ERROR?
3476 024112 001416 BEQ 12$ ;; IF NOT: BR

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3477 024114 005737 001214      TST      $ENV          ;; RUNNING UNDER APT?
3478 024120 001413              BEQ      12$          ;; IF NOT: BR
3479 024122 005737 001174      11$:    TST      $MSGTYPE  ;; FINISHED LAST MESSAGE?
3480 024126 001375              BNE     11$          ;; IF NOT: WAIT
3481 024130 017637 000004 001176  MOV     24(SP), $FATAL ;; GET ERROR #
3482 024136 062766 000002 000004  ADD     #2, 4(SP)     ;; BUMP RETURN ADDR.
3483 024144 005237 001174      INC     $MSGTYPE     ;; TELL APT TO TAKE ERROR
3484 024150 105037 024174      12$:    CLRB   $FFLG     ;; CLEAR FATAL FLAG
3485 024154 105037 024173      CLRB   $LFLG        ;; CLEAR LOG FLAG
3486 024160 105037 024172      CLRB   $MFLG        ;; CLEAR MESSAGE FLAG
3487 024164 012601      MOV    (SP)+, R1    ;; POP STACK INTO R1
3488 024166 012600      MOV    (SP)+, R0    ;; POP STACK INTO R0
3489 024170 000207      RTS     PC          ;; RETURN
3490 024172      000      $MFLG: .BYTE 0    ;; MESSG. FLAG
3491 024173      000      $LFLG: .BYTE 0  ;; LOG FLAG
3492 024174      000      $FFLG: .BYTE 0  ;; FATAL FLAG
3493      024176      .EVEN
3494      000200      APTSIZE=200
3495      000001      APTENV=001
3496      000100      APTSPool=100
3497      000040      APTCSUP=040
3498
3499      .SBTTL TRAP DECODER
3500
3501      ;*****
3502      ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
3503      ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
3504      ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
3505      ;*GO TO THAT ROUTINE.
3506
3507 024176 010046      $TRAP:  MOV     RO, -(SP)  ;; SAVE RO
3508 024200 016600 000002  MOV     2(SP), RO    ;; GET TRAP ADDRESS
3509 024204 005740      TST     -(RO)        ;; BACKUP BY 2
3510 024206 111000      MOVB   (RO), RO     ;; GET RIGHT BYTE OF TRAP
3511 024210 006300      ASL    RO           ;; POSITION FOR INDEXING
3512 024212 016000 024232  MOV     $TRPAD(RO), RO ;; INDEX TO TABLE
3513 024216 000200      RTS     RO          ;; GO TO ROUTINE
3514
3515
3516      ;; THIS IS USE TO HANDLE THE "GETPRI" MACRO
3517
3518 024220 011646      $TRAP2: MOV    (SP), -(SP) ;; MOVE THE PC DOWN
3519 024222 016666 000004 000002  MOV    4(SP), 2(SP)  ;; MOVE THE PSW DOWN
3520 024230 000002      RTI           ;; RESTORE THE PSW
3521
3522      .SBTTL TRAP TABLE
3523
3524      ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
3525      ;*BY THE "TRAP" INSTRUCTION.
3526
3527      ;
3528      ; ROUTINE
3529      ;-----
3530 024232 024220      $TRPAD: .WORD  $TRAP2
3530 024234 022570      $TYPE   ;; CALL=TYPE TRAP+1(104401) TTY TYPEOUT ROUTINE

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3531	024236	022366		\$TYPOC	:::CALL=TYPOC	TRAP+2(104402)	TYPE OCTAL NUMBER (WITH LEADING ZEROS)
3532	024240	022342		\$TYPOS	:::CALL=TYPOS	TRAP+3(104403)	TYPE OCTAL NUMBER (NO LEADING ZEROS)
3533	024242	022402		\$TYPON	:::CALL=TYPON	TRAP+4(104404)	TYPE OCTAL NUMBER (AS PER LAST CALL)
3534	024244	021176		\$TYPDS	:::CALL=TYPDS	TRAP+5(104405)	TYPE DECIMAL NUMBER (WITH SIGN)
3535							
3536	024246	023122		\$GTSWR	:::CALL=GTSWR	TRAP+6(104406)	GET SOFT-SWR SETTING
3537							
3538	024250	023052		\$CKSWR	:::CALL=CKSWR	TRAP+7(104407)	TEST FOR CHANGE IN SOFT-SWR
3539	024252	023334		\$RDCHR	:::CALL=RDCHR	TRAP+10(104410)	TTY TYPEIN CHARACTER ROUTINE
3540	024254	023454		\$RDLIN	:::CALL=RDLIN	TRAP+11(104411)	TTY TYPEIN STRING ROUTINE
3541	024256	023626		\$RDOCT	:::CALL=RDOCT	TRAP+12(104412)	READ AN OCTAL NUMBER FROM TTY
3542							
3543	024260	000074		BUF2:	.BLKW 60.		
3544	024450	000074		BUF3:	.BLKW 60.		
3545	024640	000074		BUFFER:	6C.		
3546							
3547	024642	000240					
3548							
3549							
3550							
3551							
3552							
3553							
3554							
3555							
3556							
3557							
3558							
3559							
3560							
3561							
3562							
3563							
3564							
3565	024644			\$LPAI:			
3566	024644	013746	000004	MOV	4, -(SP)		
3567							
3568	024650	000413		BR	31\$		
3569							
3570							
3571							
3572							
3573							
3574							
3575							
3576							
3577							
3578							
3579							
3580							
3581	024652	012737	024676	MOV	#30\$, 4		
3582	024660	005237	170000	INC	170000		
3583	024664	104401	024672	TYPE	65\$:::TYPE ASCIZ STRING
3584	024670	000401		BR	64\$:::GET OVER THE ASCIZ

BUF2: .BLKW 60.
BUF3: .BLKW 60.
BUFFER: 6C.

NOP

*
*THIS SUB CODE IS USED TO INITIALIZE THE LPA-11
*FIRST WE WILL LOAD MICROCODE INTO KMC-11
*NEXT WE WILL INIT BOTH UPROCESSORS
*THEN WE WILL LOAD DEVICE TABLE IN SLAVE UP.
*THE ORDER OF LOAD IS DETERMINED BY THE USER.

