LP11

LINE PRINTER TEST

MD-11-DZLPA-B

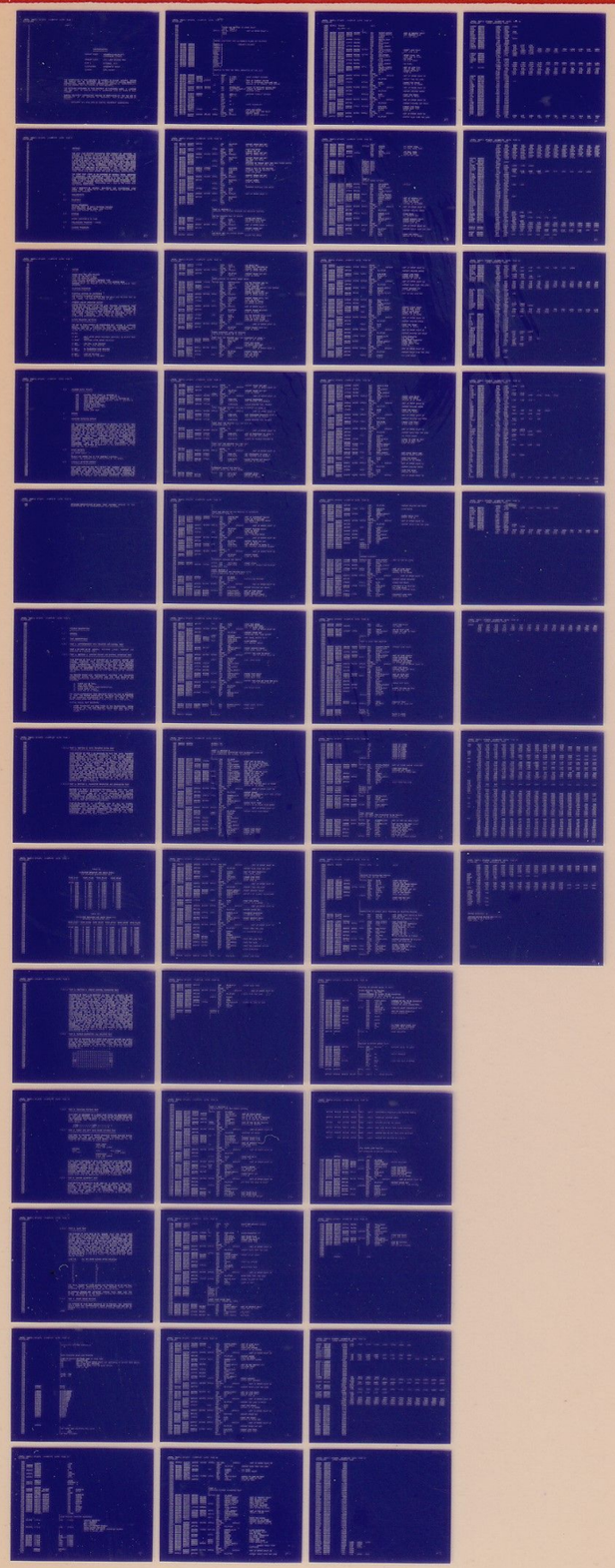
EP DZLPA B DL

FICHE 1 OF 1

JAN 1978

digital

MADE IN USA



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                                        .REPT 0
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IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DZLPA-B
SUPERCEDES 11-D2CA

PRODUCT NAME: LP11 LINE PRINTER TEST

DATE : DECEMBER, 1975

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: EARL HAIGHT

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                                1.      ABSTRACT
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                                        THE LP11 LINE PRINTER DIAGNOSTIC TEST PROGRAM IS  DESIGNED  TO
                                        PROVIDE  A THOROUGH CHECK-OUT OF THE PRINTER CONTROL INTERFACE
                                        ELECTRONICS AS WELL AS THE ELECTRONIC AND MECHANICAL  PORTIONS
                                        OF THE LINE PRINTER MECHANISM ITSELF.  THE PROGRAM CONSISTS OF
                                        A SERIES OF SEVEN (7) TEST AND DRIVE ROUTINES, EACH  OF  WHICH
                                        CAN BE SELECTED AND OPERATED INDEPENDENTLY OF THE OTHERS USING
                                        SPECIAL ENTRY POINTS.  INTERNALLY  DETECTED  ERROR  CONDITIONS
                                        ARE  DISPLAYED  ON THE TELEPRINTER WHILE DETAILED DESCRIPTIONS
                                        OF EACH ERROR AND WHAT WAS HAPPENING AT  THE  TIME  THE  ERROR
                                        OCCURRED, IS PRESENTED IN THE LISTING.  PRINT PATTERNS USED IN
                                        THESE TESTS HAVE BEEN CHOSEN FOR EASE OF VISUAL VERIFICATION.

                                        THE FIRST TEST (TEST 1) IS COMPOSED OF SEVERAL TESTS  DESIGNED
                                        TO  CHECK-OUT  THE PROCESSOR INTERFACE CONTROL ELECTRONICS AND
                                        INTERCOMMUNICATIONS DATA PATHS.  TEST 2, 3, AND  4  USE  WORST
                                        CASE  PATTERNS TO TEST PRINTER PERFORMANCE AND ENDURANCE WHILE
                                        TESTS 5 AND 6 PROVIDE DRIVE FOR PRINTER HAMMER ALLIGNMENT  AND
                                        INTENSITY  ADJUSTMENT  PROCEDURES AND A TEST OF THE PAPER SLEW
                                        AND CLUTCH OPERATIONS.

                                        TEST 7 CONSISTS OF  SEVERAL  SUB-TESTS  AND  MAINTENANCE  AIDS
                                        AMONG  THEM  A SCOPE DRIVE TEST, FOR HELPING THE TECHNICIAN TO
                                        DEBUG THE HARDWARE.

                                2.      REQUIREMENTS
                                        ------------

                                2.1     EQUIPMENT
                                        ---------

                                        PDP-11 PROCESSOR
                                        TELETYPE MODEL 33 ASCII KEYBOARD PRINTER
                                        DATA PRODUCTS, MODEL 2318, LINE PRINTER
                                        LP11 LINE PRINTER CONTROL UNIT

                                2.2     STORAGE
                                        -------

                                        MEMORY LOCATION 0 TO 7000

                                2.3     PRELIMINARY PROGRAMS    (NONE)
                                        --------------------

                                3.      LOADING PROCEDURE
                                        -----------------
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                                3.1     METHOD
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                                        POWER DOWN THE LINE PRINTER
                                        POWER UP THE PDP-11 ONLY
                                        LOAD THE ABSOLUTE LOADER
                                        LOAD THE LP11 DIAGNOSTIC PROGRAM TAPE
                                        AFTER LOADING HAS BEEN COMPLETED, LOAD ADDRESS 0200
                                        DEPRESS START AND PROCEED WITH THE LINE PRINTER POWER-UP  TEST
                                        SEQUENCE.

                                4.      STARTING PROCEDURE
                                        ------------------

                                4.1     STARTING ADDRESS OR ADDRESSES
                                        ----------------------------
                                        THE INITIAL STARTING ADDRESS FOR THE LP11 LINE PRINTER TEST IS
                                        LOC.  0200.  THE RESTART ADDRESS IS 600.

                                4.2     PROGRAM AND/OR OPERATOR ACTION
                                        ------------------------------
                                        DURING INITIAL START-UP OF THE LINE  PRINTER  DIAGNOSTIC  TEST
                                        THE HEADER MESSAGE "MAINDEC-11-D2CA LINE PRINTER TEST" WILL BE
                                        TYPED ON THE  TELEPRINTER  FOLLOWED  BY  RESTART  ADDRESS  600
                                        EXECUTION OF THE PRINTER READY PORTION OF TEST 1.  PRINTING OF
                                        THE MESSAGE "POWER-UP" ON THE TELEPRINTER INDICATES  START  OF
                                        THIS   TEST   SEQUENCE.   THIS  TEST  IS  CARRIED  OUT  BY  AN
                                        INTERACTIVE EXCHANGE BETWEEN THE TEST AND THE USER.

                        5.      SWITCH REGISTER SETTINGS
                                ----------------------

                                THE USE OF THIS PROGRAM ON PROCESSORS NOT  HAVING  A  HARDWARE
                                SWITCH   REGISTER   NECESSITATES  OPERATOR  INTERACTION.   THE
                                OPERATOR MUST SET UP LOCATION 176 WITH  THE  SOFTWARE  DISPLAY
                                VALUES AND LOCATION 176 WITH THE SOFTWARE SWITCH VALUES.

                                SWITCH

                                15 SET          HALT AFTER ERROR PRINTOUT (OPTIONAL IN STATIC TEST
                                                ONLY)
                                15 RESET        CONTINUE AFTER ERROR PRINTOUT

                                14 SET          132 COL. LINE PRINTER
                                14 RESET        80 COL. LINE PRINTER

                                13 SET          96 CHARACTER LINE PRINTER
                                13 RESET        64 CHARACTER LINE PRINTER

                                12 SET          LOOP ON ROUTINE
                                12 RESET        CONTINUE TO THE NEXT
```

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                                5.2     ADDRESS ENTRY POINTS
                                        --------------------

                                            600     CONTROL TEST (TEST 1, SECTION 1)
                                            610     TEST DATA PATHS (TEST 1, SECTION 2)
                                            614     TEST CHARACTER GENERATOR (TEST 1, SECTION 3)
                                            620     TEST ZONE AND FORMAT CONTROL (TEST 1, SECTION 4)
                                            624     TEST WORST CASE NOISE
                                            630     ROTATING PATTERN
                                            634     DOUBLE WEDGE PATTERN
                                            640     HAMMER ALIGNMENT TEST
                                            644     SLEW TEST
                                            650     SCOPE LOOP TEST

                                6.      ERRORS
                                        ------

                                6.1     COMPUTER DETECTED ERRORS
                                        ------------------------

                                        THE FOLLOWING DISCUSSION DESCRIBES IN GENERAL THE METHOD USED
                                        FOR INTERNAL ERROR DETECTION AND ERROR DISPLAY BY THE LINE
                                        PRINTER DIAGNOSTIC TEST PROGRAM. MONITORING OF THE CURRENT
                                        CONDITION OF THE READY LINE (BIT 7 OF LPS) AND THE ERROR FLAG
                                        FLIP-FLOP (BIT 15 OF LPS) AFTER EACH OPERATION AS WELL AS TIME
                                        TIME OUT OF THE PRINT CYCLE (PRT TIM), LINE FEED (LF TIME),
                                        AND FORM FEED (FF TIM). CYCLES IS CARRIES ON CONTINUOUSLY
                                        DURING ALL TESTS WHERE APPROPRIATE AND IS DESCRIBED IN THE
                                        FOLLOWING PARAGRAPHS.  HOWEVER, ADDITIONAL TESTING IS
                                        PERFORMED ESPECIALLY DURING EXECUTION OF THE FIRST SEGMENT OF
                                        TEST 1.  FOR A COMPLETE DESCRIPTION OF THESE TESTING
                                        PROCEDURES USED IN TEST 1 AND THE CORRESPONDING ERROR
                                        CONDITIONS, THE READER IS REFERRED TO THE DESCRIPTION OF THE
                                        TEST AND THE TEST LISTING.

                                6.2     ERROR REPORTS
                                        -------------
                                        XXX ERROR COUNT
                                        /
                                        EQUALS THE ERROR TAG IN THE ASSEMBLY LISTING.
                                        CONSULT THE ASSEMBLY FOR A DEFINITION OF THE ERROR.

                                6.3     VISUALLY DETECTED ERRORS
                                        ------------------------

                                        SINCE THE COMPUTER CAN ONLY DETECT THE CURRENT CONDITION OF
                                        THE READY AND DEMAND RETURN LINES AND DOES NOT RECEIVE ANY
                                        ADDITIONAL DATA BACK FROM THE LINE PRINTER, IT IS NECESSARY TO
                                        EXAMINE THE PRINT PATTERNS PRODUCED BY THE VARIOUS TEST
                                        ROUTINES OR RESORT TO MANUAL SCOPING PROCEDURES AS PROVIDED BY
                                        TEST  7 TO DETECT AND DIAGNOSE ADDITIONAL DIFFICULTIES.
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                                        DETAILED DESCRIPTIONS OF EACH  TEST  PATTERN  APPEARS  IN  THE
                                        DESCRIPTION OF THE CORRESPONDING TEST ROUTINES.
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                        7.      PROGRAM DESCRIPTION
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                        7.1     GENERAL
                                =======

                        7.2     TEST DESCRIPTIONS
                                =================

                        7.2.1   TEST 1  COMPREHENSIVE DATA TRANSFER AND CONTROL TEST
                                ================================================

                                TEST 1 IS MADE UP OF  SEVERAL  SECTIONS  LINKED  TOGETHER  AND
                                EXECUTED AS A SINGLE TEST.

                        7.2.1.1 TEST 1, SECTION 1  COMMAND DECODE AND CONTROL INTERFACE TEST
                                ===========================================================

                                THIS PORTION OF TEST 1 IS DESIGNED AS  A  COMMAND  DECODE  AND
                                CONTROL  INTERFACE  TEST  AND INCLUDES CHECKOUT OF THE PRINTER
                                INTERRUPT FACILITY.  UPON INITIAL  ENTRY  INTO  THIS  ROUTINE,
                                MANUAL  INTERVENTION  IS REQUIRED TO TEST THE VARIOUS TESTABLE
                                ERROR (NON-READY) CONDITIONS OF THE  PRINTER.   THE  OPERATING
                                SEQUENCE  IS  DESCRIBED IN DETAIL BELOW.  AFTER INITIAL ENTRY,
                                THE MANUAL INTERVENTION PART OF THIS TEST WILL NOT BE  ENTERED
                                AGAIN.

                                THE PRINTER ERROR LINE  CONTINUOUSLY  MONITORS  THE  FOLLOWING
                                CONDITIONS  WITHIN  THE  PRINTER  AND  ITS  TRUE  STATE AT THE
                                CONTROL ELECTRONICS INTERFACE IS CONDITIONAL UPON NONE OF THEM
                                EXISTING.

                                    A.  PAPER OUT OR TORN.
                                    B.  DRUM GATE OPEN.
                                    C.  PAPER FEED MOTOR OVER-TEMPERATURE.
                                    D.  POWER SUPPLY FAULT.
                                    E.  DRUM NOT UP TO SPEED.

                                THE MANUAL-INTERACTIVE TEST SEQUENCE WHICH FOLLOWS IS DESIGNED
                                TO  TEST  THE PROPER OPERATION OF THE READY LINE AS IT APPEARS
                                AT THE INTERFACE ELECTRONICS WITH  RESPECT  TO  THOSE  OF  THE
                                ABOVE ITEMS WHICH ARE TESTABLE (I.E., (A.), (B.) AND (C.)).

                                INITIAL MANUAL TEST SEQUENCE:

                                1.  AFTER "POWER-UP" HAS BEEN TYPED ON THE TELEPRINTER,  BRING
                                    POWER-UP  ON  THE LINE PRINTER, MAKING SURE THAT THE PAPER
                                    IS IN PLACE IN THE TRACTORS AND  THAT  THE  DRUM  GATE  IS
                                    CLOSED.
```

```
                        7.2.1.2 TEST 1, SECTION 2  DATA TRANSFER PATHS TEST
                                ---------------------------------------

                                THIS PORTION OF TEST 1 IS DESIGNED TO TEST THE  DATA  TRANSFER
                                PATHS  FROM  THE  PROCESSOR  INTERFACE,  THRU THE LINE PRINTER
                                INPUT REGISTER AND INTO THE PRINTER'S  8 X 20  BUFFER  MEMORY.
                                SINCE  PRINTING  WILL  ALSO  TAKE  PLACE, THIS TEST PROVIDES A
                                PRELIMINARY TEST OF THAT FUNCTION  AS  WELL.   AN  ALTERNATING
                                STRING OF "0" AND "9" CHARACTERS IS TRANSMITTED TO THE PRINTER
                                ON A  FULL  80  COLUMN  BASIS.   SINCE  THESE  CHARACTERS  ARE
                                COMPLIMENTARY  BITWISE,  THEY  PROVIDE  BOTH  A ONES AND ZEROS
                                CHECK OF ALL TRANSMISSION LINES.  AUTOMATIC  PRINTING  TAKES
                                PLACE  AFTER  EACH  20  CHARACTERS  IS RECEIVED BY THE PRINTER
                                PROVIDING A CHECK ON ZONE ADVANCE AND HAMMER DRIVER SWITCHING.
                                END  OF  LINE  IS  SENSED WITH THE PROCESSOR AND A "LINE FEED"
                                CHARACTER TRANSMITTED AFTER COMPLETION OF THE LAST PRINT CYCLE
                                FOR EACH LINE.  PRINTING OF THE TEST LINE IS  REPEATED TEN (10)
                                TIMES ALTERNATING THE COLUMN POSITIONS  OF  THE  "0"  AND  "9"
                                CHARACTERS.   COMPLETION  OF  THIS SECTION OF TEST 1 INITIATES
                                SECTION 3 OF TEST 1 DIRECTLY.

                        7.2.1.3 TEST 1, SECTION 3  CHARACTER GENERATOR AND COMPARATOR TEST
                                ---------------------------------------------------------

                                SECTION 3 OF TEST 1 IS DESIGNED PRIMARILY  TO  TEST  THE  LINE
                                PRINTER  CHARACTER  GENERATOR  AND  COMPARATOR LOGIC AND ITS
                                ABILITY TO DETECT  AND  ACT  ON  BOTH  PRINTABLE  AND  ILLEGAL
                                CHARACTERS.   A  SERIES OF ALL 64 (OR 96) PRINTABLE CHARACTERS
                                ARE TRANSMITTED IN SEQUENCE TO THE LINE PRINTER AND PRINTED ON
                                A  SINGLE  LINE BEGINNING WITH THE SPACE CHARACTER (SEE TABLES
                                II AND III FOR THE CHARACTER SEQUENCE).

                                THIS IS FOLLOWED BY  AN  ALTERNATE  LINE  OF  ALL  64  ILLEGAL
                                CHARACTERS  EACH  OF  WHICH SHOULD BE CONVERTED TO A SPACE
                                CHARACTER PRODUCING NO VISIBLE PRINTING.  THIS  SEQUENCE  OF
                                ALTERNATING  ALL  PRINTABLE CHARACTERS FOLLOWED BY ALL ILLEGAL
                                CHARACTERS (NON-PRINTING CHARACTER)  IS  REPEATED  10  TIMES
                                PRODUCING   20  LINES  OF  PRINT.   COMPLETION  OF  THIS  TEST
                                INITIATES SECTION 4 OF TEST 1 DIRECTLY.
```