*
* CALL= JSR R5, \$LPAI
* .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.

```

3585          ;:65$: .ASCIZ <7>##
3586 024674   64$:
3587 024674   000401   BR          31$
3588 024676   022626   CMP          (SP)+,(SP)+
3589 024700   012637   000004   MOV          (SP)+,4
3590 024704   005037   025522   CLR          $AERR          ;ALL THIS JUNK MUST BE REMOVED!!
3591 024710   004537   025524   JSR          R5,$LOAD      ;LOAD MICRO-CODE.
3592 024714   000000G   .WORD      DRLPX2          ;FILE "DRLPX2.OBJ"
3593
3594 024716   052777   040000   154512   BIS          #BIT14,@KMADO ;ISSUE KMC+DMC INIT.
3595
3596 024724     1$:
3597
3598 024724   010146   MOV          R1,-(SP)      ;"HANGS" HERE THEN KMC-11 ERROR.
3599 024726   005001   CLR          R1
3600 024730   005201   INC          R1          ;STALL FOR DMC-UP
3601 024732   001376   BNE          2$
3602 024734   012777   104000   154474   MOV          #BIT15!BIT11,@KMADO ;SET RUN, AND ENABLE ARBITRATION.
3603 024742   105201   25$:
3604 024744   001376   INCB        R1
3605
3606 024746   032777   000040   154462   BIT          #BITS,@KMADO ;SLAVE READY? (READING IPBM SR)
3607 024754   001401   BEQ          3$
3608
3609 024756   104000   ERROR      ;FATAL LPA-11 ERROR SLAVE NOT READY.
3610
3611 024760   012777   000004   154454   3$: MOV          #4,@KMAD2 ;READ FAST PATH
3612 024766     4$:
3613 024766   004537   026434   JSR          R5,$TOUT      ;-TOUT-CHECK FOR TIMEOUT
3614
3615 024772   104000   ERROR      ;/TIME-OUT ERROR
3616
3617
3618
3619
3620
3621 024774   000774   BR          4$
3622
3623
3624 024776   122777   000377   154436   CMPB        #377,@KMAD2 ;/RETURNS HERE-FROM-TIMED OUT.
3625 025004   001370   BNE          4$          ;WAIT TILL KMC DONE COMMAND.
3626 025006   122777   000377   154432   CMPB        #377,@KMAD4 ;IF FAST PATH=377 THEN ERROR.
3627 025014   001001   BNE          35$
3628 025016   104000   ERROR      ;IPBM ERROR (SLAVE SIDE)
3629
3630
3631 025020   122777   000004   154420   35$: CMPB        #4,@KMAD4 ;IS THIS THE CORRECT VERSION OF MICRO-CODE?
3632 025026   001543   BEQ          5$          ;YES-CONTINUE.
3633 025030   005227   177777   INC          #-1
3634 025034   001140   BNE          5$
3635 025036   005227   177777   INC          #-1
3636 025042   001135   BNE          5$
3637 025044   104401   025052   TYPE        67$
3638 025050   000440   BR          66$          ;;TYPE ASCIZ STRING
                          ;;GET OVER THE ASCIZ

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3639          ;:67$: .ASCIZ <200>"W A R N I N G THIS PROGRAM WAS DESIGNED TO RUN WITH VERSION 4"
3640          66$:
3641 025152          TYPE      69$          ;:TYPE ASCIZ STRING
3642 025152 104401 025160          BR      68$          ;:GET OVER THE ASCIZ
3643 025156 000430          ;:69$: .ASCIZ <200>"MICRO-CODE: ANOTHER VERSION CODE WAS DETECTED."
3644          68$:
3645 025240          TYPE      71$          ;:TYPE ASCIZ STRING
3646 025240 104401 025246          BR      70$          ;:GET OVER THE ASCIZ
3647          ;:71$: .ASCIZ <200>"THIS MAY OR MAYNOT CAUSE FALSE ERROR TO BE REPORTED."<200><200>
3648          70$:
3649
3650 025336 112737 177777 025470 5$:      MOVB      #0-1,11$      ;DAC CODE FOR SLAVE.
3651 025344 012501          MOV      (5)+,R1      ;GET NEXT DEVICE ADDR.
3652 025346 021127 000000 6$:      CMP      (R1),#0      ;TERM REACHED?
3653 025352 001444          BEQ      10$
3654 025354 105237 025470          INCB      11$
3655 025360 113777 025470 154060          MOVB      11$,@KMA04      ;FIFO DATA
3656 025366 004737 025472          JSR      PC,20$      ;ISSUE SEND
3657 025372 112177 154050          MOVB      (R1)+,@KMA04      ;SEND LOW BYTE OF DEVICE ADDR TO SLAVE.
3658 025376 004737 025472          JSR      PC,20$      ;ISSUE SEND
3659 025402 112177 154040          MOVB      (R1)+,@KMA04      ;SEND HIGH BYTE OF DEVICE ADDR. TO SLAVE.
3660 025406 004737 025472          JSR      PC,20$
3661
3662 025412 032777 000002 154016 7$:      BIT      #BIT1,@KMA00      ;WAIT FOR FIFO DATA
3663 025420 001374          BNE      7$
3664 025422 112777 000002 154012          MOVB      #2,@KMA02      ;READ FIFO.
3665
3666 025430          8$:
3667 025430 004537 026434          JSR      R5,$TOUT      ;-TOUT-CHECK FOR TIMEOUT
3668
3669 025434 104000          ERROR
3670          ;/TIME-OUT ERROR
3671          ;/WE FAILED TO COMPLETE
3672          ;/CURRENT OPERATION.
3673          ;/CONTINUES IN THIS LOOP
3674          ;/WOULD MAKE US "HANG" HERE
3675 025436 000774          BR      8$
3676
3677          ;/RETURNS HERE-FROM-TIMED OUT.
3678 025440 122777 000377 153774          CMPB      #377,@KMA02      ;WAIT FOR READ.
3679 025446 001370          BNE      8$
3680 025450 105777 153772          TSTB      @KMA04
3681 025454 001734          BEQ      6$
3682          ;WAS A ZERO RETURNED?
3683 025456 005237 025522          INC      $AERR      ;YES GET NEXT ADDR.
3684          ;SLAVE WILL RETURN CODE 0 IF
3685          ;DEV PRESENT. ELSE
3686          ;EXIT $AERR=1 IF SLAVE GIVES ERROR.
3687          ;GET RID OF REFERENCE TO BAD ADDR.
3688 025462 005041          CLR      -(1)
3689 025464 012601 10$:      MOV      (SP)+,R1
3690 025466 000205          RTS      R5
3691          ;RETURN ALL ADDR. CHECKED.
3692 025470 000000 11$:      .WORD      0
3693          ;HOLDS DAC CODE PLUS OFFSET
3694          ;TO SLAVES ADDR. TABLE.
3695 025472 112777 000003 153742 20$:      MOVB      #3,@KMA02      ;ISSUE FIFO WRITE

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3693 025500          21$: JSR      R5, $TOUT      ; -TOUT-CHECK FOR TIMEOUT
3694 025500 004537 026434      ERROR      ; /TIME-OUT ERROR
3695                                     ; /WE FAILED TO COMPLETE
3696 025504 104000      ; /CURRENT OPERATION.
3697                                     ; /CONTINUES IN THIS LOOP
3698                                     ; /WOULD MAKE US "HANG" HERE
3699
3700
3701
3702 025506 000774      BR              21$
3703
3704                                     ; /RETURNS HERE-FROM-TIMED OUT.
3705 025510 122777 000377 153724  CMPB     #377, @KMAD2 ; KMC CODE WILL RETURN A "377"
3706 025516 001370      BNE     21$      ; WHEN DONE COMMAND.
3707 025520 000207      RTS     PC
3708
3709 025522 000000      $AERR: .WORD 0      ; =0 IF ADDR. LIST OK, =1 IF BAD.
3710
3711      ; *
3712      ; * THIS SUB CODE USED TO LOAD MICRO-CODE INTO LPA-11.
3713      ; * CALL = JSR R5, $LOAD
3714      ; * .WORD XX ; ADDR. OF MICRO CODE.
3715      ; * RETURNS HERE
3716      ; * NOTE: MICRO CODE FILE MUST END IN -1 DATA.
3717      ; *
3718
3719 025524 010446      $LOAD: MOV     R4, -(SP)      ; SAVE R4.
3720 025526 010046      MOV     R0, -(SP)      ; SAVE R0.
3721 025530 012500      1$:  MOV     (5)+, R0      ; GET PROG. ADDR.
3722 025532 005077 153700      CLR     @KMAD0      ; CLEAR CSR
3723 025536 005077 153704      CLR     @KMAD4      ; CLEAR CRAM ADDR.
3724 025542 052777 002000 153666 2$:  BIS     #2000, @KMAD0 ; SELECT CRAM.
3725 025550 012077 153676      MOV     (0)+, @KMAD6 ; WRITE DATA.
3726 025554 052777 020000 153654      BIS     #2000, @KMAD0 ; SET CRAM WRITE
3727 025562 005077 153650      CLR     @KMAD0      ; DISABLE CRAM.
3728 025566 005277 153654      INC     @KMAD4      ; UPDATE CRAM ADDR.
3729 025572 021027 177777      CMP     (0), #-1    ; ALL DONE?
3730 025576 001361      BNE     2$          ; NO LOOP.
3731 025600 005077 153642      CLR     @KMAD4      ; CLEAR CRAM ADDR.
3732 025604 016500 177776      MOV     -2(5), R0   ; GET MICRO CODE ADDR.
3733
3734 025610 052777 002000 153620 3$:  BIS     #2000, @KMAD0 ; SELECT CRAM
3735 025616 022077 153630      CMP     (R0)+, @KMAD6 ; DATA OK?
3736 025622 001013      BNE     5$          ; NO - REPORT AN ERROR.
3737 025624 021027 177777      CMP     (0), #-1    ; ALL DONE?
3738 025630 001405      BEQ     4$          ; YES - EXIT
3739 025632 005077 153600      CLR     @KMAD0      ; NO - DESELECT CRAM.
3740 025636 005277 153604      INC     @KMAD4      ; UPDATE CRAM ADDR.
3741 025642 000762      BR      3$
3742
3743 025644 012600      4$:  MOV     (SP)+, R0    ; RESTORE R0
3744 025646 012604      MOV     (SP)+, R4    ; RESTORE R4
3745 025650 000205      RTS     R5          ; EXIT
3746

```

```

3747 025652          SS:          ;COME HERE ON LOAD ERROR
3748 025652 005745          TST      -(5)          ;UPDATE ERROR COUNTER.
3749 025654 105204          INCB     R4            ;IF NOT TOO MANY, TRY AGAIN.
3750 025656 100324          BPL      1$           ;MICRO CODE LOAD ERROR.
3751 025660 000000          HALT                    ;KMC-11 FAULT. YOU COULD TRY
3752                                     ;TO PRESS CONTINUE TO GIVE IT
3753 025662 000722          BR       1$           ;ANOTHER CHANCE, BUT I DOUBT
3754                                     ;THAT THAT WOULD WORK. SINCE I'VE
3755                                     ;ALREADY GIVEN IT 177 (OCTAL) CHANCES.
3756                                     ;TRY RUNNING THE KMC-11 DIAGNOSTIC.
3757
3758
3759
3760

```

```

3761                                     ;*THIS ROUTINE ISSUES A WRITE COMMAND TO THE LPA-11
3762                                     ;*
3763                                     ;*      CALL = JSR      R5,$TLKW
3764                                     ;*              .WORD  0          ;OFFSET OF DEVICE ADDR.
3765                                     ;*              .WORD  0          ;DATA TO BE WRITTEN
3766                                     ;*
3767 025664 010046          $TLKW:  MOV      R0,-(SP)      ;SAVE R0
3768 025666 012500          MOV      (5)+,R0      ;GET DEVICE OFFSET
3769 025670 052700 000340  BIS      #340,R0      ;ADD WRITE CODE.
3770 025674 004737 026146  JSR      PC,$LPW      ;WAIT FOR FAST PATH READY
3771 025700 010037 025772  MOV      R0,W1
3772 025704 010077 153536  MOV      R0,@KMA04
3773 025710 112777 000005 153524  MOVB     #5,@KMA02    ;ISSUE FAST PATH WRITE
3774 025716 004737 026146  JSR      PC,$LPW      ;WAIT FOR RDY
3775 025722 011537 025774  MOV      (5),W2
3776 025726 112577 153514  MOVB     (5)+,@KMA04  ;WRITE LOW BYTE DATA.
3777
3778 025732 112777 000005 153502  MOVB     #5,@KMA02    ;FP WRITE
3779 025740 004737 026146  JSR      PC,$LPW
3780 025744 111537 025776  MOVB     (5),W3
3781 025750 112577 153472  MOVB     (5)+,@KMA04  ;WRITE HIGH BYTE
3782 025754 112777 000005 153460  MOVB     #5,@KMA02
3783 025762 004737 026146  JSR      PC,$LPW
3784 025766 012600          MOV      (SP)+,R0
3785 025770 000205          RTS      R5          ;EXIT DONE.
3786 025772 000000          W1:      0
3787 025774 000000          W2:      0
3788 025776 000000          W3:      0
3789
3790

```

```

3791                                     ;*THIS ROUTINE ISSUES A READ COMMAND TO THE LPA-11
3792                                     ;*
3793                                     ;*      CALL = JSR      R5,$TLKR
3794                                     ;*              .WORD  0          ;OFFSET OF DEVICE
3795                                     ;*              .WORD  0          ;RETURNS HERE
3796                                     ;*      *DATA IN WORD $DATA
3797                                     ;*
3798
3799 026000 010046          $TLKR:  MOV      R0,-(SP)      ;SAVE R0
3800 026002 012500          MOV      (5)+,R0      ;GET OFFSET

```

```

3801 026004 052700 000300
3802 026010 004737 026146
3803 026014 110077 153426
3804 026020 112777 000005 153414
3805 026026 004737 026146
3806 026032 010037 026142
3807 026036
3808 026036 004537 026434
3809
3810 026042 104000
3811
3812
3813
3814
3815
3816 026044 000774
3817
3818
3819 026046 032777 000040 153362
3820 026054 001370
3821 026056 112777 000004 153356
3822 026064 004737 026146
3823 026070 117737 153352 026144
3824 026076
3825 026076 004537 026434
3826
3827 026102 104000
3828
3829
3830
3831
3832
3833 026104 000774
3834
3835
3836 026106 032777 000040 153322
3837 026114 001370
3838 026116 112777 000004 153316
3839 026124 004737 026146
3840 026130 117737 153312 026145
3841 026136 012600
3842 026140 000205
3843 026142 000000
3844 026144 000000
3845
3846
3847
3848
3849
3850
3851
3852
3853
3854

```

1S:

2S:

RD1:
\$DATR:

```

BIS #300,RO ;ADD READ CODE
JSR PC,$LPW ;WAIT TILL READY
MOVB RO,$KMAD4
MOVB #5,$KMAD2 ;ISSUE WRITE FP
JSR PC,$LPW
MOV RO,RO1

JSR RS,$TOUT ;--TOUT-CHECK FOR TIMEOUT

ERROR ;/TIME-OUT ERROR
;WE FAILED TO COMPLETE
;CURRENT OPERATION.
;CONTINUES IN THIS LOOP
;/WOULD MAKE US "HANG" HERE

BR 1S

BIT #BITS,$KMADO ;/RETURNS HERE-FROM-TIMED OUT.
BNE 1S ;FAST PATH GOT DATA?
MOVB #4,$KMAD2 ;ISSUE FAST PATH READ
JSR PC,$LPW
MOVB $KMAD4,$DATR ;GET LOW BYTE

JSR RS,$TOUT ;--TOUT-CHECK FOR TIMEOUT

ERROR ;/TIME-OUT ERROR
;WE FAILED TO COMPLETE
;CURRENT OPERATION.
;CONTINUES IN THIS LOOP
;/WOULD MAKE US "HANG" HERE

BR 2S

BIT #BITS,$KMADO ;/RETURNS HERE-FROM-TIMED OUT.
BNE 2S ;FAST PATH READY?
MOVB #4,$KMAD2 ;ISSUE FAST PATH READ
JSR PC,$LPW
MOVB $KMAD4,$DATR+1 ;SAVE HIGH BYTE
MOV (SP)+,RO
RTS RS

WORD 0

;THIS ROUTINE WAITS FOR KMC-CODE TO BECOME READY AS WELL
;AS FAST PATH TO BE READ.

CALL = JSR PC,$LPW

;IT WILL TIME OUT IF TOO MUCH TIME IS TAKEN BY
;THE MICRO-PROCESSORS AND REPORT AN ERROR, THEN HALT.

```

```

3855 026146 010146          $LPW:  MOV   R1,-(SP)      ;SAVE R1
3856 026150 005001          CLR   R1
3857 026152 122777 000377 153262 1$:  CMPB  #377,#KMA02    ;FINISHED INSTRUCTION?
3858 026160 001403          BEQ   2$
3859 026162 005201          INC   R1              ;TIME OUT?
3860 026164 001372          BNE   1$
3861 026166 000411          BR    10$
3862
3863 026170 032777 000020 153240 2$:  BIT   #BIT4,#KMA00    ;FAST PATH READ?
3864 026176 001403          BEQ   3$
3865 026200 005201          INC   R1              ;NO - TIME OUT?
3866 026202 001372          BNE   2$
3867 026204 000402          BR    10$            ;YES - REPORT AN ERROR
3868
3869 026206 012601          3$:  MOV   (SP)+,R1       ;RESTORE R1
3870 026210 000207          RTS   PC              ;EXIT
3871
3872 026212
3873 026212 104401 026220      10$:  TYPE  65$            ;;TYPE ASCIZ STRING
3874 026216 000407          BR    64$            ;;GET OVER THE ASCIZ
3875
3876 026236          ;:65$: .ASCIZ '<200>#LPA-11 FAULT#'
3877          64$:
3878 026236 000000          11$:  HALT
3879 026240 000776          BR    11$            ;LPA-11 FAULT RUN LPA-11
3880
3881
3882
3883
3884
3885
3886
3887
3888
3889
3890
3891
3892
3893
3894 026242 010046          $OUTLP: MOV  RD,-(SP)    ;SAVE RD
3895 026244 010146          MOV  R1,-(SP)        ;SAVE R1
3896
3897 026246 012700 001464          MOV  #.DVLS,RD       ;PROGRAM DEFINED LIST.
3898 026252 005001          CLR  R1
3899 026254 005710          1$:  TST  (0)             ;TERMINATOR REACHED?
3900 026256 001421          BEQ  10$              ;YES NEXT STEP.
3901 026260 027520 000000          CMP  @5,(0)+         ;MATCH WITH ADDR IN LIST?
3902 026264 001402          BEQ  2$
3903 026266 005201          INC  R1
3904 026270 000771          BR   1$
3905
3906 026272 010137 026310          2$:  MOV  R1,3$           ;SAVE OFFSET, DEVICE KNOWN.
3907 026276 005725          TST  (5)+
3908 026300 013537 026312          MOV  @5+,4$         ;GET DATA TO BE WRITTEN

```

```

;*
;*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
;* $TLKw
;*

```

3909	026304	004537	025664		JSR	R5,\$TLKw		;DO WRITE
3910	026310	000000		3\$:	.WORD	0		;DEVICE OFFSET
3911	026312	000000		4\$:	.WORD	0		;DATA TO BE WRITTEN.
3912	026314	012601			MOV	(SP)+,R1		
3913	026316	012600			MOV	(SP)+,R0		
3914	026320	000205			RTS	R5		
3915	026322	017520	000000	10\$:	MOV	@(5),(0)+		;SAVE ADDR.
3916	026326	005010			CLR	(0)		
3917	026330	004537	024644		JSR	R5,\$LPAl		
3918	026334	001464			.WORD	.DVLS		
3919	026336	000755			BR	2\$		
3920								
3921								
3922								
3923								
3924								
3925								
3926								
3927								
3928								
3929								
3930								
3931								
3932								
3933								
3934								
3935								
3936	026340	010046						
3937	026342	010146						
3938								
3939	026344	012700	001464					
3940	026350	005001						
3941	026352	005710		1\$:	TST	(0)		;EOL REACHED?
3942	026354	001420			BEQ	10\$;YES - DEFINE NEW ADDR.
3943								
3944	026356	027520	000000		CMP	@(5),(0)+		;ADDR. MATCH?
3945	026362	001402			BEQ	2\$		
3946	026364	005201			INC	R1		
3947	026366	000771			BR	1\$		
3948								
3949	026370	010137	026402	2\$:	MOV	R1,3\$;SAVE LIST OFFSET
3950	026374	005725			TST	(5)+		
3951	026376	004537	026000		JSR	R5,\$TLKw		;GO READ DEVICE
3952		026402						
3953	026402	000000		\$OFS=.				
3954				3\$:	.WORD	0		;OFFSET OF DEVICE
3955	026404	013735	026144		MOV	\$DATA,@(5)+		;STORE DATA.
3956	026410	012601			MOV	(SP)+,R1		;RESTORE R1
3957	026412	012600			MOV	(SP)+,R0		;RESTORE R2
3958	026414	000205			RTS	R5		;EXIT
3959								
3960	026416	017520	000000	10\$:	MOV	@(5),(0)+		
3961	026422	005010			CLR	(0)		
3962	026424	004537	024644		JSR	R5,\$LPAl		

```

; *
; * 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
; * USED BEFORE. IF NOT, WE HAVE TO INITIALIZE THE LPA
; * WITH THE NEW ADDR.
; * WHEN THE ADDR IS KNOWN WE CAN DO OUTPUT THROUGH
; * $TLKR
; * CALL THROUGH MOVEI DATA,ADDR.
; * WHICH EQUALS:
; * JSR R5,$INLP
; * .WORD XX ADDR OF DEVICE
; * .WORD YY ADDR TO STORE READ DATA.