TABLE II

CHARACTER SEQUENCE AND ASCII CODES
FOR STANDARD 64-CHARACTER DRUM

ROWS 1-16		ROWS 17-32		ROWS 33-48		ROWS 49-64	
SPACE	(40)	0	(60)	@	(100)	P	(120)
!	(41)	1	(61)	A	(101)	Q	(121)
"	(42)	2	(62)	B	(102)	R	(122)
#	(43)	3	(63)	C	(103)	S	(123)
$	(44)	4	(64)	D	(104)	T	(124)
%	(45)	5	(65)	E	(105)	U	(125)
&	(46)	6	(66)	F	(106)	V	(126)
'	(47)	7	(67)	G	(107)	W	(127)
(	(50)	8	(70)	H	(110)	X	(130)
)	(51)	9	(71)	I	(111)	Y	(131)
*	(52)	:	(72)	J	(112)	Z	(132)
+	(53)	;	(73)	K	(113)	[	(133)
,	(54)	<	(74)	L	(114)	\	(134)
-	(55)	=	(75)	M	(114)	]	(135)
.	(56)	>	(76)	N	(116)	^	(136)
/	(57)	?	(77)	O	(117)	_	(137)

TABLE III

CHARACTER SEQUENCE AND ASCII CODES FOR
OPTIONAL 96-CHARACTER DRUM

ROWS 1-16		ROWS 17-32		ROWS 33-48		ROWS 49-64		ROWS 65-80		ROWS 81-96	
SPACE	(40)	0	(60)	@	(100)	P	(120)	`	(140)	p	(160)
!	(41)	1	(61)	A	(101)	Q	(121)	a	(141)	q	(161)
"	(42)	2	(62)	B	(102)	R	(122)	b	(142)	r	(162)
#	(43)	3	(63)	C	(103)	S	(123)	c	(143)	s	(163)
$	(44)	4	(64)	D	(104)	T	(124)	d	(144)	t	(164)
%	(45)	5	(65)	E	(105)	U	(125)	e	(145)	u	(165)
&	(46)	6	(66)	F	(106)	V	(126)	f	(146)	v	(166)
'	(47)	7	(67)	G	(107)	W	(127)	g	(147)	w	(167)
(	(50)	8	(70)	H	(110)	X	(130)	h	(150)	x	(170)
)	(51)	9	(71)	I	(111)	Y	(131)	i	(151)	y	(171)
*	(52)	:	(72)	J	(112)	Z	(132)	j	(152)	z	(172)
+	(53)	;	(73)	K	(113)	[	(133)	k	(153)	{	(173)
,	(54)	<	(74)	L	(114)	\	(134)	l	(154)	|	(174)
-	(55)	=	(75)	M	(115)	]	(135)	m	(155)	}	(175)
.	(56)	>	(76)	N	(116)	^	(136)	n	(156)	~	(176)
/	(57)	?	(77)	O	(117)	_	(137)	o	(157)	RUBOUT	(177)

H1

355
356
357
358 7.2.1.4 TEST 1, SECTION 4 FORMAT CONTROL CHARACTER TEST
359 ----------
360
361 SECTION 4 OF TEST 1 IS DESIGNED TO TEST THE ABILITY OF THE
362 LINE PRINTER TO DETECT AND ACT UPON EACH OF THE FORMAT CONTROL
363 CHARACTERS, "CR", "LF", AND "FF". THE TEST IS PERFORMED BY
364 FIRST TRANSMITTING 20 SPACE CHARACTERS (ONE FULL SEGMENT)
365 FOLLOWED BY A "CR" CHARACTER. THIS SEQUENCE WILL CAUSE THE
366 FIRST SEGMENT OF THE PRINTER TO BE LOADED AND PRINTED AFTER
367 WHICH THE PRINTER'S ZONE COUNTER WILL BE RESET TO COLUMN 1.
368 PAPER FEED SHOULD NOT TAKE PLACE DURING THIS CYCLE. THE
369 PRECEEDING STRING IS THEN FOLLOWED BY 20 "A" CHARACTERS, A
370 "CR" AND FINALLY A "FF" CHARACTER. THIS SHOULD AGAIN CAUSE
371 PRINTING AND RETURN OF THE ZONE COUNTER TO COLUMN 1
372 OVER-PRINTING THE "A"'S ON THE PREVIOUSLY PRINTED SPACES.
373 THIS SEQUENCE OF FIRST PRINTING SPACES AND THEN OVER-PRINTING
374 "A"'S IS CONTINUED 4 MORE TIMES, EACH TIME INCREASING THE LINE
375 LENGTH BY AN ADDITIONAL 20 "SPACE" AND "A" CHARACTERS UNTIL
376 ALL 4 SEGMENTS OF THE 80 COLUMN PRINT LINE HAVE BEEN COVERED.
377 THE WHOLE TEST SEQUENCE IS REPEATED 10 TIMES PRODUCING A
378 SERIES OF 10 LEFT TRIANGLES EXTENDING DOWN THE PAPER
379 APPARENTLY MADE UP OF THE LETTER "A". THE FINAL CHARACTER
380 TRANSMITTED IN THIS TEST TO THE LINE PRINTER IS THE FORM FEED
381 (FF) CHARACTER WHICH SHOULD PRODUCE A SLEW TO TOP OF PAGE
382 TERMINATING TEST 1.
383
384 7.2.2 TEST 2 SINGLE CHARACTER, ALL COLUMNS TEST
385 ----------
386
387 THIS TEST IS DESIGNED AS A WORST CASE HAMMER DRIVER AND SUPPLY
388 TEST AS WELL AS A PRINTER ENDURANCE TEST. 80 COLUMNS OF EACH
389 OF THE 64 PRINTABLE CHARACTERS IS TRANSMITTED TO THE LINE
390 PRINTER AND PRINTED IN ROTATION. THE COMPLETE CHARACTER
391 SEQUENCE IS AS SHOWN IN TABLE II AND A SAMPLE OF THE PRINTOUT
392 SHOWN BELOW.
393
394
395
396
397
398
399
400
401
402
403
404

7.2.3 TEST 3 ROTATING PATTERN TEST

THIS TEST IS DESIGNED AS A WORST CASE NOISE AND ENDURANCE TEST OF THE LINE PRINTER. A ROTATING, 64 COLUMN PATTERN FOLLOWING THE CHARACTER SEQUENCE SHOWN IN TABLE II IS TRANSMITTED TO THE LINE PRINTER AND PRINTED. A SAMPLE OF THE PRINT PATTERN IS SHOWN BELOW:

```
     !"#$- - - - - - - -ABC- - - - - - - - -!
    !"#$- - - - - - - -ABC- - - - - - - - -!
```

7.2.4 TEST 4 RIGHT AND LEFT HAND WEDGE PATTERN TEST

THIS TEST IS DESIGNED TO DETECT SPURIOUS HAMMER FIRINGS DURING OPERATION OF THE LINE PRINTER. THE PATTERNS WHICH ARE PRODUCED ARE RIGHT AND LEFT HAND WEDGES EACH COMPOSED OF 88 LINES OF "?" CHARACTERS AS SHOWN BELOW:

```
                                        ----  ----
                                        LEFT-HAND
                                        CYCLE (88 LINES)
PRINTED                                 ----          FULL CYCLE
AREA                                    ----              (168 LINES)
"?" CHAR.                                             
                                        RIGHT-HAND
                                        CYCLE (88 LINES)
                                        ----  ----
```

A FULL CYCLE CONSISTS OF BOTH THE RIGHT AND LEFT HAND WEDGES. THE LEFT HAND WEDGE IS FORMED SIMPLY BY TRANSMITTING AND PRINTING DECREASING NUMBERS OF CHARACTERS TO THE PRINTER ON SUCCESSIVE LINES UNTIL THE NUMBER OF CHARACTERS TO BE TRANSMITTED BECOMES ZERO. EACH LINE IS TERMINATED BY A "LF" CHARACTER CAUSING PAPER FEED TO OCCUR. THE RIGHT HAND WEDGE HOWEVER, REQUIRES THAT INCREASING NUMBERS OF LEADING SPACES BE TRANSMITTED FOLLOWED BY "?" CHARACTERS TO FILL OUT THE LINE. AGAIN, EACH LINE IS TERMINATED WITH A "LF" CHARACTER.

7.2.5 TEST 5 HAMMER ALIGNMENT TEST

THIS ROUTINE IS DESIGNED TO BE USED AS A DRIVER FOR MANUAL HAMMER ALIGNMENT AND INTENSITY ADJUSTMENTS OF THE LINE PRINTER. NO INTERNAL ERROR TESTS ARE MADE DURING THE EXECUTION OF THIS ROUTINE. IN OPERATION, THIS TEST PRINTS A FULL 88 COLUMN LINES OF "E" CHARACTERS. MORE DETAIL CONCERNING THE OPERATION OF THE ROUTINE MAY BE OBTAINED FROM THE PROGRAM LISTINGS.

7.2.6 TEST 6 SLEW TEST

THE PURPOSE OF THIS TEST IS TO INSURE THAT THE PAPER FEED DRIVE AND CLUTCH ARE OPERATING PROPERLY AND THAT THE FUNCTION OF MULTIPLE LINE SLEWS CAN BE PERFORMED CORRECTLY. IN THE LATTER CASE, THE DEMAND LINE FROM THE LINE PRINTER GOES HIGH BEFORE THE ACTUAL END OF THE PREVIOUS LINE FEED OPERATION HAS BEEN COMPLETED. IF A SECOND LINE FEED APPEARS AS THE FIRST CHARACTER TRANSMITTED FOR THE NEW LINE, SLEWING WILL CONTINUE TO THE NEXT LINE WITHOUT A STOP IN BETWEEN. THIS MODE OF OPERATION WILL IN FACT CONTINUE AS LONG AS LINE FEEDS ARE TRANSMITTED AS THE FIRST CHARACTER AND BEFORE THE END OF SLEW HAS OCCURRED FOR THE CURRENT LINE. THE TEST CONSISTS OF A ROUTINE TO PRINT A LINE OF E'S FOLLOWED BY MULTIPLE LINE SLEWS AS DETERMINED BY A LINE SLEW TABLE. THE ENTRIES IN THE TABLE ARE AS FOLLOWS:

LINE NO.	NO. OF LINES SLEWED AFTER PRINTING
1	3
2	2
3	10
4	14
5	6
6	3
7	8
8	4
9	5
10	5
11	3

THE TOTAL NUMBER OF LINES SLEWED AND PRINTED IS 63 OR ONE FULL PAGE. CAREFUL EXAMINATION OF THE PRINTED LINES SHOULD DETERMINE IF ANY CLUTCH SLIPPAGE IS TAKING PLACE.

NO INTERNAL ERRORS ARE DETECTED DURING THIS TEST AND THE READER IS REFERRED TO THE PROGRAM LISTING FOR FURTHER DETAILS ON THE OPERATION OF THE ROUTINE.

7.2.7 TEST 7 SCOPE DRIVE ROUTINE

THE PURPOSE OF THIS TEST SEQUENCE IS TO PROVIDE THE OPERATOR WITH A SHORT BUT COMPREHENSIVE SCOPE DRIVER ROUTINE FOR USE IN TROUBLE SHOOTING THE PRINTER INTERFACE CONTROL MODULE WITH THE SCOPE.

.ENDR

K'

```
                                ;
                                ;******LP11 PRINTER TEST******
                                ;
                                ;
                                ;
                                ;
                                ;DATA PRODUCTS 2310 LINE PRINTER
                                ;
                                ;LIST OF SWITCH SETTINGS USED IN THIS TEST
                                ;SWITCH NO.     DESCRIPTION
                                ;15             SET HALT AFTER ERROR PRINT OUT (OPTIONAL IN STATIC TEST ONLY).
                                ;14             SET - 132 COL. PRINTER.
                                ;13             "DOWN" 64 CHAR./"UP"-96 CHAR OPTION
                                ;12             LOOP ON TEST
                                ;
                                ;
                                ;
                                .ENABL  ABS
                                .ENABL  AMA
                                ;
                                ;
                                ;
                                ;

000007                          PC=%7
000006                          SP=%6

100000                          BIT15=100000
040000                          BIT14=40000
020000                          BIT13=20000
010000                          BIT12=10000
004000                          BIT11=4000
002000                          BIT10=2000
001000                          BIT9=1000
000400                          BIT8=400
000200                          BIT7=200
000100                          BIT6=100
000040                          BIT5=40
000020                          BIT4=20
000010                          BIT3=10
000004                          BIT2=4
000002                          BIT1=2
000001                          BIT0=1
                                ;
                                ;
                                ;

000000                                  .=0
                                ;
                                ;THE FIRST 100 LOCATIONS WILL HAVE
                                ;       .+2
                                ;       HALT
                                ;AS TRAP CATCHERS
```

```
                                        /
                    000030                      .=30
000030  006746                                  TYP
000032  000340                                  34R
                    000042                      .=42
000042  000000                                  0
                    000046                      .=46
000046  006424                                  LOGICAL
                    000052                      .=52
000052  040PPR                                  BIT14

                    000174                      .=174
000174  000000                                  DISPREG: 0
000176  000PPP                                  SWREG:   0

                    000200                      .=200
000200  012706  001000                          MOV     #1000,%6
000204  000137  001056                          JMP     SETUP
                    000600                      .=600
000600  012706  001000                          MOV     #1000,%6
000604  000137  002074                          JMP     TEST2A
000610  000137  002422                          JMP     TEST2B
000614  000137  003240                          JMP     TeST3
000620  000137  003732                          JMP     SNGCHR
000624  000137  004304                          JMP     ROTATE
000630  000137  005052                          JMP     TST6
000634  000137  006110                          JMP     MAMALN
000640  000137  006254                          JMP     SLWTST
000644  000137  007514                          JMP     SCOPE
000650  000137  001316                          JMP     TEST1
                    001000                      .=1000
                                        /
                                        /LINE PRINTER HARDWARE REGISTERS
                                        /
001000  177514                        LPS:    177514          /STATUS REGISTER
                                                                /BIT 15=ERROR
                                                                /BIT 7=READY
                                                                /BIT 6=INTERRUPT ENABLE
001002  177516                        LPB:    177516          /DATA BUFFER REGISTER
                                                                /BITS 0-6=7 BIT ASCII CHARACTER BUFFER
                                        /                       /BITS 7-15=NOT USED
                                        /
                                        /
001004  17757P                        SWR:    177570
001006  177570                        DISPLAY:177570
001010  177776                        PS:     177776
001012  177566                        TPB:    177566
001014  177562                        TKB:    177562
001016  177564                        TPS:    177564
001020  177560                        TKS:    177560

                    000240              NOP=240
                    000000              N=0
```