```

```

3963 026430 001464 .WORD .DVL5
3964 026432 000756 BR 2$
3965
3966
3967
3968
3969
3970
3971
3972
3973
3974 026434 020537 026470 $STOUT: CMP RS,$$AD ;SAME ADDR?
3975 026440 001405 BEQ 1$
3976 026442 010537 026470 MOV RS,$$AD ;NO-SAVE THIS ADDR.
3977 026446 005037 026472 CLR $CNT ;CLR CNT AT ADDR.
3978 026452 000403 BR 2$
3979 026454 005237 026472 1$: INC $CNT ;OVERFLOW?
3980 026460 100402 BMI 3$ ;YES-ERROR RETURN
3981 026462 062705 000004 2$: ADD #4,R5 ;NO-NON ERROR RETURN
3982 026466 000205 3$: RTS RS ;RETURN.
3983
3984 026470 000000 $$AD: .WORD 0 ;CONTAINS LOOP ADDR.
3985 026472 000000 $CNT: .WORD 0 ;# OF TIMES AT ADDR.
3986
3987
3988
3989
3990
3991
3992
3993
3994
3995
3996 026474 000005 $RESET: RESET ;RESET THE WORLD.
3997
3998
3999 026506 005737 025522 ;* MOV 2$ 1$ ;/READ DEVICE REG 2$,PUT DATA IN 1$.
4000 026512 001004 TST $AERR ;IF NO ERROR,LOOP
4001 026514 062737 000002 026530 BNE 10$ ;THERE WAS AN ERROR.
4002 ADD #2,2$ ;UPDATE DEVICE ADDR.
4003 ;YOU SEE, WE HAVE TO PROTECT OUR SELF!
4004 ;IF 2$ CONTAINED A VALID ADDR,WE
4005 ;MUST KEEP TRYING UNTIL WE GENERATE
4006 ;AN INVALID ADDR.
4006 026522 000764 BR $RESET
4007 026524 10$:
4008 026524 000207 RTS PC
4009 026526 000000 1$: .WORD 0 ;JUNK LOC.
4010 026530 160000 2$: .WORD 160000 ;DUMB ADDR. FORCES INIT OF DMC/KMC.
4011
4012
4013
4014
4015
4016
;SDELAY- ROUTINE TO GIVE A MINOR DELAY.
; IS NOT TIME DEP#NDENT CODE SENCE
; NOT USED TO GET SPECIFIC TIME BUT

```

```

4017 ; JUST A LITTLE DELAY.
4018 ;
4019 ; THAT IS UNLESS A REAL TIME CLOCK IS PRESENT!
4020 ; THEN WE'LL GENERATE A TIME BETWEEN: 16MS TO 32 MS
4021 ;
4022 ;
4023 ; CALL= JSR PC, SDELAY
4024 ;
4025 SDELAY:
4026 026532 005737 026614 TST RTCCSR ;CLOCK PRESENT?
4027 026536 100016 BPL 10$
4028 026540 012737 000002 026604 MOV #2, TIME
4029 026546 052777 000115 000040 BIS #15, RTCCSR ;START CLOCK
4030 026554 005037 177776 CLR PS
4031 026560 005737 026604 1$: TST TIME
4032 026564 001375 BNE 1$
4033 026566 005077 000022 CLR RTCCSR ;STOP CLOCK
4034
4035 026572 000207 RTS PC
4036 026574 105237 026604 10$: INCB TIME
4037 026600 001375 BNE 10$
4038 026602 000207 RTS PC
4039
4040 026604 000000 TIME: .WORD 0
4041
4042 026606 005337 026604 CLKINT: DEC TIME
4043 026612 000002 RTI
4044 026614 000000 RTCCSR: .WORD 0 ;CLOCK CSR IF USED.
4045
4046 ;
4047 ; *THIS MACRO ALLOWS THE OPERATOR TO TALK TO
4048 ; *ANY DEVICE ON THE I/O BUS
4049 ; *USER MUST START AT THIS ADDR.
4050 ; *HE MUST SAY EITHER "E" FOR EXAMINE, OR "D" FOR DEPOSIT.
4051 ; *"E" IS DEFAULT.
4052 ; *NEXT, HE MUST SUPPLY AN ADDR.
4053 ; *NOTE IF ADDR. IS NOT FOUND ON I/O BUS, A HALT
4054 ; *WILL OCCUR.
4055
4056 026616 SUTK:
4057 026616 005037 001464 CLR .DVLS
4058 026622 21$:
4059 026622 104401 026630 TYPE 65$ ;;TYPE ASCIZ STRING
4060 026626 000405 BR 64$ ;;GET OVER THE ASCIZ
4061 ;:65$: .ASCIZ <200>#E OR D?#
4062 64$:
4063 026642 105777 152276 1$: TSTB @TKS
4064 026646 100375 BPL 1$
4065 026650 117737 152272 026772 MOVB @TKB, 20$ ;GET INPUT
4066 026656 104401 026772 TYPE 20$ ;ECHO NEXT MESSAGE.
4067 026662 142737 000240 026772 BICB #240, 20$ ;STRIP PARITY, LC
4068 026670 104412 RDOCT ;GET ADDR.
4069 026672 012637 026770 MOV (SP)+, 14$
4070 026676 123727 026772 000104 CMPB 20$, #D ;DEPOSIT?

```

4071	026704	001411				BEQ	10\$	
4072								
4073	026706	004537	026340			JSR	R5,\$INLP	;GET DATA
4074	026712	026770			2\$:	.WORD	14\$	
4075	026714	026726				.WORD	5\$	
4076								
4077	026716	013746	026726			MOV	5\$,-(SP)	::SAVE 5\$ FOR TYPEOUT
4078	026722	104402				TYPOC		::GO TYPE--OCTAL ASCII(ALL DIGITS)
4079	026724	000736				BR	21\$;LOOP.
4080	026726	000000			5\$:	.WORD	0	
4081								
4082	026730				10\$:			
4083	026730	104401	026736			TYPE	67\$::TYPE ASCIZ STRING
4084	026734	000404				BR	66\$::GET OVER THE ASCIZ
4085					::67\$:	.ASCIZ	<200>#DATA= #	
4086	026746				66\$:			
4087	026746	104412				RDOCT		
4088	026750	012637	026766			MOV	(SP)+,13\$	
4089								
4090	026754	004537	026242		11\$:	JSR	R5,\$OUTLP	;OUTPUT ROUTINE.
4091	026760	026770			12\$:	.WORD	14\$;DEVICE ADDR.
4092	026762	026766				.WORD	13\$;DATA
4093	026764	000716				BR	21\$	
4094								
4095	026766	000000			13\$:	.WORD	0	
4096	026770	000000			14\$:	.WORD	0	
4097	026772	100001	042504	044526	20\$:	.ASCIZ	<1><200>#DEVICE ADDR= #	
4098	027000	042503	040440	042104				
4099	027006	036522	000040					
4100								
4101						.EVEN		
4102								
4103								
4104								
4105								
4106								
4107								
4108								
4109								
4110								
4111								
4112								
4113								
4114								
4115								
4116								
4117								
4118								
4119								
4120								
4121								
4122								
4123								
4124	027012	012537	027022		\$PUTS:	MOV	(5)+,1\$;GET ADDR OF ADDR. OF A/D

```

THIS ROUTINE LOOKS THROUGH CURENT .DVLS FOR A/D ADDR.
IF UNFOUND GENERATES IT. THIS ROUTINE'S WHOLE PURPOSE IS
TO SET UP THE USER PROGRAM TO LINK TO FILE "DRLPX2" FOR
SAMPLE TAKEING PURPOSES.
TO TAKE SAMPLES, THE USER PROGRAM MUST SET UP
A/D CSR IN BSEL 4 AND 5.
(2) HE MUST CALL THIS ROUTINE:
      JSR      R5,$PUTS      ;CALL SET UP ROUTINE.
      .WORD   ADCSR        ;ADDR. OF A/D CSR.
      ;RETURNS HERE ;KMC BSEL 3,6,7 PERMINENTLY SET UP
                          ;(UNTILL ONE DOES A RESET)

(3)THE USER MUST PUT CODE 006 INTO KMC REG 2 TO
    START CONVERSION. CAUTION*DO WITH MOVVB INSTR.!
(4)MONITOR KMC REG 2 FOR CODE 377 (DRLPX2 IS DONE)
(5)READ KMC REG 4,5 FOR A/D RESULT.
(6) TO TAKE MORE $AMPLES, SIMPLY PUT A/D CSR INTO
    BSEL 4,5 AND CODE 6 INTO BSEL 2.
    
```

4125	027016	004537	026340			JSR	R5,\$INLP
4126	027022	000000			1\$:	.WORD	0
4127	027024	027120				.WORD	10\$
4128	027026	113777	026402	152416		MOVB	\$OF,\$,AKMAD6
4129	027034	113777	026402	152412		MOVB	\$OFS,AKMAD7
4130	027042	013737	027022	027062		MOV	1\$,2\$
4131	027050	062737	000002	027062		ADD	#2,\$
4132	027056	004537	026340			JSR	R5,\$INLP
4133	027062	000000			2\$:	.WORD	0
4134	027064	027120				.WORD	10\$
4135	027066	113777	026402	152350		MOVB	\$OFS,AKMAD3
4136	027074	152777	000340	152350		BISB	#340,AKMAD6
4137	027102	152777	000300	152344		BISB	#300,AKMAD7
4138	027110	152777	000300	152326		BISB	#300,AKMAD3
4139	027116	000205				RTS	R5
4140	027120	000000			10\$:	.WORD	0
4141							
4142		000001				.END	

JOB

MAINDEC-11-DRLPB-A
DRLPB.P11

AA11-K
CROSS REFERENCE

DIAGNOSTIC
TABLE

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SEQ 0100

R1Y	007472	1667	1677	1691	1694									
R2	=%000002	1445*	1449*	1457*	1463*	1467*	1492	1509						
		74*	531*	533	535*	536	537	1486*	1495	2127*	2131*	2135*	2139*	2141*
		2144	2277*	2280*	2864	2875*	2879*	2882	2889*	2890*	2891	2896*	2904*	3065
R2Y	007500	3086*	3417	3421*	3425*	3427*	3429*	3435	3436*					
		1460*	1520*	1524*	1534	1540	1568	1571	1600	1603	1624*	1628*	1636	1644
		1662	1665	1674	1686	1669								
R22	020422	2763*												
R3	=%000003	75*	1485*	1503	1525*	1629*	2147*	2148*	2153*	2154*	2865	2873*	2874*	2888*
		2891*	2900*	2901*	2903*	3066	3085*	3141	3150*	3156*	3157*	3160*	3165*	3166*
		3167	3176*	3373	3374*	3375	3378*	3379	3383	3385	3387*	3389*		
R37	020534	2017	2777*											
R38	020310	1996	2749*											
R39	020601	2026	2784*											
R4	=%000004	76*	1484*	1526*	1552	1568	1584	1600	1630*	1662	1686	1691	3067	3084*
		3142	3144*	3145*	3146*	3147	3148*	3162	3164*	3172*	3175*	3719	3744*	3749*
R40	020355	2005	2756*											
R41	020646	2081	2791*											
R43	020713	2091	2798*											
R44	020467	2068	2770*											
R5	=%000005	77*	614*	653*	656*	659*	662*	665*	677*	679*	690*	692*	705*	707*
		719*	721*	732*	734*	747*	749*	762*	764*	775*	777*	790*	792*	806*
		808*	819*	821*	834*	836*	848*	851*	854*	857*	860*	863*	870*	877*
		884*	896*	907*	910*	916*	919*	930*	933*	939*	942*	954*	957*	964*
		967*	978*	981*	987*	990*	1000*	1003*	1014*	1017*	1028*	1031*	1042*	1045*
		1059*	1062*	1076*	1078*	1088*	1090*	1107*	1109*	1118*	1120*	1137*	1140*	1143*
		1160*	1164*	1175*	1179*	1192*	1196*	1209*	1213*	1226*	1230*	1243*	1247*	1260*
		1264*	1277*	1281*	1294*	1298*	1311*	1315*	1328*	1330*	1333*	1337*	1345*	1360*
		1364*	1367*	1374*	1477*	1481*	1484*	1492*	1495*	1498*	1500*	1503*	1509*	1511*
		1517*	1532*	1534*	1538*	1540*	1546*	1549*	1552*	1555*	1557*	1560*	1568*	1571*
		1573*	1576*	1584*	1587*	1589*	1592*	1600*	1603*	1605*	1608*	1621*	1636*	1638*
		1642*	1644*	1651*	1654*	1657*	1660*	1662*	1665*	1667*	1674*	1677*	1681*	1684*
		1686*	1689*	1691*	1694*	1719*	1722*	1735*	1738*	1760*	1768*	1781*	1790*	1803*
		1804*	1817*	1820*	1821*	1835*	1836*	1849*	1850*	1863*	1864*	1877*	1881*	1887*
		1890*	1893*	1899*	1906*	1907*	1922*	1923*	1933*	1941*	1945*	1947*	1954*	1957*
		1960*	1968*	1971*	1974*	1980*	1988*	1993*	2000*	2004*	2009*	2014*	2021*	2025*
		2030*	2035*	2048*	2053*	2063*	2067*	2072*	2077*	2087*	2096*	2102*	2147*	2153*
		2198*	2200*	2202*	2204*	2221*	2223*	2225*	2227*	2240*	2242*	2245*	2251*	2272*
		2311	2318*	2323*	2326*	2331*	2334*	2340*	2342*	2344	2349*	2355*	2399	2400
		2404*	2420	2428*	2431*	2434*	2438*	2441*	2449*	2866	2868*	2870*	2877*	2881*
		2896	2902*	3068	3083*	3143	3149*	3151*	3153*	3154*	3155*	3156	3174*	3591*
		3613*	3667*	3687*	3694*	3745*	3785*	3808*	3825*	3842*	3909*	3914*	3917*	3951*
		3958*	3962*	3974	3976	3981*	3982*	3999*	4073*	4090*	4125*	4132*	4139*	
		78*	474*	475*	476									
R6	=%000006	79*												
R7	=%000007	4025*												
SDELAY	026532	1751	2686*											
SEL001	017604	2046	2693*											
SEL023	017651	1988	2009	2048	2072	2311*								
SNDVLT	014532	80*	478*	492*	500*	504	515*	516*	525	526	574*	577	628*	667
SP	=%000006	1418*	1435*	1713*	1746*	2110	2117*	2190*	2208*	2378	2463*	2464*	2472	2473
		2474*	2477	2478	2862*	2863*	2864*	2865*	2866*	2867*	2868	2871*	2884	2886*
		2888	2898	2900	2902	2903	2904	2905	2906	2908*	2909*	2937*	2940	2942
		2943	2965	2967*	2989	3019*	3024*	3045	3049*	3063*	3064*	3065*	3066*	3067*

SW8 =	000400	111#							
SW9 =	001000	110#							
TBITVE =	000014	152#							
EMP	021154	466#	470	568	1133*	1145*	2839#		
TEMP1	021156	2272*	2282	2840#					
TICKS	021152	1450*	1468*	1517*	1621*	2366*	2390*	2838#	
TIME	026604	4028*	4031	4036*	4040#	4042*			
TIMER	014756	1453	1471	1612	1696	2360#			
TIMERA	014772	2364#							
TIMER1	015014	2367	2369#						
TIMER2	015016	2365	2374#						
TIMER4	015046	2379#							
TIMSV	021150	2362*	2364	2374*	2375*	2376*	2377*	2379	2837#
TITLE	015472	573	2483#						
TKVEC =	000060	159#							
TPVEC =	000064	160#							
TRAPVE =	000034	158#	484*	485*					
TRTVEC =	000014	153#							
TST1	002616	623	647#						
TST10	003304	758#							
TST11	003344	765	771#						
TST12	003406	778	784#						
TST13	003464	802#							
TST14	003524	809	815#						
TST15	003566	822	828#						
TST16	003644	844#							
TST17	004114	885	890#						
TST2	002744	673#							
TST20	004160	897	903#						
TST21	004276	920	926#						
TST22	004414	943	950#						
TST23	004532	968	974#						
TST24	004650	991	996#						
TST25	004720	1004	1010#						
TST26	004770	1018	1024#						
TST27	005040	1032	1038#						
TST3	003004	680	686#						
TST30	005110	1046	1052#						
TST31	005170	1063	1069#						
TST32	005316	1082	1092	1100#					
TST33	005444	1113	1121	1128#					
TST34	005562	1131	1144	1155#					
TST35	005644	1165	1170#						
TST36	005726	1180	1185#						
TST37	006016	1188	1197	1202#					
TST4	003046	693	699#						
TST40	006106	1205	1214	1219#					
TST41	006174	1222	1231	1236#					
TST42	006262	1239	1248	1253#					
TST43	006354	1256	1265	1270#					
TST44	006446	1273	1282	1287#					
TST45	006540	1290	1299	1304#					
TST46	006632	1307	1316	1321#					
TST47	006774	1324	1341	1346	1353#				

N08

MAINDEC-11-DRLPB-A
DRLPB.F:1

CROSS REFERENCE

AA11-K DIAGNOSTIC
TABLE

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SEQ 0104

\$BDDAT	001126	246#	608*	614	616*	679	692	707	721	734	749	764	777	792
		808	821	836	863	870	877	884	896	910	919	933	942	957
		967	981	990	1003	1017	1031	1045	1062	1078	1090	1091	1109	1120
		1164	1179	1196	1213	1230	1247	1264	1281	1298	1315	1345	1374	1770*
		1783*	1806*	1807	1823*	1824	1838*	1839	1852*	1853	1866*	1867	1881	1893
		1909*	1910	1925*	1926	1947	1960	1974	2144*	2147	2153	2448*	2466	2816
		2818	2820	2822	2824	2829								
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\$CHARC	023046	3230*	3240*	3247	3256*	3261#								
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\$CMTAG	001100	232#	473	474	482	488	489							
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\$CM2	= 000004	264#	265#	266#										
\$CM3	= 000002	262#	264											
\$CNT	026472	3977*	3979*	3985#										
\$CNTLG	023577	3285	3398#											
\$CNTLU	023572	3302	3397#											
\$CPUOP	001222	289#												
\$CRLF	001171	268#	2995	3010	3018	3037	3042	3046	3229	3264	3313	3397		
\$DATR	026144	3823*	3840*	3844#	3955									
\$DBLK	021412	2873	2907	2915#										
\$DEVCT	001204	280#												
\$DEVm	001252	316#												
\$DOAGN	007330	1413	1422	1428#										
\$DTBL	021402	2876	2911#											
\$ENDAD	007320	198	1424#											
\$ENDCT	007266	1415#												
\$ENDMG	007337	1417	1432#											
\$ENULL	007334	1420	1431#											
\$ENV	001214	285#	2997	3208	3453	3477								
\$ENVm	001215	286#	507	3210	3215	3455								
\$EOP	007232	1386	1405#											
\$EOPCT	007260	1412#	1416											
\$ERFLG	001103	235#	2921	2950	2952*	2970	2985*	3010						
\$ERMAX	001115	241#	2970											
\$ERrOR	021636	482	2982#											
\$ERRPC	001116	242#	2816	2818	2820	2822	2824	2826	2827	2829	2989*	2990*	2991	3010
		3024												
\$ERRTB	001256	334#	3032											
\$ERRTY	021766	2994	3017#											
\$ERTL	001112	239#	2988*	3010										
\$ETABL	001214	284#												
\$ETEND	001256	224	318#											
\$FAIAL	001176	277#	3481*											
\$FFLG	024174	3444*	3447*	3475	3484*	3492*								
\$FILLC	001156	260#	3233	3264										
\$FILLS	001155	259#	3264											
\$GDADR	001120	243#												
\$GDDAT	001124	245#	674*	677	679	687*	690	692	701*	705	707	710*	716*	719
		721	729*	732	734	743*	747	749	752*	759*	762	764	772*	775
		777	786*	790	792	795*	803*	806	808	816*	819	821	830*	834
		836	839*	860*	863	867*	870	874*	877	881*	884	892*	896	907*
		910	916*	919	930*	933	939*	942	954*	957	964*	967	978*	981
		987*	990	1000*	1003	1014*	1017	1028*	1031	1042*	1045	1055*	1059*	1062