M1

```
                                        ;
                                        ;MACRO FOR SETTING UP ERROR COUNT
                                        .MACR   ERROR X
                                ERR'X': MOV #X, ERCOUNT         ;SET UP ERROR COUNT X
                                        N=N+1
                                        .ENDM
                                        ;
                                        ;
                                ;
                                ;MEMORY LOCATIONS USED AS PROGRAM FLAGS AND COUNTERS
                                ;
001022  000000                  SEGCNT: 0               ;SEGMENT COUNTER
001024  000000                  CHRCNT: 0
001026  000000                  CHRGEN: 0
001030  000000                  LINCNT: 0
001032  000000                  CYCCNT: 0
001034  000000                  ERNO:   0
001036  000000                  TSTNO:  0
001040  000000                  LOCA:   0
001042  000000                  TSTSW:  0
001044  000000                  WORK:   0
001046  000000                  SAVE:   0
001050  000000                  ERCOUNT:0
001052  000000                  WIDTH:  0
001054  000000                  SEGMNT:0
                                ;
                                ;ROUTINE TO TEST THE MECH. OPERATION OF THE 1318
                                ;
                                ;
001056  000005                  SETUP:  RESET
001060  013746  000004                  MOV     4,-(SP)         ;SAVE CURRENT VECTORS
001064  013746  000006                  MOV     6,-(SP)         ;
001070  012737  001104  000004          MOV     #1$,4           ;SET UP TIMEOUT VECTOR
001076  005777  177782                  TST     @SWR            ;TRY TO REFERENCE HARDWARE SWR
001102  000407                          BR      2$              ;BRANCH IF NO TIMEOUT TRAP OCCURS
001104                          1$:
001104  012737  000176  001004          MOV     #SWREG,SWR      ;POINT TO SOFTWARE SWITCH REG
001112  012737  000174  001006          MOV     #DISPREG,DISPLAY ;POINT TO DISPLAY REGISTER
001120  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
001122                          2$:
001122  012637  000004                  MOV     (SP)+,4         ;RESTORE TIMEOUT VECTORS
001126  012637  000006                  MOV     (SP)+,6         ;
001132  104000                          EMT     +0
001134  007230                          MES1
001136  104000                          EMT     +0
001140  007276                          MES2
001142  104000                          EMT     +0              ;TYPE "POWER-UP"
001144  007323                          MES3
001146  000000                          HALT
001150  005777  177624          STP1:   TST     @LPS            ;TEST FOR ERROR
001154  100006                          BPL     STP2            ;NO ERROR TEST FOR READY
001156                                  ERROR   \N              ;REPORT ERROR
001156  012737  000000  001050  ERR0:   MOV #0, ERCOUNT         ;SET UP ERROR COUNT 0
        000001                          N=N+1
```

```
673  001164  004537  007152                  JSR     %5,$TAER        ;REPORT ERROR BIT SET
674  001170  000767                          BR      $TP1            ;GO TEST FOR ERROR NOT
675
676  001172  105777  177602          $TP2:   TSTB    @LPS            ;TEST FOR READY
677  001176  100406                          BMI     $TP3            ; READY SET OK
678  001200                                  ERROR   \N              ;REPORT READY NOT SET
679  001200  012737  000001  001050  ERR1:   MOV #1, ERCOUNT        ;SET UP ERROR COUNT 1
680           000002                         N=N+1
681  001206  004537  007152                  JSR     %5,$TAER        ;REPORT READY NOT SET
682  001212  000767                          BR      $TP2            ;GO TEST FOR READY
683  001214  104000                  $TP3:   EMT     +0              ;REPORT
684  001216  007352                          MES4                    ;PRINTER OK "READY SET" TRY TORN PAPER SWITCH
685  001220  000000                          HALT                    ;DEPRESS CONTINUE WHEN READY
686  001222                          $TP4:
687  001222  012777  000014  177552          MOV     #14,@LPS        ;SEND A "FF" TO THE PRINTER
688  001230  012777  000015  177544          MOV     #15,@LPS        ;ATTEMPT "FF" BY SENDING "CR"
689  001236  005777  177536                  TST     @LPS            ;TEST FOR ERROR
690  001242  100406                          BMI     $TP5
691  001244                                  ERROR   \N              ;REPORT ERROR NOT SET
692  001244  012737  000002  001050  ERR2:   MOV #2, ERCOUNT        ;SET UP ERROR COUNT 2
693           000003                         N=N+1
694  001252  004537  007152                  JSR     %5,$TAER        ;REPORT ERROR
695  001256  000761                          BR      $TP4            ;LOOP ON ERROR
696  001260  104000                  $TP5:   EMT     +0
697  001262  007414                          MES5                    ;
698  001264  000000                          HALT                    ;DEPRESS CONTINUE WHEN READY
699  001266  005777  177506          $TP6:   TST     @LPS
700  001272  100406                          BMI     $TP7
701  001274                                  ERROR   \N
702  001274  012737  000003  001050  ERR3:   MOV #3, ERCOUNT        ;SET UP ERROR COUNT 3
703           000004                         N=N+1
704  001302  004537  007152                  JSR     %5,$TAER
705  001306  000767                          BR      $TP6
706  001310  104000                  $TP7:   EMT     +0
707  001312  007457                          MES6
708  001314  000000                          HALT
709
710                                  ;
711                                  ;TEST 1, SECTION 1
712                                  ;PERFORMS PRELIMINARY COMMAND AND REGISTER TESTING.
713                                  ;
714                                  ;
715                                  ;IS THE PRINTER FREE OF ERRORS
716  001316  000005                  TEST1:  RESET                   ;CLEAR THE WORLD
717  001320  005777  177454                  TST     @LPS            ;IS ERROR FLAG CLEAR
718  001324  100006                          BPL     TEST1A          ;ERROR IS CLEAR OK
719  001326                                  ERROR   \N
720  001326  012737  000004  001050  ERR4:   MOV #4, ERCOUNT        ;SET UP ERROR COUNT 4
721           000005                         N=N+1
722  001334  004537  007152                  JSR     %5,$TAER        ;REPORT ERROR SET
723  001340  000766                          BR      TEST1           ;LOOP ON ERROR
724                                  ;
725                                  ;IS READY SET (NO ERRORS EXIST)
726  001342  000005                  TEST1A: RESET                   ;CLEAR THE WORLD
```

```
001344  105777  177430                   TSTB    @LPS            ;IS READY SET
001350  100406                           BMI     TEST1B          ;READY SET; PRINTER OK
001352                                   ERROR   \N              ;REPORT READY NOT SET
001352  012737  000005  001050  ERR5:    MOV #5, ERCOUNT         ;SET UP ERROR COUNT 5
        000006                           N=N+1
001360  004537  007152                   JSR     %5,STAER        ;REPORT READY NOT SET
001364  000766                           BR      TEST1A          ;LOOP ON ERROR
                                ;
                                ;DOES LOADING THE BUFFER RESET READY
                                ;
001366  032777  040000  177410  TEST1B:  BIT     #BIT14,@SWR     ;IS THE PRINTER 132 COL
001374  001043                           BNE     TEST1C          ;YES SKIP THIS TEST
001376  005037  001044                   CLR     WORK            ;CLEAR COUNTER
001402  012777  000015  177372           MOV     #15,@LPB        ;LOAD CARRIAGE RETURN INTO BUFFER
001410  105777  177364                   TSTB    @LPS            ;IS READY CLEAR
001414  100006                           BPL     LP1             ;READY IO CLEAR OK!
001416                                   ERROR   \N              ;REPORT READY STILL SET
001416  012737  000006  001050  ERR6:    MOV #6, ERCOUNT         ;SET UP ERROR COUNT 6
        000007                           N=N+1
001424  004537  007152                   JSR     %5,STAER        ;REPORT READY STILL SET
001430  000756                           BR      TEST1B          ;LOOP ON ERROR
001432  005777  177342          LP1:     TST     @LPS            ;IS THERE AN ERROR
001436  100006                           BPL     LP2             ;NO ERROR CONTINUE
001440                                   ERROR   \N
001440  012737  000007  001050  ERR7:    MOV #7, ERCOUNT         ;SET UP ERROR COUNT 7
        000010                           N=N+1
001446  004537  007152                   JSR     %5,STAER        ;REPORT ERROR OCCURRED
001452  000745                           BR      TEST1B          ;LOOP ON ERROR

001454  105777  177320          LP2:     TSTB    @LPS            ;IS THE PRINTER STILL BUSY
001460  100411                           BMI     TEST1C          ;NO! GO TO NEXT TEST
001462  005237  001044                   INC     WORK            ;YES! GO CHECK FLAGS
001466  001361                           BNE     LP1             ;PRINTER STILL BUSY WAIT
001470                                   ERROR   \N
001470  012737  000010  001050  ERR10:   MOV #10,        ERCOUNT         ;SET UP ERROR COUNT 10
        000011                           N=N+1
001476  004537  007152                   JSR     %5,STAER        ;ERROR REPORT TIME OUT
001502  000731                           BR      TEST1B          ;LOOP ON ERROR
                                ;
                                ;CHECK INTERRUPT LEVEL OF PRINTER
                                ;THE PRINTER SHOULD BE AT LEVEL 4
                                ;
                                ;TEST THAT THE PRINTER WILL NOT INTERRUPT AT LEVEL 7
001504  012737  001740  000200  TEST1C:  MOV     #INT1C,200      ;SET UP INT VECTOR
001512  012737  000340  000202           MOV     #340,202
001520  005777  177254                   TST     @LPS            ;TEST FOR ERROR
001524  100006                           BPL     LP3             ;NO ERROR CONTINUE
001526                                   ERROR   \N              ;REPORT ERROR SET
001526  012737  000011  001050  ERR11:   MOV #11,        ERCOUNT         ;SET UP ERROR COUNT 11
        000012                           N=N+1
001534  004537  007152                   JSR     %5,STAER        ;REPORT ERROR SET
001540  000761                           BR      TEST1C          ;LOOP ON ERROR
001542  105777  177232          LP3:     TSTB    @LPS            ;TST FOR READY
001546  100406                           BMI     LP3X            ;READY SET OK
```

C2

```
                                                ERROR   \N                      ;REPORT READY NOT SET
001550  012737  000F12  001050  ERR12:  MOV #12,        ERCOUNT                 ;SET UP ERROR COUNT 12
                000013                  N=N+1
001556  004537  007152                  JSR     %5,STAER                ;REPORT READY NOT SET
001562  000750                          BR      TEST1C                  ;LOOP ON ERROR
001564                          LP3X:   ERROR   \N
001564  012737  000013  001050  ERR13:  MOV #13,        ERCOUNT                 ;SET UP ERROR COUNT 13
                000014                  N=N+1
001572  012777  000340  177210          MOV     #340,@PS                ;LOCKUP PROCESSOR
001600  052777  000100  177172          BIS     #100,@LPS               ;SET PRINTER INTO ENABLE
001606  000240                          NOP
001610  042777  000100  177162          BIC     #100,@LPS               ;CLEAR PRINTER INT. ENABLE
                                        ;
                                        ;TEST THAT THE PRINTER WILL NOT INTERRUPT AT LEVEL 6
001616                                  ERROR   \N
001616  012737  000F14  001050  ERR14:  MOV #14,        ERCOUNT                 ;SET UP ERROR COUNT 14
                000015                  N=N+1
001624  012777  000300  177156          MOV     #300,@PS                ;SET PROCESSOR PRIORITY LEVEL 6
001632  052777  000100  177140          BIS     #100,@LPS               ;SET PRINTER INT ENABLE
001640  000240                          NOP
001642  042777  000100  177130          BIC     #100,@LPS               ;CLEAR PRINTER INT. ENABLE
                                        ;
                                        ;TEST THAT THE PRINTER WILL NOT INT. AT
                                        ;PROCESSOR LEVEL 5
                                        ;
001650                                  ERROR   \N
001650  012737  000015  001050  ERR15:  MOV #15,        ERCOUNT                 ;SET UP ERROR COUNT 15
                000016                  N=N+1
001656  012777  000240  177124          MOV     #240,@PS                ;SET UP PROCESSOR TO LEVEL 5
001664  052777  000100  177106          BIS     #100,@LPS               ;SET PRINTER INT ENABLE
001672  000240                          NOP
001674  042777  000100  177076          BIC     #100,@LPS               ;CLEAR INT ENABLE PRINTER OK

                                        ;
                                        ;TEST THAT THE PRINTER WILL NOT INT
                                        ;WHEN THE PROCESSOR IS AT LEVEL 4
                                        ;
001702                                  ERROR   \N
001702  012737  000016  001050  ERR16:  MOV #16,        ERCOUNT                 ;SET UP ERROR COUNT 16
                000017                  N=N+1
001710  012777  000200  177072          MOV     #200,@PS                ;SET PROCESSOR TO LEVEL 4
001716  052777  000100  177054          BIS     #100,@LPS               ;SET PRINTER INT. ENABLE
001724  000240                          NOP
001726  042777  000100  177044          BIC     #100,@LPS               ;CLEAR PRINTER INT ENABLE
001734  000137  001752                  JMP     TEST1D                  ;PRINTER OK CONTINUE
                                        ;
                                        ;
                                        ;
                                        ;INTERRUPT HANDLE FOR TEST1C
                                        ;RESTORE STACK AND REPORT ERROR
                                        ;
001740  022626                  INT1C:  CMP     (6)+,(6)+               ;RESTORE STACK
001742  004537  007152                  JSR     %5,STAER                ;REPORT ERROR
001746  000137  001504                  JMP     TEST1C                  ;RE-ENTER TEST1C
```

D2

```
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;TEST THE ABILITY OF THE PRINTER TO INTERRUPT
                                        ;AT PRIORITY LEVEL 4
                                        ;
002752  012737  002064  000200  TEST1D: MOV     #INT1D,200      ;SET UP INTERRUPT VECTOR
002760  012737  000340  000202          MOV     #340,202        ;LOCK UP PRIORITIES
002766  005777  177006                  TST     @LPS            ;IS THERE A PRINTER ERROR
002772  100006                          BPL     LP4             ;NO; CONTINUE
002774                                  ERROR   \N
002774  012737  000017  001050  ERR17:  MOV #17,        ERCOUNT         ;SET UP ERROR COUNT 17
        000020                          N=N+1
002002  004537  007152                  JSR     %5,STAER        ;REPORT PRINTER ERROR
002006  000761                          BR      TEST1D          ;LOOP ON ERROR
002010  105777  176764          LP4:    TSTB    @LPS            ;IS READY SET
002014  100406                          BMI     LP5             ;YES - PRINTER READY
002016                                  ERROR   \N
002016  012737  000020  001050  ERR20:  MOV #20,        ERCOUNT         ;SET UP ERROR COUNT 20
        000021                          N=N+1
002024  004537  007152                  JSR     %5,STAER        ;REPORT READY NOT SET
002030  000750                          BR      TEST1D          ;LOOP ON ERROR
002032  012777  000140  176750  LP5:    MOV     #140,@PS        ;SET PRIORITY TO LEVEL 3
002040  052777  000100  176732          BIS     #100,@LPS       ;SET PRINTER INTERRUPT ENABLE
002046  000240                          NOP
002050                                  ERROR   \N
002050  012737  000021  001050  ERR21:  MOV #21,        ERCOUNT         ;SET UP ERROR COUNT 21
        000022                          N=N+1
002056  004537  007152                  JSR     %5,STAER        ;REPORT ERROR
002062  000733                          BR      TEST1D          ;LOOP ON ERROR
                                        ;
                                        ;INTERRUPT HANDLER FOR TEST1D
                                        ;
002064  022626          INT1D:  CMP     (6)+,(6)+       ;RESET STACK
002066  042777  000100  176704          BIC     #100,@LPS       ;CLEAR INT. ENABLE FOR PRINTER
                                        ;ENTER NEXT TEST
                                        ;
                                        ;TEST1 SECTION 2
                                        ;TESTS INTERFACE AND PRINTER DATA PATHS
                                        ;WITH ALTERNATING ONES AND ZEROS
                                        ;
002074  004737  006566          TEST2A: JSR     %7,SIZE
002100  004537  006700                  JSR     %5,PRTINT       ;INITIALIZE PRINTER
002104  000406                          BR      TST2AX
002106                                  ERROR   \N
002106  012737  000022  001050  ERR22:  MOV #22,        ERCOUNT         ;SET UP ERROR COUNT 22
        000023                          N=N+1
002114  004537  007152                  JSR     %5,STAER        ;REPORT PRINTER NOT READY
002120  000000                          HALT
002122  012737  177737  001032  TST2AX: MOV     #-41,CYCCNT     ;SET UP PASS COUNT
002130  013737  001052  001030          MOV     WIDTH,LINCNT    ;RESET ZONE COUNT
002136  013737  001054  001022          MOV     SEGMNT,SEGCNT   ;RESET SEGMENT COUNT
002144  013737  002416  002414          MOV     SCHRSW,CHARSW   ;SET CHAR. SWITCH TO 0
```

E2

```
889  002152  005777  176622          T3A:    TST     @LPB            ;TEST FOR ERROR
890  002156  100006                          BPL     LP2B            ;NO ERROR CONTINUE
891  002160                                  ERROR   \N              ;SET UP ERROR COUNT
892  002160  012737  000023  001050  ERR23:  MOV #23,        ERCOUNT         ;SET UP ERROR COUNT 23
893          000024                          N=N+1
894  002166  004537  007152                  JSR     %5,STAER        ;REPORT ERROR SET
895  002172  000F00                          HALT                    ;OPERATOR MUST TAKE ACTION
896  002174  000177  000214          LP2B:   JMP     @CHARSW
897  002200  013737  002416  002414  T1A:    MOV     $CHRSW,CHARSW   ;SET CHAR. SWITCH TO 0
898  002206  012737  000100  001046          MOV     #100,SAVE
899  002214  013777  001046  176560  T5A:    MOV     SAVE,@LPB       ;LOAD BUFFER
900  002222  005237  001022                  INC     SEGCNT          ;INC SEGMENT COUNT
901  002226  001401                          BEQ     .+4
902  002230  000750                          BR      T3A
903  002232  013737  001054  001022          MOV     SEGMNT,SEGCNT   ;RESET SEGMENT COUNT
904  002240  004537  006632                  JSR     %5,PRTTM        ;TEST CHAR. PRINT TIME
905  002244  000405                          BR      LP5A
906  002246                                  ERROR   \N              ;REPORT TOO LONG TO PRINT
907  002246  012737  000024  001050  ERR24:  MOV #24,        ERCOUNT         ;SET UP ERROR COUNT 24
908          000025                          N=N+1
909  002254  004537  007152                  JSR     %5,STAER
910  002260  005237  001030          LP5A:   INC     LINCNT          ;INC. ZONE COUNT
911  002264  001414                          BEQ     XLINF
912  002266  032777  040000  176510          BIT     #BIT14,@SWR
913  002274  001726                          BEQ     T3A
914  002276  022737  177777  001030          CMP     #-1,LINCNT
915  002304  001322                          BNE     T3A
916  002306  012737  177764  001022          MOV     #-12.,SEGCNT
917  002314  000716                          BR      T3A
918  002316  013737  001052  001030  XLINF:  MOV     WIDTH,LINCNT    ;RESET ZONE COUNT
919  002324  012777  000012  176450          MOV     #12,@LPB        ;ISSUE LINE FEED
920  002332  004537  006642                  JSR     %5,SLWTIM       ;CHECK SLEW TIME
921  002336  000405                          BR      LP5B
922  002340                                  ERROR   \N              ;REPORT TOO LONG OF TIME FOR SLOW
923  002340  012737  000025  001050  ERR25:  MOV #25,        ERCOUNT         ;SET UP ERROR COUNT 25
924          000026                          N=N+1
925  002346  004537  007152                  JSR     %5,STAER
926  002352  005237  001032          LP5B:   INC     CYCCNT          ;INC CYCLE COUNT
927  002356  001401                          BEQ     .+4
928  002360  000674                          BR      T3A
929  002362  032777  010000  176414          BIT     #BIT12,@SWR
930  002370  001241                          BNE     TEST2A
931  002372  000413                          BR      TEST2B
932
933                                  ;
934                                  ;
935                                  ;
936  002374  013737  002420  002414  T2A:    MOV     #CHRSW,CHARSW   ;RESET CHAR. SWITCH
937  002402  012737  000077  001046          MOV     #77,SAVE
938  002410  000137  002214                  JMP     T5A             ;LOAD CHAR.
939                                  ;
940                                  ;
941                                  ;
942  002414  000000          CHARSW: 0
```