		1072*	1084*	1093*	1103*	1114*	1122*	1160*	1164	1175*	1179	1192*	1196	1209*
		1213	1226*	1243*	1260*	1264	1277*	1281	1294*	1298	1311*	1315	1342*	1345
		1371*	1500*	1503	1767*	1780*	1803*	1807	1820*	1824	1835*	1839	1849*	1853
		1863*	1867	1877*	1881	1890*	1893	1906*	1910	1922*	1926	1941*	1947	1957*
		1960	1971*	1974	2143*	2147	2150*	2153	2402*	2413*	2465	2816	2818	2820
		2822	2824	2829										
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\$HIBTS	001000	219#												
\$HIOCT	023726	3435*	3440#											
\$ICNT	001104	236#	2958*	2959	2961*	2969								
\$ILLUP	022266	3061	3077	3096#										
\$INLP	026340	614	653	656	659	662	665	679	692	707	721	734	749	764
		777	792	808	821	836	863	870	877	884	896	910	919	933
		942	957	967	981	990	1003	1017	1031	1045	1062	1078	1090	1109
		1120	1143	1164	1179	1196	1213	1230	1247	1264	1281	1298	1315	1330
		1337	1345	1367	1374	1481	1500	1546	1552	1557	1568	1573	1584	1589
		1600	1605	1651	1657	1662	1681	1686	1691	1719	1881	1887	1893	1947
		1954	1960	1968	1974	2242	2251	2323	2331	2434	2438	3936#	3999	4073
		4125	4132											
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\$ITEMB	001114	240#	2991*	2999	3010	3021								
\$LF	001172	269#	3010	3264	3388	3397								
\$LFLG	024173	3485*	3491#											
\$LOAD	025524	3591	3719#											
\$LPADR	001106	237#	489*	648*	1758*	2965*	2967	2969						
\$LPAI	024644	3565#	3917	3962										
\$LPERR	001110	238#	1757*											
\$LPW	026146	3770	3774	3779	3783	3802	3805	3822	3839	3855#				
\$MADR1	001226	302#												
\$MADR2	001232	306#												
\$MADR3	001236	309#												
\$MADR4	001242	312#												
\$MAIL	001174	220	224	275#	506	2964	2997	3208						
\$MAMS1	001224	296#												
\$MAMS2	001230	304#												
\$MAMS3	001234	307#												
\$MAMS4	001240	310#												
\$MBAOR	001002	220#												
\$MFLG	024172	3445*	3451	3486*	3490#									
\$MNEW	023615	3289	3401#											
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\$MSGLG	001212	283#	3466*											
\$MSGTY	001174	276#	3459	3467*	3479	3483*								
\$MSWR	023604	3286	3399#											
\$MTYP1	001225	297#												
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\$MXCNT	021634	2962	2969#											
\$NULL	001154	258#	3235	3264										
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		841#	887#	900#	923#	947#	971#	993#	1007#	1021#	1035#	1049#	1066#	1097#

		1125#	1152#	1167#	1182#	1199#	1216#	1233#	1250#	1267#	1284#	1301#	1318#	1350#
		1378#	1763#	1776#	1796#	1811#	1828#	1842#	1856#	1870#	1899#	1915#	1934#	1982#
		2039#												
\$OCNT	022564	3140#	3169#	3182#										
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\$OMODE	022566	3135#	3139#	3144	3147#	3158#	3184#							
\$OUILP	026242	677	690	705	719	732	747	762	775	790	806	819	834	848
		851	854	857	860	907	916	930	939	954	964	978	987	1000
		1014	1028	1042	1059	1076	1088	1107	1118	1137	1140	1160	1175	1192
		1209	1226	1243	1260	1277	1294	1311	1328	1333	1360	1364	1477	1484
		1492	1495	1498	1503	1509	1511	1517	1532	1534	1538	1540	1549	1555
		1560	1571	1576	1587	1592	1603	1608	1621	1636	1638	1642	1644	1654
		1660	1665	1667	1674	1677	1684	1689	1694	1722	1735	1738	1803	1817
		1820	1835	1849	1863	1877	1890	1899	1906	1922	1933	1941	1945	1957
		1971	1993	2004	2014	2025	2053	2063	2067	2077	2087	2147	2153	2198
		2200	2202	2204	2221	2223	2225	2227	2240	2245	2272	2318	2326	2334
		2340	2349	2428	2431	2441	3894#	4090						
		2933	2944	2949	2960	2966#								
\$OVER	021620	279#	506#	603#	1409#	1410#	1418	1431	2956	2970				
\$PASS	001202	222#												
\$PASTM	001006	4124#												
\$PUTS	027012	3094#												
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\$PWRON	022122	3092#												
\$PWRMG	022256	3071	3077#											
\$PWRUP	022174	267#	3010	3264	3332	3381	3397							
\$QUES	001170	3345#	3539											
\$RDCHR	023334	3542												
\$RDDEC =	***** U	3373#	3540											
\$RDLIN	023454	3413#	3541											
\$RDOCT	023626	3366#												
\$RDSZ =	000010	262#												
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\$REGO	001162	265#												
\$REG1	001164	893	1161	1176	1193	1210	1227	1244	1261	1278	1295	1312	1376	1383
\$RESET	026474	3996#	4006											
		1430#												
\$RTNAD	007332	3542												
\$R2A =	***** U	3974	3976#	3984#										
\$SAD	026470	3070#	3078	3079#	3080#	3098#								
\$SAVRE =	***** U	480	2929#											
\$SAVR6	022272	336#	472#	479	480	482	484	486	488	489	1407	2930	2983	3007
\$SCOPE	021422	3009	3269	3403										
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		2941	2963#											
\$STUP =	177777	196#	201											
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\$SVPC =	000214	490	648	674	687	700	716	729	742	759	772	785	803	816
\$SWR =	164400	829	845	891	904	927	951	975	997	1011	1025	1039	1053	1070
		1101	1129	1156	1171	1186	1203	1220	1237	1254	1271	1288	1305	1322
		1354	1382	1402	1408	1423	1429	1431	1767	1780	1800	1815	1832	1846
		1860	1874	1903	1919	1938	1986	2043	2922	2923	2924	2925	2932	2944
		2946	2947	2950	2951	2952	2953	2954	2966	2969	2976	2977	2978	2979