F2

```
                                SCHRSW: T2A
                                RCHRSW: T1A
                                ;
                                ;
                                ;TEST 1, SECTION 3
                                ;TEST CHARACTER COMPARATOR WITH ALTERNATE LINES OF
                                ;ALL CHARACTERS AND ILLEGAL CHARACTERS
                                ;
                                ;
002422  004737  006566          TEST28: JSR     %7,SIZE
002426  032777  020000  176350          BIT     #BIT13,@SWR     ;TEST FOR 96 CHR SW.
002434  001412                          BEQ     LP2C            ;NOT 96 = 64 CHARACTERS
002436  012737  177766  001032          MOV     #-12,CYCCNT     ;SET 10 CYCLES, 30 LINES
002444  012737  002624  003234          MOV     #T287,NOCHRS    ;SET NO. CHAR. SWITCH
002452  012737  177640  003236          MOV     #-96.,LEGCHR    ;STORE CHAR. CNT
002460  000411                          BR      T280            ;GO PRINT
002462  012737  177761  001032  LP2C:   MOV     #-17,CYCCNT     ;SET CYCLE FOR 30 LINES
002470  012737  002720  003234          MOV     #T282,NOCHRS    ;RESET NO. CHAR. SW.
002476  012737  177700  003236          MOV     #-64.,LEGCHR    ;STORE 64 CHAR. CNT
002504  013737  001052  001030  T280:   MOV     WIDTH,LINCNT    ;SET UP LINE CNT
002512  012737  000040  001026          MOV     #40,CHRGEN      ;SET FIRST CHAR.
002520  013737  003236  001024          MOV     LEGCHR,CHRCNT   ;SET CHAR: COUNT
002526  013737  001054  001022          MOV     SEGMNT,SEGCNT   ;RESET SEG. COUNT
002534  005777  176240          T281:   TST     @LPS            ;DOES THE PRINTER HAVE AN ERROR
002540  100006                          BPL     LP2E            ;BRANCH IF NO ERROR
002542                                  ERROR   \N
002542  012737  000026  001050  ERR26:  MOV #26.,       ERCOUNT         ;SET UP ERROR COUNT 26
                000027                  N=N+1
002550  004537  007152                  JSR     %5,STAER        ;REPORT ERROR
002554  000000                          HALT                    ;ERROR SET OPERATOR MUST TAKE ACTION
002556  013777  001026  176216  LP2E:   MOV     CHRGEN,@LPB     ;PRINT CHARACTER
002564  005237  001022                  INC     SEGCNT          ;INC. SEGMENT COUNT
002570  001053                          BNE     T282
002572  013737  001054  001022          MOV     SEGMNT,SEGCNT
002600  004537  006632                  JSR     %5,PRTTM        ;CHECK PRINT TIME
002604  000405                          BR      LP2F            ;BRANCH IF NO PRINT TIME ERROR
002606                                  ERROR   \N
002606  012737  000027  001050  ERR27:  MOV #27,       ERCOUNT         ;SET UP ERROR COUNT 27
                000030                  N=N+1
002614  004537  007152                  JSR     %5,STAER        ;REPORT PRINT TIME ERROR
002620  000177  000410          LP2F:   JMP     @NOCHRS
002624  005237  001030          T287:   INC     LINCNT
002630  001414                          BEQ     REFIL
002632  032777  040000  176144          BIT     #BIT14,@SWR
002640  001427                          BEQ     T282
002642  022737  177777  001030          CMP     #-1,LINCNT
002650  001023                          BNE     T282
002652  012737  177764  001022          MOV     #-12.,SEGCNT
002660  000417                          BR      T282
002662  013737  001052  001030  REFIL:  MOV     WIDTH,LINCNT    ;RESET LINE COUNT
002670  012777  000012  176104          MOV     #12,@LPB        ;ISSUE LINE FEED
002676  004537  006642                  JSR     %5,SLWTIM       ;CHECK SLEW TIME
002702  000406                          BR      T282            ;TIME OK
002704                                  ERROR   \N
```

```
  997  002704  012737  000030  001050  ERR30:  MOV #30,        ERCOUNT         ;SET UP ERROR COUNT 30
  998          000031                          N=N+1
  999  002712  004537  007152                  JSR     %5,STAER        ;REPORT SLEW TIME TOO LONG
 1000  002716  000000                          HALT
 1001  002720  005237  001026          T282:   INC     CHRGEN          ;SET UP NEXT CHARACTER
 1002  002724  005237  001024                  INC     CHRCNT          ;INC. CHAR. COUNT
 1003  002730  001301                          BNE     T281
 1004  002732  012777  000012  176042          MOV     #12,@LPB        ;ISSUE LINE FEED
 1005  002740  004537  006642                  JSR     %5,SLWTIM       ;CHECK SLEW TIME
 1006  002744  000406                          BR      LP2M            ;SLEW TIME OK
 1007  002746                                  ERROR   \N
 1008  002746  012737  000031  001050  ERR31:  MOV #31,        ERCOUNT         ;SET UP ERROR COUNT 31
 1009          000032                          N=N+1
 1010  002754  004537  007152                  JSR     %5,STAER        ;REPORT TIME TOO LONG
 1011  002760  000000                          HALT
 1012  002762  013737  001054  001022  LP2M:   MOV     SEGMNT,SEGCNT   ;RESET SEGMENT COUNT
 1013  002770  012737  000200  001024          MOV     #200,CHRCNT
 1014  002776  063737  003236  001024          ADD     LEGCHR,CHRCNT   ;SETUP # OF ILLEGAL CHARACTERS
 1015  003004  005137  001024                  COM     CHRCNT
 1016  003010  005237  001024                  INC     CHRCNT
 1017
 1018  003014  005777  175760          T283:   TST     @LPB            ;TEST FOR ERROR
 1019  003020  100006                          BPL     LDCH            ;BRANCH IF NO ERROR
 1020  003022                                  ERROR   \N
 1021  003022  012737  000032  001050  ERR32:  MOV #32,        ERCOUNT         ;SET UP ERROR COUNT 32
 1022          000033                          N=N+1
 1023  003030  004537  007152                  JSR     %5,STAER        ;REPORT ERROR BIT
 1024  003034  000000                          HALT
 1025  003036  013777  001026  175736  LDCH:   MOV     CHRGEN,@LPB     ;TRANSMIT CHARACTER
 1026  003044  005237  001022                  INC     SEGCNT          ;+1 SEGMENT COUNT
 1027  003050  001014                          BNE     T284
 1028  003052  013737  001054  001022          MOV     SEGMNT,SEGCNT   ;RESET SEGMENT COUNT
 1029  003060  004537  006632                  JSR     %5,PRTTM        ;CHECK PRINT TIME
 1030  003064  000406                          BR      T284
 1031  003066                                  ERROR   \N
 1032  003066  012737  000033  001050  ERR33:  MOV #33,        ERCOUNT         ;SET UP ERROR COUNT 33
 1033          000034                          N=N+1
 1034  003074  004537  007152                  JSR     %5,STAER        ;PRINT TOOK TOO LONG
 1035  003100  000000                          HALT
 1036  003102  005237  001024          T284:   INC     CHRCNT          ;+1 CHARACTER COUNT
 1037  003106  001422                          BEQ     T285
 1038  003110  005237  001026                  INC     CHRGEN
 1039  003114  042737  177600  001026          BIC     #177600,CHRGEN
 1040  003122  022737  000012  001026          CMP     #12,CHRGEN      ;TEST FOR LINE FEED
 1041  003130  001764                          BEQ     T284
 1042  003132  022737  000014  001026          CMP     #14,CHRGEN      ;TEST FOR SLEW
 1043  003140  001760                          BEQ     T284
 1044  003142  022737  000015  001026          CMP     #15,CHRGEN      ;TEST FOR CARRIAGE RETURN
 1045  003150  001754                          BEQ     T284
 1046  003152  000720                          BR      T283            ;LOAD CHARACTER
 1047                                  ;
 1048                                  ;
 1049                                  ;
 1050  003154  012777  000012  175620  T285:   MOV     #12,@LPB        ;ISSUE LINE FEED
```

H2

```
1051  003162  004537  006642                    JSR     %5,SLWTIM       ;CHECK SLEW TIME
1052  003166  000406                            BR      LP28X
1053  003170                                    ERROR   \N
1054  003170  012737  000034  001050  ERR34:   MOV #34,        ERCOUNT          ;SET UP ERROR COUNT 34
1055          000035                            N=N+1
1056  003176  004537  007152                    JSR     %5,STAER        ;SLEW TIME TOO LONG
1057  003202  000000                            HALT
1058  003204  005237  001032          LP28X:   INC     CYCCNT
1059  003210  001402                            BEQ     .+6
1060  003212  000137  002504                    JMP     T280
1061  003216  032777  010000  175560            BIT     #BIT12,@#WR     ;CHECK TO LOOP ON TEST
1062  003224  001402                            BEQ     .+6
1063  003226  000137  002422                    JMP     TEST28
1064  003232  000402                            BR      TEST3
1065
1066  003234  000000                  NOCHRS:  0
1067  003236  000000                  LEGCHR:  0
1068                                           ;
1069                                           ;
1070                                           ;
1071
```

```
1072                                    ;
1073                                    ;TEST 1, SECTION 4
1074                                    ;TESTS PRINTER ZONE AND FORMAT CONTROL
1075                                    ;
1076  003240  004737  006566  TEST3:   JSR     %7,SIZE
1077  003244  013737  003716  003720           MOV     %N,T3NCNT       ;SET UP CYCLE COUNT
1078  003252  032777  040000  175524           BIT     #BIT14,@#SR     ;IS PRINTER 132 COL.
1079  003260  001404                           BEQ     Z80Z            ;NO IT IS AN 80 COL PRINTER
1080  003262  012737  000007  003730           MOV     #7,ZCOUNT       ;IT IS AN 132 COL PRINTER
1081  003270  000403                           BR      FORMF
1082  003272  012737  000005  003730  Z80Z:    MOV     #5,ZCOUNT       ;SET UP FOR 80 COL PRINTER
1083  003300  004537  006700  FORMF:   JSR     %5,PRTINT       ;INITIALIZE PRINTER
1084  003304  000406                           BR      T9
1085  003306                                   ERROR   \N
1086  003306  012737  000035  001050  ERR35:   MOV #35,        ERCOUNT         ;SET UP ERROR COUNT 35
1087          000036                           N=N+1
1088  003314  004537  007152                   JSR     %5,$TAER        ;PRINTER NOT READY
1089  003320  000000                           HALT
1090  003322  012737  177777  003722  T9:      MOV     #-1,CYCTST      ;
1091  003330  012737  003506  003724           MOV     #T6,PHFLG       ;PRESET PHASE FLAG
1092  003336  012737  003422  003726           MOV     #T5,SPCFLG      ;PRESET SPACE FLAG
1093  003344  012737  177777  001032           MOV     #-1,CYCCNT
1094  003352  013737  001054  001022           MOV     SEGMNT,SEGCNT   ;SET UP SEGMENT COUNT
1095  003360  005777  175414          T1:      TST     @#LPS           ;TEST FOR ERROR
1096  003364  100006                           BPL     XT1A            ;NO ERROR
1097  003366                                   ERROR   \N
1098  003366  012737  000036  001050  ERR36:   MOV #36,        ERCOUNT         ;SET UP ERROR COUNT 36
1099          000037                           N=N+1
1100  003374  004537  007152                   JSR     %5,$TAER
1101  003400  000000                           HALT
1102  003402  105777  175372          XT1A:    TSTB    @#LPS           ;TEST FOR READY
1103  003406  100403                           BMI     T1X             ;READY SET
1104  003410                                   ERROR   \N
1105  003410  012737  000037  001050  ERR37:   MOV #37,        ERCOUNT         ;SET UP ERROR COUNT 37
1106          000040                           N=N+1
1107  003416  000177  000304          T1X:     JMP     @#SPCFLG
1108  003422  012777  000040  175352  T5:      MOV     #40,@#LPB       ;LOAD A SPACE
1109  003430  005237  001022          T5X:     INC     SEGCNT          ;+1 SEGMENT CNT
1110  003434  001351                           BNE     T1              ;TEST FOR END
1111  003436  013737  001054  001022           MOV     SEGMNT,SEGCNT
1112  003444  004537  006632                   JSR     %5,PRTTM        ;CHECK PRINT OUT
1113  003450  000406                           BR      INCCY           ;TIME OK
1114  003452                                   ERROR   \N
1115  003452  012737  000040  001050  ERR40:   MOV #40,        ERCOUNT         ;SET UP ERROR COUNT 40
1116          000041                           N=N+1
1117  003460  004537  007152                   JSR     %5,$TAER        ;IT TOOK TOO LONG TO PRINT
1118  003464  000000                           HALT
1119  003466  005237  001032          INCCY:   INC     CYCCNT
1120  003472  001332                           BNE     T1
1121  003474  013737  003722  001032           MOV     CYCTST,CYCCNT
1122  003502  000177  000216                   JMP     @PHFLG
1123  003506  012737  003550  003724  T6:      MOV     #T7,PHFLG       ;SET PHASE FLAG
1124  003514  012737  003540  003726           MOV     #T4,SPCFLG      ;SET SPACE FLAG
1125  003522  012777  000015  175252           MOV     #15,@#LPB       ;LOAD CARRIAGE RETURN
```

```
1126  003530  105777  175244                  TSTB    @LPS            ;WAIT FOR SEGMENT DIODES
1127  003534  100375                          BPL     .-4             ;TO SETTLE
1128  003536  000710                          BR      T1
1129                                  ;
1130                                  ;
1131  003540  012777  000101  175234  T4:      MOV     #101,@LPB       ;LOAD CHARACTER "A"
1132  003546  000730                          BR      TSX
1133  003550  012737  003506  003724  T7:      MOV     #T8,PHFLG       ;SET PHASE FLAG
1134  003556  012737  003422  003726          MOV     #T5,SPCFLG      ;SET SPACE /A FLAG
1135  003564  012777  000012  175210          MOV     #12,@LPB        ;ISSUE LINE FEED
1136  003572  004537  006642                  JSR     %5,SLWTIM       ;CHECK SLEW TIME
1137  003576  000405                          BR      LPT7X
1138  003600                                  ERROR   \N
1139  003600  012737  000041  001050  ERR41:  MOV #41,        ERCOUNT         ;SET UP ERROR COUNT 41
1140          000042                          N=N+1
1141  003606  004537  007152                  JSR     %5,STAER        ;REPORT SLEW TOOK TOO LONG
1142
1143  003612  005337  003722          LPT7X:  DEC     CYCTST
1144  003616  013737  003722  001032          MOV     CYCTST,CYCCNT   ;RESET CYCLE COUNT
1145  003624  013737  003722  001044          MOV     CYCTST,WORK
1146  003632  063737  003730  001044          ADD     ZCOUNT,WORK
1147  003640  001247                          BNE     T1
1148  003642  005237  003720                  INC     T3NCNT          ;TEST ALL CYCLES
1149  003646  001225                          BNE     T9
1150  003650  012777  000014  175124          MOV     #14,@LPB
1151  003656  004537  006502                  JSR     %5,FRFTIM       ;CHECK FORM FEED
1152  003662  000406                          BR      XLPX2
1153  003664                                  ERROR   \N
1154  003664  012737  000042  001050  ERR42:  MOV #42,        ERCOUNT         ;SET UP ERROR COUNT 42
1155          000043                          N=N+1
1156  003672  004537  007152                  JSR     %5,STAER        ;FORM FEED TOOK TOO LONG
1157  003676  000000                          HALT
1158  003700  032777  010000  175076  XLPX2:  BIT     @BIT12,@SWR     ;CHECK TO LOOP ON TEST
1159  003706  001402                          BEQ     .+6
1160  003710  000137  003240                  JMP     TEST3           ;LOOP ON TEST
1161  003714  000406                          BR      SNGCHR
1162                                  ;
1163  003716  177766                  XN:     -14
1164  003720  000000                  T3NCNT: 0
1165  003722  000000                  CYCTST: 0
1166  003724  000000                  PHFLG:  0
1167  003726  000000                  SPCFLG: 0
1168  003730  000000                  ZCOUNT: 0
1169                                  ;
1170                                  ;WORST CASE NOISE TEST
1171                                  ;SINGLE CHAR. ACROSS ALL COLS.
1172                                  ;
1173  003732  004737  006566          SNGCHR: JSR     %7,SIZE
1174  003736  013737  001054  001022          MOV     SEGMNT,SEGCNT   ;SET UP SEGMENT COUNT
1175  003744  032777  020000  175032          BIT     @BIT13,@SWR     ;TEST FOR 96 CHAR.
1176  003752  001404                          BEQ     82
1177  003754  012737  177640  001024          MOV     #-96.,CHRCNT    ;96 CHAR.
1178  003762  000403                          BR      .+10
1179  003764  012737  177700  001024  82:     MOV     #-64.,CHRCNT    ;64 CHAR.
```