COMMEN	162#														
CROSS	644#	1789	1979	1993	2000	2014	2021	2053	2063	2077	2087				
CSPACE	644#	1997	2006	2018	2027	2058	2069	2082	2092						
ENDCOM	162#														
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	838	865	872	879	886	898	912	921	935	944	959	969	983	992	1005
	1019	1033	1047	1064	1080	1094	1111	1123	1149	1166	1181	1198	1215	1232	1249
	1266	1283	1300	1317	1347	1374	1774	1787	1809	1826	1841	1855	1869	1883	1895
	1912	1928	1949	1962	1976	2410	3609	3615	3628	3669	3696	3810	3827		
ESCAPE	162#														
GETPRI	162#														
GETSWR	162#														
LRXX	2749#	2756	2763	2770	2777	2784	2791	2798							
MOVEI	20#	611	650	654	657	660	663	677	690	705	719	732	747	762	775
	790	806	819	834	861	868	875	882	894	908	917	931	940	955	965
	979	988	1001	1015	1029	1043	1060	1076	1088	1107	1118	1140	1162	1177	1194
	1211	1228	1245	1262	1279	1296	1313	1328	1334	1343	1364	1372	1479	1498	1544
	1549	1555	1565	1571	1581	1587	1597	1603	1649	1654	1660	1678	1684	1689	1717
	1879	1884	1891	1945	1951	1958	1965	1972	2240	2249	2321	2329	2431	2436	3997
MOVEM	19#	675	688	702	717	730	744	760	773	787	804	817	831	846	849
	852	855	858	905	914	928	937	952	962	976	985	998	1012	1026	1040
	1057	1074	1086	1105	1116	1135	1138	1158	1173	1190	1207	1224	1241	1258	1275
	1292	1309	1326	1331	1358	1362	1475	1482	1490	1493	1496	1501	1507	1509	1515
	1530	1532	1536	1538	1547	1553	1558	1569	1574	1585	1590	1601	1606	1619	1634
	1636	1640	1642	1652	1658	1663	1665	1672	1675	1682	1687	1692	1720	1733	1736
	1801	1815	1818	1833	1847	1861	1875	1888	1897	1904	1920	1931	1939	1943	1955
	1969	1991	2002	2012	2023	2051	2061	2065	2075	2085	2145	2151	2196	2198	2200
	2202	2218	2221	2223	2225	2238	2243	2270	2316	2324	2332	2338	2347	2426	2429
	2439														
MULT	162#														
NEWONE	1250#	1267	1284	1301											
NEWTST	162#	644	670	683	696	712	725	738	755	768	781	799	812	825	841
	887	900	923	947	971	993	1007	1021	1035	1049	1066	1097	1125	1152	1167
	1182	1199	1216	1233	1250	1267	1284	1301	1318	1350	1378	1763	1776	1796	1811
	1828	1842	1856	1870	1899	1915	1934	1982	2039						
POP	162#	2902	3082	3083	3436	3487	3488								
PUSH	162#	2861	3063	3069	3415	3448	3450	3471							
REPORT	162#														
SCOPE	57#	647	673	686	699	715	728	741	758	771	784	802	815	828	844
	890	903	926	950	974	996	1010	1024	1038	1052	1069	1100	1128	1155	1170
	1185	1202	1219	1236	1253	1270	1287	1304	1321	1353	1381	1406	1766	1779	1799
	1814	1831	1845	1859	1873	1902	1918	1937	1985	2042					
SETPRI	162#														
SETTRA	3522#	3531	3532	3533	3534	3536	3538	3539	3540	3541					
SETUP	162#	472													
SKIP	162#	623	636	638	666	680	693	708	722	735	750	765	778	793	809
	822	837	864	871	878	885	897	911	920	934	943	958	968	982	991
	1004	1018	1032	1046	1063	1079	1082	1092	1110	1113	1121	1131	1144	1146	1148
	1165	1180	1188	1197	1205	1214	1222	1231	1239	1248	1256	1265	1273	1282	1290
	1299	1307	1316	1324	1341	1346	1356	1386	1773	1786	1788	1808	1825	1840	1854
	1868	1882	1894	1911	1927	1948	1961	1975	2409	2414					
SLASH	162#														
SPACE	162#														
STARS	162#	194	205	207	214	227	270	273	644	646	670	672	683	685	696

SEOP	30#	1397
SEARC	30#	2970
SEART	30#	3010
SINLP	28#	3921
SMMAC	18#	
SOUTL	27#	3882
SPARM	30#	
SPOWE	30#	3057
SRODC	30#	3403
SREAD	30#	3264
SSAVE	30#	
SSCOP	30#	2916
SSPAC	30#	
SSWDO	30#	
STLKW	26#	3760
STOUT	454#	3965
STRAP	30#	3499
STYPD	30#	2849
STYPE	30#	3185
STYPO	30#	3108

ADC	2447														
ADD	546	553	616	1387	1388	1389	1390	1391	1392	1393	1495	1552	1568	1662	1691
	1735	2368	2376	2438	2474	2881	3032	3136	3146	3221	3303	3312	3431	3458	3470
	3482	3981	4001	4131											
ASL	2375	2390	3029	3030	3031	3326	3327	3328	3424	3426	3428	3511			
ASLB	2886														
ASR	710	752	795	839	2443	2444	2445	2446	3465						
BCC	2887														
BEG	508	581	583	585	587	589	638	680	693	708	722	735	750	765	778
	793	809	822	837	864	871	878	885	897	911	920	934	943	958	968
	982	991	1004	1018	1032	1046	1063	1131	1165	1180	1197	1214	1231	1248	1256
	1265	1273	1282	1290	1299	1307	1316	1346	1356	1386	1422	1447	1465	1478	1522
	1528	1543	1626	1632	1648	1716	1882	1894	1948	1961	1975	2236	2248	2275	2313
	2389	2947	2949	2951	2957	2986	3034	3039	3052	3163	3211	3224	3259	3283	3310
	3325	3423	3452	3456	3476	3478	3607	3632	3653	3681	3738	3858	3864	3900	3902
	3942	3945	3975	4071											
BGE	1825	1840	1854	1927	2960										
BGT	1413	2895	3170	3322	3363										
BIC	551	555	578	1410	1968	2125	2163	2175	2323	2374	3160	3279	3296	3323	3350
	3356	3364	3430												
BICB	4067														
BIS	635	1137	1481	1546	1651	1719	1887	1954	2242	2331	2345	2889	2890	3165	3166
	3330	3594	3724	3726	3734	3769	3801	4029							
BISB	3021	4136	4137	4138											
BIT	1130	1187	1204	1221	1238	1255	1272	1289	1306	1323	1355	1446	1464	1477	1487
	1521	1527	1542	1625	1631	1647	1715	2235	2247	2258	2274	2364	2932	2946	2954
	2992	3606	3662	3819	3826	3863									
BITB	507	3210	3215	3247	3455										
BLE	1808														
BLOS	3376	1860	1911	2471											
BLT	2878	2894	3171	3238	3320	3361									
BMI	625	1079	1092	1110	1121	1144	1338	1368	2252	2885	3980				
BNE	477	497	523	538	543	549	569	571	615	621	711	753	796	840	1146
	1148	1188	1205	1222	1239	1324	1340	1370	1437	1488	1504	1562	1578	1594	1611
	1669	1695	1739	2126	2130	2134	2138	2149	2155	2165	2177	2180	2254	2257	2259
	2290	2320	2328	2341	2352	2354	2365	2367	2414	2442	2883	2933	2955	2993	2998
	3022	3044	3081	3161	3209	3216	3218	3226	3234	3248	3255	3275	3281	3301	3308
	3315	3352	3358	3380	3386	3454	3460	3463	3480	3601	3604	3625	3627	3634	3636
	3663	3679	3706	3730	3736	3820	3837	3860	3866	4000	4032	4037			
BPL	2161	2173	2229	2264	2288	2294	2435	2468	2869	2899	3005	3159	3203	3252	3277
	3293	3348	3354	3750	4027	4064									
BR	469	499	592	604	618	623	636	666	1082	1113	1341	1454	1455	1472	1473
	1511	1534	1613	1614	1638	1697	1730	1773	1786	1788	1793	2128	2132	2136	2140
	2156	2184	2204	2216	2278	2284	2334	2391	2409	2880	2897	2935	2941	2944	3003
	3027	3054	3073	3097	3137	3152	3173	3205	3231	3241	3250	3257	3304	3331	3333
	3359	3382	3432	3446	3468	3568	3584	3587	3621	3638	3642	3646	3675	3702	3741
	3753	3816	3833	3861	3867	3874	3879	3904	3919	3947	3964	3978	4006	4060	4079
	4084	4093													
CLR	466	467	468	475	488	506	524	528	534	603	609	610	640	674	716
	759	803	1055	1133	1192	1209	1226	1243	1394	1407	1408	1535	1639	1674	1732
	1941	1957	2150	2214	2246	2350	2424	2872	2875	2953	3020	3079	3150	3290	3291
	3420	3421	3590	3599	3685	3722	3723	3727	3731	3739	3856	3898	3916	3940	3961
	3977	4030	4033	4057											
CLRB	2901	2952	3230	3256	3387	3484	3485	3486							