K2

```
1180  003772  013737  001052  001030          MOV     WIDTH,LINCNT    ;SET UP LINE COUNT
1181  004000  012737  000040  001026          MOV     #40,CHRGEN      ;SET UP SPACE
1182  004006  005777  174766          $1:     TST     @LPS            ;TEST FOR ERRORS
1183  004012  100006                          BPL     %81%            ;BRANCH IF NO ERRORS
1184  004014                                  ERROR   \N
1185  004014  012737  000F43  001050  ERR43:  MOV #43,        ERCOUNT         ;SET UP ERROR COUNT 43
1186          000044                          N=N+1
1187  004022  004537  007152                  JSR     %5,STAER        ;REPORT ERROR
1188  004026  000000                          HALT                    ;HALT ON ERROR
1189  004030  013777  001026  174744  %81%:  MOV     CHRGEN,@LPS     ;LOAD PRINTER BUFFER
1190  004036  005237  001022                  INC     SEGCNT
1191  004042  001361                          BNE     $1
1192  004044  013737  001F54  001022          MOV     SEGMNT,SEGCNT   ;SET UP NEW SEGMENT CNT
1193  004052  005237  001F30                  INC     LINCNT          ;+1 LINE COUNT
1194  004056  001424                          BEQ     $4              ;END OF LINE
1195  004060  032777  040000  174716          BIT     #BIT14,@SWR
1196  004066  001407                          BEQ     LINPT
1197  004070  022737  177777  001030          CMP     #-1,LINCNT
1198  004076  001003                          BNE     LINPT
1199  004100  012737  177764  001022          MOV     #-12.,SEGCNT
1200  004106  004537  006632          LINPT:  JSR     %5,PRTTM        ;PRINT SEGMENT
1201  004112  000735                          BR      $1              ;FETCH NEXT SEGMENT
1202  004114                                  ERROR   \N
1203  004114  012737  000044  001050  ERR44:  MOV #44,        ERCOUNT         ;SET UP ERROR COUNT 44
1204          000045                          N=N+1
1205  004122  004537  007152                  JSR     %5,STAER        ;REPORT PRINT TIME TOO LONG
1206  004126  000000                          HALT
1207
1208  004130  013737  001052  001030  $4:     MOV     WIDTH,LINCNT    ;SET UP LINE COUNT
1209  004136  004537  006632                  JSR     %5,PRTTM        ;END OF LINE PRINT
1210  004142  000406                          BR      $4%             ;PRINT TIME OK
1211  004144                                  ERROR   \N
1212  004144  012737  000045  001050  ERR45:  MOV #45,        ERCOUNT         ;SET UP ERROR COUNT 45
1213          000046                          N=N+1
1214  004152  004537  007152                  JSR     %5,STAER        ;REPORT TOO LONG TO PRINT
1215  004156  000000                          HALT
1216  004160  005777  174614          $4%:    TST     @LPS            ;TEST FOR ERROR
1217  004164  100006                          BPL     $4%1            ;BRANCH IF NO ERROR
1218  004166                                  ERROR   \N
1219  004166  012737  000046  001050  ERR46:  MOV #46,        ERCOUNT         ;SET UP ERROR COUNT 46
1220          000047                          N=N+1
1221  004174  004537  007152                  JSR     %5,STAER        ;REPORT ERROR SET
1222  004200  000000                          HALT
1223  004202  105777  174572          $4%1:   TSTB    @LPS            ;TEST FOR READY
1224  004206  100406                          BMI     $4%2            ;BRANCH IF READY SET
1225  004210                                  ERROR   \N
1226  004210  012737  000047  001050  ERR47:  MOV #47,        ERCOUNT         ;SET UP ERROR COUNT 47
1227          000050                          N=N+1
1228  004216  004537  007152                  JSR     %5,STAER        ;REPORT READY NOT SET
1229  004222  000000                          HALT
1230  004224  012777  000012  174550  $4%2:   MOV     #12,@LPS        ;ISSUE LINE FEED
1231  004232  004537  006642                  JSR     %5,SLWTIM       ;CHECK SLEW TIME
1232  004236  000406                          BR      $7
1233  004240                                  ERROR   \N
```

```
1234  004240  012737  000050  001050  ERR50:  MOV #50,        ERCOUNT          ;SET UP ERROR COUNT 50
1235          000051                          NUM+1
1236  004246  004537  007152                  JSR     %5,$TAER         ;REPORT SLEW TOOK TOO LONG
1237  004252  000000                          HALT
1238  004254  005237  001026          ST:     INC     CHRGEN           ;+1 CHAR.
1239  004260  005237  001024                  INC     CHRCNT           ;+1 CHAR. COUNT
1240  004264  001401                          BEQ     LPST
1241  004266  000647                          BR      ST
1242  004270  032777  010000  174506  LPST:   BIT     #BIT12,@#WR      ;CHECK TO LOOP ON TEST
1243  004276  001402                          BEQ     .+6              ;DO NOT LOOP ON TEST
1244  004300  000137  003732                  JMP     @NGCHR           ;LOOP ON TEST
1245                                          ;
1246                                          ;
1247
1248                                          ;
1249                                          ;TEST 3
1250                                          ;ROTATING PATTERN CHARACTER TEST
1251                                          ;
1252                                          ;
1253  004304  004737  006566          ROTATE: JSR     %7,$IZE
1254  004310  013737  001054  001022          MOV     $EGMNT,SEGCNT            ;SET UP SEGMENT COUNT
1255  004316  013737  001052  001030          MOV     WIDTH,LINCNT             ;SET UP LINE COUNT
1256  004324  013737  005036  005032          MOV     #SEGFL,SEGFLG            ;SET SEGMENT FLAG
1257  004332  013737  005044  005040          MOV     #LINFL,LINFLG            ;SET LINE FLAG
1258  004340  032777  020000  174436  ROT3:   BIT     #BIT13,@#WR              ;TEST FOR 96 CHAR.
1259  004346  001404                          BEQ     ROT7             ;64 CHAR. PRINTER
1260  004350  012737  177640  005050          MOV     #-96.,,STRCNT            ;SET UP FOR 96 CHAR.
1261  004356  000403                          BR      .+10
1262  004360  012737  177700  005050  ROT7:   MOV     #-64.,,STRCNT            ;SET UP FOR 64 CHAR.
1263  004366  012737  000040  005046          MOV     #40,STRCHR               ;FETCH A SPACE
1264  004374  013737  005046  001026  ROT11:  MOV     STRCHR,CHRGEN
1265  004402  013737  005050  001024          MOV     STRCNT,CHRCNT
1266  004410  005777  174364          ROT1:   TST     @LPS             ;TEST FOR ERROR
1267  004414  100006                          BPL     ROT11Z           ;BRANCH IF NO ERROR
1268  004416                                  ERROR   \N               ;REPORT PRINTER ERROR
1269  004416  012737  000051  001050  ERR51:  MOV #51,        ERCOUNT          ;SET UP ERROR COUNT 51
1270          000052                          NUM+1
1271  004424  004537  007152                  JSR     %5,$TAER
1272  004430  000000                          HALT
1273  004432  013777  001026  174342  ROT11Z: MOV     CHRGEN,@LPB              ;LOAD CHARACTER
1274  004440  005237  001022                  INC     SEGCNT           ;+1 SEGMENT COUNT
1275  004444  001425                          BEQ     ROT8             ;END OF SEG.
1276  004446  005237  001026          ROT9:   INC     CHRGEN           ;+1 CHAR. GENERATOR
1277  004452  005237  001024                  INC     CHRCNT           ;+1 CHAR. COUNT
1278  004456  001454                          BEQ     ROT10            ;ROLL OVER
1279  004460  000177  000354          ROT4:   JMP     @LINFLG          ;TEST LINE FLAG
1280  004464  000177  000342          ROT5:   JMP     @SEGFLG          ;TEST SEGMENT FLAG
1281  004470  013737  005036  005032  ROT2:   MOV     #SEGFL,SEGFLG
1282  004476  004537  006632                  JSR     %5,PRTTM                 ;CHECK PRINT TIME
1283  004502  000742                          BR      ROT1             ;CONTINUE
1284  004504                                  ERROR   \N
1285  004504  012737  000052  001050  ERR52:  MOV #52,        ERCOUNT          ;SET UP ERROR COUNT 52
1286          000053                          NUM+1
1287  004512  004537  007152                  JSR     %5,$TAER         ;REPORT PRINT TIME TOO LONG
```

M2

```
1288  004516  000000                          HALT
1289
1290                                  ;
1291                                  ;
1292  004520  013737  001P54  001022  ROT8:   MOV     SEGMNT,SEGCNT           ;SET UP SEGMENT COUNT
1293  004526  013737  005034  005032          MOV     STSGFL,SEGFLG           ;SET SEGMENT FLAG
1294  004534  005237  001030          INC     LINCNT                  ;+1 LINE COUNT
1295  004540  001414                  BEQ     ROT8X
1296  004542  032777  040000  174234          BIT     #BIT14,@#SWR
1297  004550  001736                  BEQ     ROT9
1298  004552  022737  177777  001030          CMP     #-1,LINCNT
1299  004560  001332                  BNE     ROT9
1300  004562  012737  177764  001022          MOV     #-12.,SEGCNT
1301  004570  000726                  BR      ROT9
1302  004572  013737  001052  001030  ROT8X:  MOV     WIDTH,LINCNT            ;RESET LINE COUNT
1303  004600  013737  005042  005040          MOV     STLNFL,LINFLG           ;SET LINE FLAG
1304  004606  000717                  BR      ROT9
1305  004610  012737  000040  001026  ROT10:  MOV     #40,CHRGEN              ;RESET CHAR. GEN
1306  004616  032777  020000  174160          BIT     #BIT13,@#SWR            ;TEST FOR 96 CHAR.
1307  004624  001404                  BEQ     .+12                    ;64 CHAR.
1308  004626  012737  177640  001024          MOV     #-96.,CHRCNT            ;96 CHAR COUNT
1309  004634  000403                  BR      .+10
1310  004636  012737  177700  001024          MOV     #-64.,CHRCNT            ;64 CHAR.
1311  004644  000705                  BR      ROT4
1312  004646  013737  005044  005040  ROT6:   MOV     RSLNFL,LINFLG           ;SET UP LINE FLG.
1313  004654  013737  005036  005032          MOV     RSSGFL,SEGFLG           ;SET UP SEG. FLG.
1314  004662  004537  006632                  JSR     %5,PRTTM                ;CHECK PRINTIME
1315  004666  000406                  BR      ROT6X                   ;TIME OK
1316  004670                          ERROR   \N
1317  004670  012737  000053  001050  ERR53:  MOV #53,        ERCOUNT         ;SET UP ERROR COUNT 53
1318          000054                  N=N+1
1319  004676  004537  007152                  JSR     %5,STAER                ;PRINT TIME TOO LONG
1320  004702  000000                  HALT
1321  004704  005777  174070  ROT6X1: TST     @#LPS                   ;CHECK FOR ERROR
1322  004710  100006                  BPL     ROT6X1                  ;BRANCH IF NO ERROR
1323  004712                          ERROR   \N
1324  004712  012737  000054  001050  ERR54:  MOV #54,        ERCOUNT         ;SET UP ERROR COUNT 54
1325          000055                  N=N+1
1326  004720  004537  007152                  JSR     %5,STAER                ;REPORT PRINTER ERROR
1327  004724  000000                  HALT
1328  004726  105777  174046  ROT6X1: TSTB    @#LPS                   ;TEST FOR READY
1329  004732  100406                  BMI     ROT6X2                  ;BRANCH IF READY
1330  004734                          ERROR   \N
1331  004734  012737  000055  001050  ERR55:  MOV #55,        ERCOUNT         ;SET UP ERROR COUNT 55
1332          000056                  N=N+1
1333  004742  004537  007152                  JSR     %5,STAER                ;REPORT PRINTER NOT READY
1334  004746  000000                  HALT
1335  004750  012777  000012  174024  ROT6X2: MOV     #12,@#LPB               ;ISSUE LINE FEED
1336  004756  004537  006642                  JSR     %5,SLWTIM               ;CHECK SLEW TIME
1337  004762  000406                  BR      ROT6X3                  ;SLEW OK
1338  004764                          ERROR   \N
1339  004764  012737  000056  001050  ERR56:  MOV #56,        ERCOUNT         ;SET UP ERROR COUNT 56
1340          000057                  N=N+1
1341  004772  004537  007152                  JSR     %5,STAER                ;REPORT SLEW TOOK TOO LONG
```

A3

```
1342  005776  000000                          HALT
1343  006000  005237  006046        ROT6X3:   INC     STRCHR                  ;+1 START CHAR.
1344  006004  005237  006050                  INC     STRCNT                  ;+1 CTR. CHAR. CNT.
1345  006010  001402                          BEQ     .+6
1346  006012  000137  004376                  JMP     ROT11                   ;NO ROLL OVER
1347  006016  032777  010000  173760          BIT     #BIT12,@#WR             ;LOOP ON TEST
1348  006024  001412                          BEQ     TST6                    ;NO DO NOT LOOP
1349  006026  000137  004340                  JMP     ROT3
1350
1351                                          ;
1352  006032  004410                SEGFLG:   ROT1
1353  006034  004470                STSGFL:   ROT2
1354  006036  004410                RSSGFL:   ROT1
1355  006040  004464                LINFLG:   ROT5
1356  006042  004646                STLNFL:   ROT6
1357  006044  004464                RSLNFL:   ROT5
1358  006046  000000                STRCHR:   0
1359  006050  000000                STRCNT:   0
1360                                          ;
1361                                          ;
1362                                          ;TEST 6
1363                                          ;DOUBLE WEDGE PATTERN
1364                                          ;
1365  006052  012737  000077  001026  TST61:   MOV     #77,CHRGEN              ;FETCH?
1366  006060  004737  006566                  JSR     %7,SIZE
1367  006064  032777  040000  173712          BIT     #BIT14,@#WR
1368  006072  001404                          BEQ     X66X
1369  006074  012737  177574  006186          MOV     #-132.,T6LNLG
1370  006102  000403                          BR      .+10
1371  006104  012737  177660  006186  X66X:   MOV     #-80.,T6LNLG
1372  006112  013737  006186  006102          MOV     T6LNLG,T6LNCT
1373  006120  013737  001054  001022          MOV     SEGMNT,SEGCNT           ;SET UP SEGMENT CNT
1374  006126  013737  001052  001030          MOV     WIDTH,LINCNT            ;SET UP LINE CNT
1375  006134  005777  173640        T61:      TST     @LPS                    ;TEST FOR ERROR
1376  006140  100006                          BPL     T61Z                    ;BRANCH IF NO ERROR
1377  006142                                  ERROR   \N
1378  006142  012737  000057  001050  ERR57:   MOV #57,        ERCOUNT        ;SET UP ERROR COUNT 57
1379          000060                          N=N+1
1380  006150  004537  007152                  JSR     %5,STAER                ;REPORT PRINTER ERROR
1381  006154  000000                          HALT
1382  006156  013777  001026  173616  T61Z:   MOV     CHRGEN,@LPB             ;LOAD CHAR.
1383  006164  005237  001022                  INC     SEGCNT                  ;+1 SEGMENT CNT
1384  006170  001013                          BNE     T65
1385  006172  013737  001054  001022          MOV     SEGMNT,SEGCNT           ;RESET SEGMENT COUNT
1386  006200  004537  006632                  JSR     %5,PRTTM                ;CHECK PRINT TIME
1387  006204  000405                          BR      T65                     ;PRINT TIME OK
1388  006206                                  ERROR   \N
1389  006206  012737  000060  001050  ERR60:   MOV #60,        ERCOUNT        ;SET UP ERROR COUNT 60
1390          000061                          N=N+1
1391  006214  004537  007152                  JSR     %5,STAER                ;REPORT PRINT TIME TOO LONG
1392  006220  005237  006102        T65:      INC     T6LNCT
1393  006224  001343                          BNE     T61
1394  006226  005777  173546                  TST     @LPS                    ;TEST FOR ERROR
1395  006232  100006                          BPL     T65X                    ;BRANCH IF NO ERROR
```

```
1396  005234                                        ERROR   \N
1397  005234  012737  000061  001050  ERR61:  MOV #61,        ERCOUNT         ;SET UP ERROR COUNT 61
1398          000062                          N=N+1
1399  005242  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER ERROR
1400  005246  000000                          HALT
1401  005250  012777  000012  173524  T65X:   MOV     #12,@LPB                ;ISSUE LINE FEED
1402  005256  004537  006642                  JSR     %5,$LWTIM               ;CHECK SLEW TIME
1403  005262  000406                          BR      T65Z                    ;BRANCH IF TIME OK
1404  005264                                  ERROR   \N
1405  005264  012737  000062  001050  ERR62:  MOV #62,        ERCOUNT         ;SET UP ERROR COUNT 62
1406          000063                          N=N+1
1407  005272  004537  007152                  JSR     %5,$TAER                ;REPORT SLEW TIME TOO LONG
1408  005276  000000                          HALT
1409  005300  013737  001054  001022  T65Z:   MOV     SEGMNT,SEGCNT           ;RESET SEGMENT CNT
1410  005306  005237  006106                  INC     T6LNLG                  ;+1 LINE LENGTH
1411  005312  001405                          BEQ     T6PT2
1412  005314  013737  006106  006102          MOV     T6LNLG,T6LNCT           ;SET UP NEW LINE CNT
1413  005322  000137  005134                  JMP     T61
1414                                  ;
1415
1416  005326  032777  040000  173450  T6PT2:  BIT     #BIT14,@$SR
1417  005334  001404                          BEQ     X88X
1418  005336  012737  177574  001032          MOV     #-132.,,CYCCNT
1419  005344  000403                          BR      X88X+6
1420  005346  012737  177660  001032  X88X:   MOV     #-88.,,CYCCNT           ;PRESET CYCLE COUNT
1421  005354  013737  001054  001022          MOV     SEGMNT,SEGCNT           ;SET UP SEG. COUNT
1422  005362  013737  001052  001030          MOV     WIDTH,LINCNT            ;SET UP LINE COUNT
1423  005370  005777  173404          T66:    TST     @LPS                    ;CHECK FOR ERROR
1424  005374  100006                          BPL     T66X                    ;BRANCH IF NO ERROR
1425  005376                                  ERROR   \N
1426  005376  012737  000063  001050  ERR63:  MOV #63,        ERCOUNT         ;SET UP ERROR COUNT 63
1427          000064                          N=N+1
1428  005404  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER ERROR
1429  005410  000000                          HALT
1430  005412  105777  173362          T66X:   TSTB    @LPS                    ;TEST FOR READY
1431  005416  100406                          BMI     T66Z                    ;BRANCH IF READY
1432  005420                                  ERROR   \N
1433  005420  012737  000064  001050  ERR64:  MOV #64,        ERCOUNT         ;SET UP ERROR COUNT 64
1434          000065                          N=N+1
1435  005426  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER NOT READY
1436  005432  000000                          HALT
1437  005434  013777  001026  173340  T66Z:   MOV     CHRGEN,@LPB             ;LOAD CHARACTER
1438  005442  005237  001022                  INC     SEGCNT                  ;+1 SEG. CNT
1439  005446  001350                          BNE     T66                     ;LOAD NEXT CHARACTER
1440  005450  013737  001054  001022          MOV     SEGMNT,SEGCNT           ;RESET SEG. CNT
1441  005456  004537  006632                  JSR     %5,PRTTM                ;CHECK PRINT TIME
1442  005462  000406                          BR      T66Z1                   ;TIME OK
1443  005464                                  ERROR   \N
1444  005464  012737  000065  001050  ERR65:  MOV #65,        ERCOUNT         ;SET UP ERROR COUNT 65
1445          000066                          N=N+1
1446  005472  004537  007152                  JSR     %5,$TAER                ;REPORT PRINT TIME TOO LONG
1447  005476  000000                          HALT
1448  005500  005237  001030          T66Z1:  INC     LINCNT                  ;+1 LINE COUNT
1449  005504  001414                          BEQ     T66Z1X
```

C3

```
1458  005506  032777  040000  173270          BIT     #BIT14,@#WR
1459  005514  001725                          BEQ     T66
1460  005516  022737  177777  001030          CMP     #-1,LINCNT
1461  005524  001321                          BNE     T66
1462  005526  012737  177764  001022          MOV     #-12.,,SEGCNT
1463  005534  000715                          BR      T66
1464  005536  013737  001052  001030  T66Z1X: MOV     WIDTH,LINCNT            ;RESET LINE COUNT
1465  005544  005777  173230                  TST     @LPS                    ;CHECK FOR ERROR
1466  005550  100006                          BPL     T7A                     ;BRANCH IF NO ERROR
1467  005552                                  ERROR   \N
1468  005552  012737  000066  001050  ERR66: MOV #66,         ERCOUNT         ;SET UP ERROR COUNT 66
1469          000067                          N=N+1
1470  005560  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER ERROR
1471  005564  000000                          HALT
1472  005566  105777  173206          T7B:    TSTB    @LPS                    ;TEST FOR READY
1473  005572  100406                          BMI     T7BX                    ;BRANCH IF READY
1474  005574                                  ERROR   \N
1475  005574  012737  000067  001050  ERR67: MOV #67,         ERCOUNT         ;SET UP ERROR COUNT 67
1476          000070                          N=N+1
1477  005602  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER NOT READY
1478  005606  000000                          HALT
1479  005610  012777  000012  173164  T7BX:  MOV     #12,@LPS                ;ISSUE LINE FEED
1480  005616  004537  006642                  JSR     %5,$LWTIM               ;CHECK SLEW TIME
1481  005622  000406                          BR      T71
1482  005624                                  ERROR   \N
1483  005624  012737  000070  001050  ERR70: MOV #70,         ERCOUNT         ;SET UP ERROR COUNT 70
1484          000071                          N=N+1
1485  005632  004537  007152                  JSR     %5,$TAER                ;REPORT SLEW TOOK TOO LONG
1486  005636  000000                          HALT
1487  005640  005237  001032          T71:    INC     CYCCNT                  ;+1 CYCLE COUNT
1488  005644  001006                          BNE     T72
1489  005646  032777  010000  173130          BIT     #BIT12,@#WR             ;CHECK TO LOOP ON TEST
1490  005654  001515                          BEQ     MAMALN                  ;NO GO TO NEXT TEST
1491  005656  000137  005052                  JMP     TST6                    ;LOOP ON TEST
1492  005662  013737  001054  001022  T72:    MOV     SEGMNT,SEGCNT
1493  005670  032777  040000  173106          BIT     #BIT14,@#WR
1494  005676  001404                          BEQ     T72X
1495  005700  012737  000204  006104          MOV     #132.,,T6SPCT
1496  005706  000403                          BR      .+10
1497  005710  012737  000120  006104  T72X:   MOV     #80.,,T6SPCT            ;GET CYCLE COUNT AND
1498  005716  063737  001032  006104          ADD     CYCCNT,T6SPCT           ;DERIVE SPACE COUNTER
1499
1500  005724  005777  173050          T69:    TST     @LPS                    ;TEST FOR ERROR
1501  005730  100006                          BPL     T69X                    ;BRANCH IF NO ERROR
1502  005732                                  ERROR   \N                      ;
1503  005732  012737  000071  001050  ERR71: MOV #71,         ERCOUNT         ;SET UP ERROR COUNT 71
1504          000072                          N=N+1
1505  005740  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER ERROR
1506  005744  000000                          HALT
1507  005746  105777  173026          T69X:   TSTB    @LPS                    ;TEST FOR READY
1508  005752  100406                          BMI     T69Z                    ;BRANCH IF READY
1509  005754                                  ERROR   \N
1510  005754  012737  000072  001050  ERR72: MOV #72,         ERCOUNT         ;SET UP ERROR COUNT 72
1511          000073                          N=N+1
```

D3

```
1504  005762  004537  007152                  JSR     %5,$TAER                ;REPORT PRINTER NOT READY
1505  005766  000000                          HALT
1506  005770  012777  000040  173004  T69Z:   MOV     #40,@LPB                ;LOAD SPACE
1507  005776  005237  001022                  INC     SEGCNT
1508  006002  001032                          BNE     T68X
1509  006004  013737  001054  001022          MOV     $EGMNT,SEGCNT
1510  006012  004537  006632                  JSR     %5,PRTTM                ;CHECK PRINT TIME
1511  006016  000406                          BR      T68                     ;PRINT TIME OK
1512  006020                                  ERROR   \N
1513  006020  012737  000073  001050  ERR73:  MOV #73,        ERCOUNT         ;SET UP ERROR COUNT 73
1514          000074                          N=N+1
1515  006026  004537  007152                  JSR     %5,$TAER                ;REPORT PRINT TIME TOO LONG
1516  006032  000000                          HALT
1517  006034  005237  001030          T68:    INC     LINCNT
1518  006040  001416                          BEQ     T68Z
1519  006042  032777  040000  172734          BIT     #BIT14,@$WR
1520  006050  001407                          BEQ     T68X
1521  006052  022737  177777  001030          CMP     #-1,LINCNT
1522  006060  001003                          BNE     T68X
1523  006062  012737  177764  001022          MOV     #-12.,SEGCNT
1524  006070  005337  006104          T68X:   DEC     T68PCT
1525  006074  001313                          BNE     T69
1526  006076  000137  005370          T68Z:   JMP     T66
1527  006102  000000                  T6LNCT: 0
1528  006104  000000                  T68PCT: 0
1529  006106  000000                  T6LNLG: 0
1530
1531                                          ;
1532                                          ;
1533                                          ;
1534                                          ;HAMMER ALIGMENT
1535                                          ;
1536  006110  012737  177702  006252  HAMALN: MOV     #-76,HAMCNT             ;SET UP FOR 63 LINES
1537  006116  032777  040000  172660  HAM1X:  BIT     #BIT14,@$WR
1538  006124  001404                          BEQ     HAM1
1539  006126  012737  177574  001030          MOV     #-132.,LINCNT
1540  006134  000403                          BR      HAM2
1541  006136  012737  177660  001030  HAM1:   MOV     #-80.,LINCNT            ;SET UP LINE COUNT
1542  006144  005777  172630          HAM2:   TST     @LPS                    ;CHECK FOR ERROR
1543  006150  100006                          BPL     XHAM1                   ;BRANCH IF NO ERROR
1544  006152                                  ERROR   \N
1545  006152  012737  000074  001050  ERR74:  MOV #74,        ERCOUNT         ;SET UP ERROR COUNT 74
1546          000075                          N=N+1
1547  006160  004537  007152                  JSR     %5,$TAER                ;REPORT ERROR OCCURRED
1548  006164  000000                          HALT
1549  006166  105777  172606          XHAM1:  TSTB    @LPS                    ;CHECK FOR READY
1550  006172  100375                          BPL     .-4
1551  006174  012777  000105  172600  XHAM1X: MOV     #105,@LPB               ;TRANSMIT E TO PRINTER
1552  006202  005237  001030                  INC     LINCNT                  ;+1 LINE COUNT
1553  006206  001356                          BNE     HAM2                    ;TRANSMIT ANOTHER CHAR.
1554  006210  105777  172564                  TSTB    @LPS
1555  006214  100375                          BPL     .-4
1556  006216  012777  000012  172556          MOV     #12,@LPB                ;TRANSMIT LINE FEED
1557  006224  105777  172550                  TSTB    @LPS                    ;TEST FOR READY
```

E3

```
1558  006230  100375                          BPL     .-8             ;WAIT FOR READY
1559  006232  005237  006252                  INC     MAMCNT          ;+1 COUNT
1560
1561  006236  001327                          BNE     MAMIX           ;GO DO NEXT LINE
1562  006240  032777  010000  172536          BIT     #BIT12,@#WR     ;CHECK TO LOOP ON TEST
1563  006246  001320                          BNE     MAMALN          ;LOOP ON TEST
1564  006250  000401                          BR      .+4
1565  006252  000000              MAMCNT: 0
1566                                ;
1567                                ;
1568                                ;TEST 4, SLEW TEST ROUTINE
1569                                ;
1570                                ;
1571  006254  012737  006454  006450  SLWTST: MOV     #TABSTR,TBPTR   ;PRESET LINE COUNT
1572  006262  032777  040000  172514  SLWIX:  BIT     #BIT14,@#WR
1573  006270  001404                          BEQ     SLWI-6
1574  006272  012737  177574  001030          MOV     #-132.,.LINCNT
1575  006300  000403                          BR      SLWI
1576  006302  012737  177660  001030          MOV     #-80.,.LINCNT   ;SET UP LINE LENGTH
1577  006310  012777  000105  172464  SLWI:   MOV     #105,@LPB       ;LOAD CHARACTER "E"
1578  006316  005777  172456                  TST     @LPS            ;TEST FOR ERROR
1579  006322  100003                          BPL     XSLWI           ;BRANCH IF NO ERROR
1580  006324                                  ERROR   \N              ;AN ERROR OCCURRED
1581  006324  012737  000075  001050  ERR75:  MOV #75.,        ERCOUNT         ;SET UP ERROR COUNT TO
1582          000076                          N=N+1
1583  006332  105777  172442          XSLWI:  TSTB    @LPS            ;TEST FOR READY
1584  006336  100367                          BPL     SLWI+6          ;BRANCH BACK NOT READY
1585  006340  005237  001030                  INC     LINCNT          ;+1 LINE COUNT
1586  006344  001361                          BNE     SLWI
1587  006346  017737  000076  006452          MOV     @TBPTR,SLWCNT   ;SET UP SLEW CNT
1588  006354  012777  000012  172420  SLEW:   MOV     #12,@LPB        ;ISSUE LINE FEED
1589  006362  105777  172412                  TSTB    @LPS            ;TEST FOR READY
1590  006366  100375                          BPL     .-8
1591  006370  005237  006452                  INC     SLWCNT
1592  006374  001367                          BNE     SLEW            ;ISSUE NEXT SLEW
1593  006376  023727  006450  006500          CMP     TBPTR,#TABEND   ;
1594  006404  001015                          BNE     INCSLW
1595  006406  032777  010000  172370          BIT     #BIT12,@#WR     ;CHECK TO LOOP ON TEST
1596  006414  001317                          BNE     SLWTST          ;YES LOOP ON TEST
1597  006416  013700  000042                  MOV     @#42,R0
1598  006422  001404                          BEQ     INCSLW-4
1599  006424  004710              LOGICAL:JSR     %7,(0)
1600  006426  000240                          NOP
1601  006430  000240                          NOP
1602  006432  000240                          NOP
1603  006434  000137  001316                  JMP     TEST1           ;RECYCLE TEST
1604  006440  062737  000002  006450  INCSLW: ADD     #2.,TBPTR       ;SET UP NEW SLEW CNT
1605  006446  000765                          BR      SLWIX
1606                                ;
1607                                ;
1608  006450  000000              TBPTR:  0
1609  006452  000000              SLWCNT: 0
1610  006454  177775              TABSTR: -3                      ;SLEW 3 LINES
1611  006456  177776                      -2                      ;SLEW 2 LINES
```