CMP	476	496	522	537	542	548	580	582	584	586	588	667	679	692	707
	721	734	749	764	777	792	808	821	836	863	870	877	884	896	910
	919	933	942	957	967	981	990	1003	1017	1031	1045	1062	1164	1179	1196
	1213	1264	1281	1298	1315	1345	1503	1807	1824	1839	1853	1867	1881	1893	1910
	1926	1947	1960	1974	2110	2129	2133	2137	2164	2176	2179	2289	2378	2470	2893
	2942	2959	3274	3280	3300	3307	3319	3321	3351	3357	3360	3362	3375	3588	3652
	3729	3735	3737	3901	3944	3974									
CMPB	637	1385	2948	2997	3208	3223	3225	3233	3254	3258	3282	3314	3379	3385	3453
	3624	3626	3631	3678	3705	3857	4070								
COM	2314														
DEC	1145	1147	1339	1369	1411	1561	1577	1593	1610	1668	1694	2148	2154	2228	2253
	2256	2319	2327	2340	2351	2353	2366	2388	2441	3028	4042				
DECb	3158	3169	3237	3240											
EMT	56														
HALT	185	2265	3006	3072	3096	3204	3751	3878							
INC	520	617	1361	1384	1409	1442	1500	1557	1573	1589	1605	1657	1681	1878	2286
	2428	2879	2958	2988	3080	3164	3172	3329	3483	3582	3600	3633	3635	3683	3728
	3740	3859	3865	3903	3946	3979									
INCB	1330	2963	2985	3260	3603	3654	3749	4036							
IOT	57														
JMP	189	190	191	529	594	595	596	597	598	599	1395	1429	1615	1698	1699
	2108	2114	2166	2178	2379										
JSR	567	614	641	653	656	659	662	665	677	679	690	692	705	707	719
	721	732	734	747	749	762	764	775	777	790	792	806	808	819	821
	834	836	848	851	854	857	860	863	870	877	884	893	896	907	910
	916	919	930	933	939	942	954	957	964	967	978	981	987	990	1000
	1003	1014	1017	1028	1031	1042	1045	1059	1062	1076	1078	1088	1090	1107	1109
	1118	1120	1137	1140	1143	1160	1161	1164	1175	1176	1179	1192	1193	1196	1209
	1210	1213	1226	1227	1230	1243	1244	1247	1260	1261	1264	1277	1278	1281	1294
	1295	1298	1311	1312	1315	1328	1330	1333	1337	1345	1360	1364	1367	1374	1376
	1383	1424	1451	1452	1453	1469	1470	1471	1477	1481	1484	1492	1495	1498	1500
	1503	1509	1511	1517	1518	1532	1534	1538	1540	1546	1549	1552	1555	1557	1560
	1568	1571	1573	1576	1584	1587	1589	1592	1600	1603	1605	1608	1612	1621	1622
	1636	1638	1642	1644	1651	1654	1657	1660	1662	1665	1667	1674	1677	1681	1684
	1686	1689	1691	1694	1696	1714	1719	1722	1723	1725	1727	1729	1735	1738	1740
	1747	1760	1768	1772	1781	1785	1790	1803	1804	1817	1820	1821	1835	1836	1849
	1850	1863	1864	1877	1881	1887	1890	1893	1899	1906	1907	1922	1923	1933	1941
	1945	1947	1954	1957	1960	1968	1971	1974	1980	1988	1993	1997	2000	2004	2006
	2009	2014	2018	2021	2025	2027	2030	2035	2048	2053	2058	2063	2067	2069	2072
	2077	2082	2087	2092	2096	2102	2118	2121	2147	2153	2191	2193	2198	2200	2202
	2204	2209	2211	2213	2215	2221	2223	2225	2227	2240	2242	2245	2251	2255	2272
	2292	2318	2323	2326	2331	2334	2340	2349	2361	2404	2408	2428	2431	2434	2438
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	3951	3962	3999	4073	4090	4125	4132								
MOV	470	474	478	480	481	482	483	484	485	486	487	489	492	493	494
	495	500	502	503	504	509	515	516	517	518	521	525	526	531	532
	533	535	540	541	544	545	550	552	556	574	577	608	628	634	648
	649	669	687	700	701	729	742	743	772	785	786	816	829	830	845
	848	851	854	857	860	867	874	881	891	892	904	907	913	916	927
	930	936	939	951	954	961	964	975	978	984	987	997	1000	1011	1014
	1025	1028	1039	1042	1054	1056	1059	1071	1072	1073	1084	1085	1093	1102	1103
	1104	1114	1115	1122	1129	1132	1134	1156	1157	1160	1171	1172	1175	1186	1189
	1203	1206	1220	1223	1237	1240	1254	1257	1260	1271	1274	1277	1288	1291	1294

	1305	1308	1311	1322	1325	1333	1342	1354	1357	1360	1371	1382	1414	1418	1421
	1435	1444	1445	1448	1449	1450	1462	1463	1466	1467	1468	1474	1484	1485	1486
	1489	1492	1506	1514	1517	1519	1520	1523	1524	1525	1526	1529	1541	1564	1580
	1596	1618	1621	1623	1624	1627	1628	1629	1630	1633	1646	1671	1677	1713	1722
	1724	1726	1728	1746	1755	1756	1757	1758	1767	1770	1771	1780	1783	1784	1800
	1803	1806	1817	1820	1823	1832	1835	1838	1846	1849	1852	1860	1863	1866	1874
	1877	1890	1896	1903	1906	1909	1919	1922	1925	1930	1938	1942	1971	1986	1990
	2011	2043	2050	2074	2111	2117	2123	2124	2127	2131	2135	2139	2141	2143	2144
	2147	2153	2162	2174	2190	2194	2195	2208	2212	2227	2237	2245	2269	2272	2273
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	2362	2377	2387	2399	2400	2401	2402	2407	2420	2421	2423	2425	2448	2463	2464
	2465	2466	2472	2473	2477	2478	2862	2863	2864	2865	2866	2867	2868	2873	2876
	2896	2902	2903	2904	2905	2906	2908	2909	2937	2938	2940	2943	2961	2962	2965
	2966	2967	2987	2989	3019	3024	3033	3038	3043	3045	3049	3061	3062	3063	3064
	3065	3066	3067	3068	3069	3070	3071	3077	3078	3082	3083	3084	3085	3086	3087
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	3206	3207	3212	3220	3235	3287	3311	3316	3345	3346	3373	3374	3389	3390	3391
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	3461	3466	3467	3469	3471	3481	3487	3488	3507	3508	3512	3518	3519	3566	3581
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	3771	3772	3775	3784	3799	3800	3806	3841	3855	3869	3894	3895	3897	3906	3908
	3912	3913	3915	3936	3937	3939	3949	3955	3956	3957	3960	3976	4028	4069	4077
	4088	4124	4130												
MOVB	554	2312	2315	2871	2874	2888	2891	2900	2964	2991	2999	3134	3135	3138	3139
	3140	3144	3147	3148	3167	3217	3245	3253	3278	3295	3349	3355	3378	3383	3422
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	3782	3803	3804	3821	3823	3838	3840	4065	4128	4129	4135				
NEG	2469	2870	3145												
NOP	471	619	643	1425	1426	1427	1742	1743	3547						
RESET	1423	3996													
ROL	3151	3153	3154	3155	3157	3425	3427	3429							
RTI	501	2910	2968	3009	3095	3179	3222	3317	3365	3393	3439	3520	4043		
RTS	558	1505	1741	2167	2181	2230	2266	2295	2342	2355	2369	2392	2449	2475	2479
	3047	3262	3489	3513	3687	3707	3745	3785	3842	3870	3914	3958	3982	4008	4035
	4038	4139													
SUB	557	1584	1600	1686	2285	2293	2412	2413	2467	2877	2990	3464			
SWAB	2422														
TRAP	3522	3531	3532	3533	3534	3536	3538	3539	3540	3541					
TST	536	547	568	570	614	620	624	653	656	659	662	665	1230	1247	1436
	1738	2263	2882	2892	2939	2956	3004	3051	3162	3219	3227	3249	3309	3324	3433
	3459	3477	3479	3509	3748	3899	3907	3941	3950	3999	4026	4031			
TSTB	1078	1091	1109	1120	1143	1337	1367	2160	2172	2251	2287	2434	2884	2898	2950
	3202	3251	3276	3292	3347	3353	3451	3462	3475	3680	4063				
.ASCII	267	268	561	562	563	564	565	2483	2492	2499	2503	2512	2522	2529	2546
	2553	2560	2567	2707	2713	2724	2733	2808	2812						
.ASCIZ	269	1432	1795	2534	2535	2542	2575	2584	2589	2593	2597	2601	2605	2610	2615
	2622	2626	2632	2635	2642	2649	2655	2660	2662	2667	2677	2681	2687	2694	2701
	2742	2749	2756	2763	2770	2777	2784	2791	2798	3055	3099	3397	3398	3399	3401
	3586	3640	3644	3648	3876	4062	4086	4097							
.ASECT	14														
.BLKB	3396														
.BLKW	452	2915	3543	3544											
.BYTE	234	235	240	241	249	250	258	259	260	261	285	286	296	297	304
	305	307	308	310	311	630	631	1431	2672	2674	2676	2685	2686	2693	2700

	2706	2722	2723	2732	2807	2810	2811	2814	3001	3002	3180	3181	3182	3183	3394
.DSABL	3395	3490	3491	3492											
.ENABL	30	3267													
.END	4142														
.ENDC	47	56	148	162	175	177	178	190	195	199	201	206	208	215	228
	232	234	262	266	267	271	274	296	304	307	310	313	314	315	316
	317	320	336	449	472	478	479	482	484	486	488	489	490	511	527
	624	637	639	645	646	647	648	667	671	672	673	674	681	684	685
	686	687	694	697	698	699	700	701	709	713	714	715	716	723	726
	727	728	729	736	739	740	741	742	743	751	756	757	758	759	766
	769	770	771	772	779	782	783	784	785	786	794	800	801	802	803
	810	813	814	815	816	823	826	827	828	829	830	838	842	843	844
	845	865	872	879	886	888	889	890	891	892	898	901	902	903	904
	912	921	924	925	926	927	935	944	948	949	950	951	959	969	972
	973	974	975	983	992	994	995	996	997	1005	1008	1009	1010	1011	1019
	1022	1023	1024	1025	1033	1036	1037	1038	1039	1047	1050	1051	1052	1053	1064
	1067	1068	1069	1070	1080	1083	1093	1098	1099	1100	1101	1111	1114	1122	1126
	1127	1128	1129	1130	1132	1145	1147	1149	1153	1154	1155	1156	1157	1166	1168
	1169	1170	1171	1172	1181	1183	1184	1185	1186	1187	1189	1198	1200	1201	1202
	1203	1204	1206	1215	1217	1218	1219	1220	1221	1223	1232	1234	1235	1236	1237
	1238	1240	1249	1251	1252	1253	1254	1255	1257	1266	1268	1269	1270	1271	1272
	1274	1283	1285	1286	1287	1288	1289	1291	1300	1302	1303	1304	1305	1306	1308
	1317	1319	1320	1321	1322	1323	1325	1342	1347	1351	1352	1353	1354	1355	1357
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	1874	1883	1895	1900	1901	1902	1903	1912	1916	1917	1918	1919	1928	1935	1936
	1937	1938	1949	1962	1976	1981	1984	1985	1986	1987	2040	2041	2042	2043	2044
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ERRORS DETECTED: 0

*DRLPB, DRLPB/SOL/CRF=DRLPA.MAC, DRLPS
RUN-TIME: 30 19 3 SECONDS
CORE USED: 41K