F3

```
1612  006460  177766                          -12                     ;SLEW 12 LINES
1613  006462  177762                          -16                     ;SLEW 16 LINES
1614  006464  177772                          -6                      ;SLEW 6 LINES
1615  006466  177775                          -3                      ;SLEW 3 LINES
1616  006470  177770                          -10                     ;SLEW 10 LINES
1617  006472  177774                          -4                      ;SLEW 4 LINES
1618  006474  177773                          -5                      ;SLEW 5 LINES
1619  006476  177773                          -5                      ;SLEW 5 LINES
1620  006500  177775                TABEND:   -3                      ;SLEW 3 LINES
1621                                ;
1622                                ;
1623                                ;
1624  006502  013737  006556  006564 FFPTIM:  MOV     FFTIMU,FFCNT2   ;SET UP TIMER ASSUME /9INC/SEC
1625  006510  013737  006560  006562         MOV     FFTIML,FFCNT1
1626  006516  105777  172256        FFRDY:  TSTB    @LPS            ;TEST FOR READY
1627  006522  100001                         BPL     .+4             ;PRINTER NOT READY
1628  006524  000205                         RTS     R5              ;EXIT HERE IF READY SET
1629  006526  005237  006562                INC     FFCNT1
1630  006532  001371                         BNE     FFRDY
1631  006534  013737  006560  006562         MOV     FFTIML,FFCNT1
1632  006542  005237  006564                INC     FFCNT2
1633  006546  001363                         BNE     FFRDY
1634  006550  062705  000002                ADD     #2,R5           ;EXIT TIME TOO LONG
1635  006554  000205                         RTS     R5
1636                                ;
1637  006556  177210                FFTIMU: -570
1638  006560  177210                FFTIML: -570
1639  006562  000000                FFCNT1: 0
1640  006564  000000                FFCNT2: 0
1641                                ;
1642  006566  032777  040000  172210 SIZE:   BIT     #BIT14,@#WR
1643  006574  001407                         BEQ     COL80
1644  006576  012737  177750  001054         MOV     #-24.,,SEGMNT
1645  006604  012737  177772  001052         MOV     #-6,WIDTH
1646  006612  000207                         RTS     R7
1647  006614  012737  177756  001054 COL80:  MOV     #-20.,,SEGMNT
1648  006622  012737  177774  001052         MOV     #-4,WIDTH
1649  006630  000207                         RTS     R7
1650                                ;
1651                                ;
1652                                ;MISC. ROUTINE
1653                                ;WAIT 144 MSEC. FOR CHARACTER TO BE PRINTED
1654                                ;WAIT 136 MSEC FOR SLEW TO BE EXECUTED
1655                                ;
1656  006632  012737  140000  001044 PRTTM:  MOV     #140000,WORK    ;SET UP FOR 144 MSEC COUNT
1657  006640  000403                         BR      PTIMU           ;
1658  006642  012737  140000  001044 SLWTIM: MOV     #140000,WORK    ;SET UP FOR 136 MSEC COUNT
1659  006650  005777  172124        PTIMU:  TST     @LPS            ;IS THERE AN ERROR
1660  006654  100406                         BMI     PITML           ;BRANCH IF ERROR
1661  006656  105777  172116                TSTB    @LPS            ;TEST FOR READY CONN.
1662  006662  100405                         BMI     PTIML           ;BRANCH IF READY
1663  006664  005237  001044                INC     WORK            ;WAIT FOR FLAG
1664  006670  001367                         BNE     PTIMU           ;NO FLAG WAIT
1665  006672  062705  000002        PITML:  ADD     #2,R5           ;SET UP FOR ERROR REPORT
```

```
1666  006676  000205                  PTIML:  RTS     %5              ;EXIT
1667                                  ;
1668                                  ;
1669                                  ;
1670                                  ;
1671                                  ;
1672                                  ;ROUTINE TO INITIALIZE PRINTER
1673                                  ;ENTER FROM JSR %5, PRTINT
1674                                  ;
1675  006700  105777  172074          PRTINT: TSTB    @LPS            ;TEST FOR READY
1676  006704  100403                          BMI     RDYOK           ;READY SET OK
1677  006706  062705  000002                  ADD     #2,%5           ;SET UP FOR ERROR REPORT
1678  006712  000205                          RTS     %5              ;REPORT READY NOT SET
1679  006714  012777  000014  172060  RDYOK:  MOV     #14,@LPB        ;ISSUE FOR FEED
1680  006722  105777  172052                  TSTB    @LPS            ;TEST FOR READY NOT SET
1681  006726  100003                          BPL     NTRDY           ;READY NOT SET OK
1682  006730  062705  000012                  ADD     #12,%5          ;SET UP FOR REPORT
1683  006734  000205                          RTS     %5              ;EXIT AND REPORT
1684  006736  105777  172036          NTRDY:  TSTB    @LPS
1685  006742  100375                          BPL     .-4             ;TEST FOR RDY SET
1686  006744  000205                          RTS     %5              ;READY SET EXIT
1687                                  ;
1688                                  ;
1689                                  ;
1690                                  ;
1691                                  ;
1692                                  ;
1693                                  ;SUBROUTINE TO OUTPUT ASCII MESSAGES ON TELETYPE PRINTER
1694                                  ;
1695  006746  011600                  TYP:    MOV     @%6,%0          ;GET ADDR. THAT CONTAINS MESS.
1696  006750  062716  000002                  ADD     #2,@%6          ;SET UP EXIT
1697  006754  011000                          MOV     @%6,%0          ;ADDRESS OF MESSAGE IN R0
1698
1699  006756  112037  007066          TYPA:   MOVB    (0)+,TYPDAT     ;GET CHARACTER
1700  006762  122737  000100  007066          CMPB    #100,TYPDAT     ;CHECK FOR "@" CHARACTER
1701  006770  001001                          BNE     TYPC            ;BRANCH IF NOT "@"
1702  006772  000002                          RTI                     ;BYTE EQUALED "@" EXIT
1703  006774  122737  000045  007066  TYPC:   CMPB    #45,TYPDAT      ;CHECK FOR "%"
1704  007002  001416                          BEQ     TYPF            ;BRANCH IF "%"
1705  007004  122737  000042  007066          CMPB    #42,TYPDAT      ;CHECK FOR "&"
1706  007012  001417                          BEQ     TYPG            ;BRANCH IF "&"
1707  007014  004737  007022                  JSR     %7,TYPD         ;TYPE CHARACTER IN TYPDAT
1708  007020  000756                          BR      TYPA
1709  007022  113777  007066  171762  TYPD:   MOVB    TYPDAT,@TPB     ;OUTPUT CHARACTER TO PRINTER
1710  007030  105777  171762                  TSTB    @TPS            ;WAIT FOR DONE FLAG
1711  007034  100375                          BPL     .-4
1712  007036  000207                          RTS     %7              ;CHAR. TYPED EXIT
1713  007040  112737  000015  007066  TYPF:   MOVB    #15,TYPDAT      ;OUTPUT CARRIAGE RETURN
1714  007046  004737  007022                  JSR     %7,TYPD         ;GO TYPE CHAR.
1715  007052  112737  000012  007066  TYPG:   MOVB    #12,TYPDAT      ;OUTPUT LINE FEED
1716  007060  004737  007022                  JSR     %7,TYPD         ;GO TYPE CHAR.
1717  007064  000734                          BR      TYPA
1718  007066  000000                  TYPDAT: 0
1719                                  ;
```

A3

```
 1720                                   ;
 1721                                   ;ROUTINE TO CONVERT OCTAL TO ASCII
 1722                                   ;
 1723                                   ;ENTER ROUTINE AS FOLLOWS
 1724                                   ;       JSR     %5,CONV
 1725                                   ;XXXXXX=ADDRESS OF NUMBER TO BE CONVERTED
 1726                                   ;XXXXXX=ADDRESS OF ASCII MESSAGE
 1727                                   ;XXXXXX=NUMBER OF OCTAL NO.'S TO BE CONVERTED
 1728                                   ;
 1729  007670  013537  007150           CONV:   MOV     @(5)+,ACNVX     ;ADDRSS OF NO. TO BE CONVERTED
 1730  007674  012501                           MOV     (5)+,%1         ;ADDRESS OF MESSAGE
 1731  007676  012502                           MOV     (5)+,%2         ;NUMBER OF ASCII CHARACTERS
 1732  007700  060201                           ADD     %2,%1
 1733  007702  013703  007150           ACVN:   MOV     ACNVX,%3        ;ISOLATE LEAST SIGNIFICANT BIT
 1734  007706  042703  177770                   BIC     #177770,%3
 1735  007712  062703  000060                   ADD     #60,%3          ;SET UP ASCII CHARACTER
 1736  007716  110341                           MOVB    %3,-(1)         ;STORE CHARACTER
 1737  007720  000241                           CLC
 1738  007722  006037  007150                   ROR     ACNVX
 1739  007726  000241                           CLC
 1740  007730  006037  007150                   ROR     ACNVX
 1741  007734  000241                           CLC
 1742  007736  006037  007150                   ROR     ACNVX
 1743  007742  005302                           DEC     %2              ;-1 FROM ASCII CHAR. CNT
 1744  007744  001356                           BNE     ACVN            ;CONVERT NEXT CHARACTER
 1745  007746  000205                           RTS     %5              ;EXIT; CONVERSION DONE
 1746                                   ;
 1747  007750  000000                   ACNVX:  0                       ;WORK REGISTER
 1748                                   ;
 1749                                   ;
 1750                                   ;
 1751                                   ;
 1752
 1753                                   ;
 1754                                   ;ROUTINE TO REPORT ERROR COUNT
 1755                                   ;
 1756  007752  004537  007070           STAER:  JSR     %5,CONV         ;CONVERT OCTAL TO ASCII
 1757  007756  001050                           ERCOUNT
 1758  007760  007210                           MED1
 1759  007762  000003                           3
 1760  007764  104000                           EMT     +0              ;PRINT MESSAGE
 1761  007766  007206                           MED1A
 1762  007770  104000                           EMT     +0
 1763  007772  007210                           MED1
 1764  007774  005777  171604                   TST     @SWR            ;TEST FOR HALT ON ERROR
 1765  010000  100001                           BPL     .+4
 1766  010002  000000                           HALT
 1767  010004  000205                           RTS     %5
 1768
       007206  040045                   MED1A:  .ASCII  /%0/
                                       ;
                                       ;
       007210  020040  020040  051105   MED1:   .ASCII  /    ERROR COUNT0/
                                       ;
```

```
                                        ;
                                        ;
                                        ;
                                        ;
007230  046445  044581  042116  MES1:   .ASCII  /%MAINDEC-11-DZLPA-B LINE PRINTER TEST%/
                                        ;
                                        ;
007276  051845  051505  040524  MES2:   .ASCII  /%RESTART ADDRESS 6000%/
                                        ;
                                        ;
007323      045 047520  042527  MES3:   .ASCII  /%POWER ON-TURN ON LINE%/
                                        ;
                                        ;
007352  047445  020116  044514  MES4:   .ASCII  /%ON LINE OK-TRY TORN PAPER SWITCH%/
                                        ;
                                        ;
007414  042445  051122  051117  MES5:   .ASCII  /%ERROR SET OK-TRY DRUM GATE SWITCH%/
                                        ;
                                        ;
007457      045 051105  047522  MES6:   .ASCII  /%ERROR SET OK-TURN ON LINE %/
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;
                                        ;LP11 SCOPE LOOP ROUTINE
                                        ;
                                        ;SET CHARACTER IN SWITCH REGISTER 5-0.
                                        ;

                007514                          .EVEN

1769  007514  004737  006566          SCOPE:  JSR     %7,SIZE
1770  007520  017737  171260  001046          MOV     @SWR,SAVE       ;FETCH SWITCHES
1771  007526  013737  001054  001022          MOV     SEGMNT,SEGCNT
1772  007534  013737  001052  001030          MOV     WIDTH,LINCNT
1773  007542  042737  177600  001046          BIC     #177600,SAVE    ;MASK CHARACTER
1774  007550  105777  171224          LOLPX:  TSTB    @LPS            ;TEST FOR READY
1775  007554  100375                          BPL     .-4             ;WAIT FOR READY
1776  007556  013777  001046  171216          MOV     SAVE,@LPB       ;LOAD PRINTER BUFFER
1777  007564  005777  171210                  TST     @LPS            ;TEST FOR ERROR
1778  007570  100006                          BPL     LPSCOPE         ;BRANCH IF NO ERROR
1779  007572                                  ERROR   \N
1780  007572  012737  000076  001050  ERR76:  MOV #76,        ERCOUNT          ;SET UP ERROR COUNT 76
1781          000077                          NOP+1
1782  007600  004537  007150                  JSR     %5,STAER        ;REPORT ERROR SET
1783  007604  000000                          HALT                    ;OPERATOR MUST TAKE ACTION
1784  007606  005237  001022          LPSCOPE:INC     SEGCNT
1785  007612  001356                          BNE     LOLPX
1786  007614  013737  001054  001022          MOV     SEGMNT,SEGCNT
1787  007622  005237  001030                  INC     LINCNT
1788  007626  001414                          BEQ     LOSCOP
1789  007630  032777  040000  171146          BIT     #BIT14,@SWR
1790  007636  001744                          BEQ     LOLPX
```

```
 1791  007640  022737  177777  001038          CMP     #-1,LINCNT
 1792  007646  001340                          BNE     LDLPX
 1793  007650  012737  177764  001022          MOV     #-12.,SEGCNT
 1794  007656  000734                          BR      LDLPX
 1795  007660  013737  001052  001038  LOSCOP: MOV     MIDTM,LINCNT
 1796  007666  012777  000012  171186          MOV     #12,@LPB
 1797  007674  105777  171180                  TSTB    @LPS            ;TEST FOR READY
 1798  007700  100375                          BPL     .-4             ;WAIT FOR READY
 1799  007702  017737  171076  007150  SRCHAN: MOV     @#WR,ACNVX      ;
 1800  007710  042737  177600  007150          BIC     #177600,ACNVX
 1801  007716  023737  007150  001046          CMP     ACNVX,SAVE      ;HAS SR CHANGED
 1802  007724  001273                          BNE     SCOPE           ;NEW SR
 1803  007726  000674                          BR      SCOPE+4         ;SR HAS NOT CHANGED
 1804                                  ;
 1805                                  ;
 1806                                  ;
 1807                                  ;
 1808                                  ;
 1809                                  ;
 1810          000001                          .END
```

```
ACNVX   007150          1729#   1733    1738#   1748#   1742#   1747#   1799#   1808#   1801
ACVN    007102          1733#   1744
BIT0  = 000001           554#
BIT1  = 000002           553#
BIT10 = 002000           544#
BIT11 = 004000           543#
BIT12 = 010000           542#    929     1061    1158    1242    1347    1481    1562    1595
BIT13 = 020000           541#    953     1175    1258    1306
BIT14 = 040000           540#    574     737     912     986     1078    1195    1296    1367    1416    1438    1483    1519
                        1537    1572    1642    1789
BIT15 = 100000           539#
BIT2  = 000004           552#
BIT3  = 000010           551#
BIT4  = 000020           550#
BIT5  = 000040           549#
BIT6  = 000100           548#
BIT7  = 000200           547#
BIT8  = 000400           546#
BIT9  = 001000           545#
CHARBW  002414           888#    896     897#    936#    942#
CHRCNT  001024           631#    964#    1082#   1013#   1014#   1015#   1016#   1036#   1177#   1179#   1239#   1265#   1277#
                        1308#   1310#
CHRGEN  001026           632#    963#    973     1081#   1025    1038#   1039#   1048    1042    1044    1181#   1189    1238#
                        1264#   1273    1276#   1305#   1365#   1382    1437
COLBB   006614          1643    1647#
CONV    007078          1729#   1756
CYCCNT  001032           634#    885#    926#    955#    959#    1058#   1093#   1119#   1121#   1144#   1418#   1488#   1479#
                        1498
CYCTBT  003722          1098#   1121    1143#   1144    1145    1165#
DISPLA  001006           689#    656#
DISPRE  000174           577#    656
ERCOUN  001050           641#    671#    679#    692#    702#    728#    738#    744#    751#    761#    775#    782#    787#
                         796#    807#    819#    847#    854#    862#    881#    892#    907#    923#    969#    988#    997#
                        1008#   1021#   1032#   1054#   1086#   1098#   1105#   1115#   1139#   1154#   1185#   1203#   1218#
                        1219#   1226#   1234#   1269#   1285#   1317#   1324#   1331#   1339#   1378#   1389#   1397#   1405#
                        1426#   1433#   1444#   1468#   1467#   1475#   1495#   1502#   1513#   1545#   1581#   1737    1788#
ERNO    001034           635#
ERRP    001156           671#
ERR1    001200           679#
ERR10   001470           761#
ERR11   001526           775#
ERR12   001550           782#
ERR13   001564           787#
ERR14   001616           796#
ERR15   001650           807#
ERR16   001702           819#
ERR17   001774           847#
ERR2    001244           692#
ERR20   002016           854#
ERR21   002050           862#
ERR22   002106           881#
ERR23   002160           892#
ERR24   002246           907#
ERR25   002340           923#
```

L3

```
ERR26   002542             9690
ERR27   002606             9880
ERR3    001274             7020
ERR30   002704             9970
ERR31   002746            10080
ERR32   003022            10210
ERR33   003066            10320
ERR34   003170            10540
ERR35   003306            10860
ERR36   003366            10980
ERR37   003410            11050
ERR4    001326             7200
ERR40   003452            11150
ERR41   003600            11390
ERR42   003664            11540
ERR43   004014            11850
ERR44   004114            12030
ERR45   004144            12120
ERR46   004166            12190
ERR47   004210            12260
ERR5    001352             7300
ERR50   004240            12340
ERR51   004416            12690
ERR52   004504            12850
ERR53   004670            13170
ERR54   004712            13240
ERR55   004734            13310
ERR56   004764            13390
ERR57   005142            13780
ERR6    001416             7440
ERR60   005206            13890
ERR61   005234            13970
ERR62   005264            14050
ERR63   005376            14260
ERR64   005420            14330
ERR65   005464            14440
ERR66   005552            14680
ERR67   005574            14670
ERR7    001440             7510
ERR70   005624            14750
ERR71   005732            14950
ERR72   005754            15020
ERR73   006020            15130
ERR74   006152            15450
ERR75   006324            15810
ERR76   007572            17000
FFCNT1  006562            1625*   1629*   1631*   1639*
FFCNT2  006564            1624*   1632*   16400
FFRDY   006516            16260   1630    1633
FFTIML  006560            1625    1631    16380
FFTIMU  006556            1624    16370
FORMP   003300            1001    10030
FRFTIM  006502            1151    16240
MAMALN  006110             591    1482    15360   1563
```

1M3

```
MAMCNT  000252          1536#   1559#   1565#
MAM1    000136          1538    1541#
MAM1X   000116          1537#   1561
MAM2    000144          1540    1542#   1593
MED1    007210          1758    1763    1768#
MED1A   007206          1761    1768#
INCCY   003466          1113    1119#
INCBLN  000440          1594    1598    1604#
INT1C   001740           778     832#
INT1D   002064           842     869#
LOCM    003036          1819    1825#
LOLPX   007550          1774#   1785    1790    1792    1798
LEGCHR  003236           957#    961#    964    1014    1067#
LINCNT  001030           633#    886#    918#    914     918#    962#    984#    988     992#    1100#   1193#   1197    1200#
                        1255#   1294#   1298    1302#   1374#   1422#   1448#   1452    1456#   1517#   1521    1539#   1541#
                        1552#   1574#   1576#   1585#   1772#   1787#   1791    1795#
LINFLG  005040          1257#   1279    1303#   1312#   1355#
LINPT   004106          1196    1198    1200#
LOCA    001040          637#
LOGICA  006424           572    1599#
LOSCOP  007660          1708    1795#
LPB     001002           6P3#    687#    688#    740#    899#    919#    973#    993#    1004#   1025#   1050#   1100#   1125#
                        1131#   1135#   1150#   1189#   1230#   1273#   1335#   1382#   1401#   1437#   1471#   1506#   1551#
                        1556#   1577#   1588#   1479#   1776#   1796#
LPB     001000          5998    668     676     689     699     717     727     741     748     756     772     779     790#
                         792#    799#    801#    810#    812#    822#    824#    844     851     859#    870#    889     966
                        1018    1095    1102    1126    1102    1216    1223    1266    1321    1328    1375    1394    1423
                        1430    1457    1464    1492    1499    1542    1549    1554    1557    1570    1583    1589    1626
                        1659    1661    1675    1680    1604    1774    1777    1797
LPBCOP  007606          1778    1784#
LPS7    004270          1240    1242#
LPT7X   003612          1137    1143#
LP1     001432           742    1488    759
LP2     001454           749    1568
LP2B    002174           898    8968
LP2BX   003204          1052    1058#
LP2C    002462           954    9598
LP2E    002556           967    9738
LP2F    002620           978    9838
LP2H    002762          1006    1012#
LP3     001542           773    7798
LP3X    001564           788    7868
LP4     002010           845    8518
LP5     002032           852    8588
LP5A    002260           905    9108
LP5B    002352           921    9268
ME81    007230           662    1768#
ME82    007276           664    1768#
ME83    007323           666    1768#
ME84    007352           684    1768#
ME85    007414           697    1768#
ME86    007457           707    1768#
N     * 000077          6178    678     6728    678     6888    691     6938    701     7038    719     7218    729     7318
                         743    7458    750     7528    760     7628    774     7768    781     7838    786     7888    798
```

```
                        797#    806     808#    818     820#    846     848#    853     859#    861     863#    880     8880
                        891     893#    906     908#    922     924#    968     978#    979     981#    996     9980    1007
                       1009#   1020    1022#   1031    1033#   1053    1059#   1085    1087#   1097    1099#   1104    11060
                       1114    1116#   1138    1140#   1153    1155#   1184    1186#   1202    1204#   1211    1213#   1218
                       1220#   1225    1227#   1233    1235#   1268    1270#   1284    1286#   1316    1318#   1323    13250
                       1338    1332#   1338    1340#   1377    1379#   1388    1390#   1396    1398#   1404    1406#   1425
                       1427#   1432    1434#   1443    1445#   1459    1461#   1466    1468#   1474    1476#   1494    14960
                       1501    1503#   1512    1514#   1544    1546#   1588    1582#   1779    1781#
NOCHRS  003234          956#    960#    983     1066#
NOP   = 000240          616#
NTRDY   006736         1681    1684#
PC    =%000007          536#
PWFLG   003724         1091#   1122    1123#   1133#   1166#
PITHL   006672         1668    1665#
PRTINT  006700          878    1003    1675#
PRTTM   006632          904     977    1029    1112    1208    1209    1282    1314    1386    1441    1518    1656#
PS      001010         6188    789#    798#    809#    821#    858#
PTIHL   006676         1662    1666#
PTIHU   006650         1657    1659#   1664
RCHRSW  002420          936     944#
RDYCK   006714         1676    1679#
REFIL   002662          985     992#
ROTATE  004304          589    1253#
ROT1    004410         1266#   1283    1352    1354
ROT10   004610         1278    1305#
ROT11   004376         1264#   1346
ROT11Z  004432         1267    1273#
ROT2    004470         1281#   1353
ROT3    004340         1258#   1349
ROT4    004466         1279#   1311
ROT5    004464         1288#   1355    1357
ROT6    004646         1312#   1356
ROT6X   004704         1315    1321#
ROT6X1  004726         1322    1328#
ROT6X2  004750         1329    1335#
ROT6X3  005000         1337    1343#
ROT7    004360         1259    1262#
ROT8    004520         1275    1292#
ROT8X   004572         1295    1302#
ROT9    004446         1276#   1297    1299    1301    1304
RSLNFL  005044         1257    1312    1357#
RSSBFL  005036         1256    1281    1313    1354#
SAVE    001046          648#    898#    899     937#   1778#   1773#   1776    1881
SCHRSW  002416          888     897     943#
SCOPE   007514          593    1769#   1802    1803
SEGCNT  001022          638#    887#    908#    913#    916#    965#    974#    976#    998#   1012#   1026#   1028#   1094#
                       1109#   1111#   1174#   1190#   1192#   1199#   1254#   1274#   1292#   1308#   1373#   1383#   1385#
                       1409#   1421#   1438#   1448#   1454#   1484#   1507#   1509#   1523#   1771#   1784#   1786#   1793#
SEGFLG  005032         1256#   1288    1281#   1293#   1313#   1352#
SEGMNT  001054          643#    887     903     965     976    1012    1028    1094    1111    1174    1192    1894    1202
                       1373    1385    1409    1421    1448    1484    1509    1644#   1647#   1771    1786
SETUP   001056          582     648#
SIZE    006566          877     952    1076    1173    1253    1366    1642#   1769
SLEW    006354         1588#   1592
```

```
SLWCNT  006452          1587#   1591#   1689#
SLWTIM  006642           928     994    1005    1051    1136    1231    1336    1402    1472    1658#
SLWTST  006254           592    1571#   1596
SLWI    006310          1573    1575    1577#   1584    1586
SLWIX   006262          1572#   1605
SNBCMR  003732           588    1161    1173#   1244
SP    =%000006          537#    649#    650#    657     659     668
SPCFLG  003726          1092#   1107    1124#   1134#   1167#
SRCMAN  007702          1799#
STAER   007152           673     681     694     704     722     732     746     753     763     777     784     833     849
                         856     864     883     894     909     925     971     982     999    1010    1023    1034    1056
                        1088    1108    1117    1141    1156    1187    1205    1214    1221    1228    1236    1271    1287
                        1319    1326    1333    1341    1388    1391    1399    1407    1428    1435    1446    1462    1469
                        1477    1497    1504    1515    1547    1756#   1782
STLNFL  005042          1303    1356#
STP1    001150           668#    674
STP2    001172           669     676#    682
STP3    001214           677     683#
STP4    001222           686#    695
STP5    001260           698     696#
STP6    001266           699#    705
STP7    001310           708     706#
STRCMR  005046          1263#   1264    1343#   1358#
STRCNT  005050          1260#   1262#   1265    1344#   1359#
STSBFL  005034          1293    1353#
SWR     001004           608#    652     655#    737     912     929     953     986    1061    1078    1158    1175    1195
                        1242    1258    1296    1386    1347    1367    1416    1458    1481    1485    1519    1537    1562
                        1572    1595    1642    1764    1778    1789    1799
SWREG   000176           578#    655
S1      004006          1182#   1191    1201    1241
S2      003764          1176    1179#
S4      004138          1194    1208#
S4X     004168          1218    1216#
S4X1    004202          1217    1223#
S4X2    004224          1224    1230#
S7      004254          1232    1238#
TABEND  006508          1593    1620#
TABSTR  006454          1571    1618#
TBPTR   006458          1571#   1587    1593    1688#   1688#
TEST1   001316           594     716#    723    1683
TEST1A  001342           718     726#    733
TEST1B  001366           728     737#    747     754     764
TEST1C  001504           738     757     774#    778     785     834
TEST1D  001752           825     842#    858     857     865
TEST2A  002074           585     877#    938
TEST2B  002422           586     931     952#    1063
TEST3   003240           587    1864    1876#    1168
TKB     001014          6128
TKS     001020          6148
TPB     001012          6118    1709#
TPS     001016          6138    1718
TSTNO   001036          6368
TSTSW   001042          6388
TST2AX  002122           879     885#
```

C4

```
T8T6    005052            598    1348    1365#   1483
TYP     006746            567    1695#
TYPA    006756           1699#   1708    1717
TYPC    006774           1701    1703#
TYPD    007022           1707    1709#   1714    1716
TYPDAT  007066           1699*   1708    1703    1705    1709    1713*   1715*   1718#
TYPF    007040           1704    1713#
TYPS    007052           1706    1715#
T1      003360           1695#   1110    1120    1128    1147
T1A     002200            897#    944
T1X     003416           1103    1107#
T2A     002374            936#    943
T2S0    002504            958     962#    1060
T2S1    002534           966#    1003
T2S2    002720            960     975     987     989     991     995     1001#
T2S3    003014           1018#   1046
T2S4    003102           1027    1030    1036#   1041    1043    1045
T2S5    003154           1037    1050#
T2S7    002624            956     984#
T3A     002152            889#    902     913     915     917     928
T3NCNT  003720           1077*   1148*   1164#
T4      003540           1124    1131#
T5      003422           1092    1100#   1134
T5A     002214            899#    938
T5X     003430           1109#   1132
T6LNCT  006102           1372*   1392*   1412*   1527#
T6LNLB  006106           1369*   1371*   1372    1410*   1412    1529#
T6PT2   005326           1411    1416#
T6SPCT  006104           1407*   1409*   1498*   1524*   1528#
T61     005134           1375#   1393    1413
T61Z    005156           1376    1382#
T6S     005220           1384    1387    1392#
T6SX    005250           1395    1401#
T6SZ    005300           1403    1409#
T66     005370           1423#   1439    1451    1453    1455    1526
T66X    005412           1424    1438#
T66Z    005434           1431    1437#
T66Z1   005500           1442    1448#
T66Z1X  005536           1449    1456#
T68     006034           1511    1517#
T68X    006070           1508    1520    1522    1524#
T68Z    006076           1518    1526#
T69     005724           1492#   1525
T69X    005746           1493    1499#
T69Z    005770           1500    1506#
T7      003550           1123    1133#
T78     005566           1458    1464#
T78X    005610           1465    1471#
T71     005640           1473    1479#
T72     005662           1480    1484#
T72X    005710           1486    1489#
T8      003506           1091    1123#   1133
T9      003322           1084    1090#   1149
WIDTH   001052            642#    886     918     962     992     1180    1208    1255    1302    1374    1422    1456    1645#
```

DH

DZLPAB.SRC CROSS REFERENCE TABLE

```
                        1648*   1772    1795
WORK    001044           639*    739*    758*   1145*   1146*   1656*   1658*   1663*
XHAM1   006166          1543    1549*
XHAM1X  006174          1551*
XLINF   002316           911     918*
XLPX2   003700          1152    1158*
XN      003716          1077    1163*
XSLW1   006332          1579    1583*
XS1X    004030          1183    1189*
XY1A    003402          1096    1102*
X66X    005104          1368    1371*
X88X    005346          1417    1419    1428*
ZCOUNT  003730          1088*   1082*   1146    1168*
Z88Z    003272          1079    1082*
.     = 007730           559*    566*    569*    571*    573*    576*    588*    583*    595*    981     927     1059    1062
                        1127    1159    1178    1243    1261    1387    1389    1345    1378    1408    1550    1555    1558
                        1564    1598    1627    1685    1711    1765    1768*   1775    1798
```

DZLPAB.SRC CROSS REFERENCE TABLE

ERROR 6210 670 678 691 701 719 729 743 750 760 774 781 786 795 806
818 846 853 861 880 891 906 922 968 979 996 1007 1020 1031 1053
1085 1097 1104 1114 1138 1153 1184 1202 1211 1218 1225 1233 1268 1284 1316
1323 1330 1338 1377 1388 1396 1404 1425 1432 1443 1459 1466 1474 1494 1501
1512 1544 1588 1779

DZLPAB.SRC CROSS REFERENCE TABLE

```
ADD     1014  1146  1490  1604  1634  1665  1677  1682  1696  1732  1735
BEQ      981   911   913   927   954   985   987  1037  1041  1043  1045  1059  1062  1079  1159
        1176  1194  1196  1240  1243  1259  1275  1278  1295  1297  1307  1345  1348  1368  1411
        1417  1449  1451  1482  1486  1518  1520  1538  1573  1598  1643  1704  1706  1708  1790
BIC      792   881   812   824   870  1039  1734  1773  1800
BIB      790   799   818   822   859
BIT      737   912   929   953   986  1061  1078  1150  1175  1195  1242  1250  1296  1306  1347
        1367  1416  1450  1481  1485  1519  1537  1562  1572  1595  1642  1789
BMI      677   690   700   720   757   780   852  1103  1224  1329  1431  1465  1500  1660  1662
        1676
BNE      730   759   915   930   975   989  1003  1027  1110  1120  1147  1149  1191  1198  1299
        1304  1393  1439  1453  1488  1508  1522  1525  1553  1561  1563  1586  1592  1594  1596
        1630  1633  1664  1701  1744  1785  1792  1802
BPL      669   710   742   749   773   845   890   967  1019  1096  1127  1183  1217  1267  1322
        1376  1395  1424  1458  1493  1543  1550  1555  1558  1579  1584  1590  1627  1681  1685
        1711  1765  1775  1778  1790
BR       653   674   682   695   705   723   733   747   754   764   770   785   850   857   865
         879   902   905   917   921   928   931   950   970   991   995  1006  1030  1046  1052
        1064  1081  1084  1113  1128  1132  1137  1152  1161  1170  1201  1210  1232  1241  1261
        1283  1301  1304  1309  1311  1315  1337  1370  1387  1403  1419  1442  1455  1473  1480
        1511  1540  1564  1575  1605  1657  1700  1717  1794  1803
CLC     1737  1739  1741
CLR      739
CMP      657   832   869   914   988  1040  1042  1044  1197  1298  1452  1521  1593  1791  1881
CMPB    1700  1703  1705
COM     1015
DEC     1143  1524  1743
EMT      661   663   665   683   696   706  1760  1762
HALT     566   667   685   698   708   884   895   972  1000  1011  1024  1035  1057  1089  1101
        1110  1157  1180  1206  1215  1222  1229  1237  1272  1288  1320  1327  1334  1342  1381
        1400  1408  1429  1436  1447  1463  1470  1478  1498  1505  1516  1540  1766  1783
INC      750   900   910   926   974   984  1001  1002  1016  1026  1036  1038  1050  1109  1119
        1140  1190  1193  1230  1239  1274  1276  1277  1294  1343  1344  1383  1392  1410  1430
        1440  1479  1507  1517  1552  1559  1505  1591  1629  1632  1663  1704  1707
JMP      582   585   586   587   588   589   590   591   592   593   594   625   634   696   930
         983  1060  1063  1107  1122  1160  1244  1279  1200  1346  1349  1413  1403  1526  1603
JSR      673   681   694   704   722   732   746   753   763   777   784   833   849   856   864
         877   878   883   894   904   909   920   925   952   971   977   902   994   999  1005
        1010  1023  1029  1034  1051  1056  1076  1083  1088  1100  1112  1117  1136  1141  1151
        1156  1173  1187  1200  1205  1209  1214  1221  1228  1231  1236  1253  1271  1282  1287
        1314  1319  1326  1333  1336  1341  1366  1380  1386  1391  1399  1402  1407  1428  1435
        1441  1446  1462  1469  1472  1477  1497  1504  1510  1515  1547  1599  1707  1714  1716
        1756  1769  1782
MOV      581   584   649   650   651   655   656   659   660   671   679   687   688   692   702
         720   730   740   744   751   761   770   771   775   782   787   789   796   798   807
         809   819   821   842   843   847   854   858   862   881   885   886   887   888   892
         897   898   899   903   907   916   918   919   923   936   937   955   956   957   980
         960   961   962   963   964   965   969   973   976   980   990   992   993   997  1004
        1008  1012  1013  1021  1025  1028  1032  1050  1054  1077  1080  1002  1006  1090  1091
        1092  1093  1094  1098  1105  1108  1111  1115  1121  1123  1124  1125  1131  1133  1134
        1135  1139  1144  1145  1150  1154  1174  1177  1179  1180  1181  1185  1189  1192  1199
        1203  1208  1212  1219  1226  1230  1234  1254  1255  1256  1257  1260  1262  1263  1264
        1265  1269  1273  1281  1285  1292  1293  1300  1302  1303  1305  1308  1310  1312  1313
        1317  1324  1331  1335  1339  1365  1369  1371  1372  1373  1374  1378  1382  1385  1389
```

DZLPAB.SRC CROSS REFERENCE TABLE

```
            1397    1401    1405    1409    1412    1418    1420    1421    1422    1426    1433    1437    1440    1444    1454
            1456    1460    1467    1471    1475    1484    1487    1489    1495    1502    1506    1509    1513    1523    1536
            1539    1541    1545    1551    1556    1571    1574    1576    1577    1581    1587    1588    1597    1624    1685
            1631    1644    1645    1647    1648    1656    1658    1679    1695    1697    1729    1730    1731    1733    1770
            1771    1772    1776    1780    1786    1793    1795    1796    1799
MOVB        1699    1709    1713    1715    1736
NOP          791     808     811     823     868    1600    1601    1602
RESET        648     716     726
ROR         1738    1740    1742
RTI         1782
RTS         1628    1635    1646    1649    1666    1678    1683    1686    1712    1745    1767
TST          652     668     689     699     717     748     772     844     889     966    1818    1895    1102    1216    1266
            1321    1375    1394    1423    1457    1492    1542    1578    1659    1764    1777
TSTB         676     727     741     756     779     851    1102    1126    1223    1328    1430    1464    1499    1540    1554
            1557    1583    1589    1626    1661    1675    1680    1684    1710    1774    1797
.ASCII      1768
.ENABL       529     530
.END        1810
.EVEN       1768
.LIST        566    1768
.MACR        621
.NLIST       566    1768
.PAGE        511
.REPT          1     566
```

```
 ERRORS DETECTED:  0

*DZLPAR,DZLPAB_DZLPAB.SRC/CRF/SOL
RUN-TIME:  0 15 2 SECONDS
CORE USED:  12K
```