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BOLT PRINTER

**PRODUCT SPECIFICATION**

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COMPANY CONFIDENTIAL  
 81000 BOLT LINE PRINTER TEST  
 P.S. 2228 3613 (A)

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**RELATED DOCUMENTS**

<u>Part Number</u>	<u>Part Name</u>
P.S. 2228 3543	31000 BOLT Executive
P.S. 2204 8623	31700/31800 I/O Bus Subsystem
P.S. 2208 3018	31700 Printer Controls

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## DATA TRANSFER

For Printer Controls 2 through 7 data is transferred between the system and the control in an 8-Bit parallel fashion according to the discipline described in P.S. 2204 8623 (B1700/B1800 IO Bus Subsystem).

A Control provides one (1) buffer capable of holding 132 bytes of data. If fewer bytes of data are required by the Printer, the control will terminate the data transfer from the system by switching states to receive the last byte it requires. If fewer than the required bytes of data are transferred to the control from the system, the control will assume all remaining untransferred data to be blanks.

Printer Controls 2/5/6 transfer paper motion information to the Printer and return a result as soon as all non-blank graphics have been printed.

Printer Control 3 transfers paper motion information to the Printer and returns a result as soon as all graphic codes have been transferred to the Printer and before printing has been completed.

Printer Controls 4/7 transfer paper motion information to the Printer and return a result after all graphics have been printed.

In all cases, the buffer in the Printer Control as well as the buffer in a Buffered Printer can be loaded while paper motion is occurring due to a prior operation.

## TRANSLATION

Character translation is discussed in detail in the Printer Controls Product Specification, part number P.S. 2208 3018. Details of the translation process for each Printer Control are given on pages 5 to 15, inclusive, of that document.

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## SPECIAL REQUIREMENTS

Before running any On-Line Line Printer Test Section, the operator should be familiar with the following special requirements of some of the test sections.

## FORMAT TAPE

Some Line Printer Test Sections assume a Printer Format Tape for six (6) lines per inch, formed into an eleven (11) inch loop. Such a Format Tape will print sixty-six (66) lines per page. Given below are all the valid Channel Numbers and the line numbers which should be punched for each Channel.

Channel #1	--	Punch In Line Number 4	(top of form)
Channel #2	--	Punch In Line Number 12	
Channel #3	--	Punch In Line Number 16	
Channel #4	--	Punch In Line Number 20	
Channel #5	--	Punch In Line Number 24	
Channel #6	--	Punch In Line Number 28	
Channel #7	--	Punch In Line Number 32	
Channel #8	--	Punch In Line Number 36	
Channel #9	--	Punch In Line Number 40	
Channel #10	--	Punch In Line Number 44	
Channel #11	--	Punch In Line Number 48	
Channel #12	--	Punch In Line Number 63	(bottom of form)

It should be noted that Channel #12 is not valid for the 1500 Line Per Minute Printer, which can be found on Printer Control 5. Nor is it valid for Printer Controls 4 and 7.

The test sections assuming the Format Tape just described are listed below by section number. No guarantee is given as to the result of running these test sections with a different Format Tape than the one specified.

Section #5: Verify Channels Test

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#### WHEN TO SELECT A CONTROL

To execute any test section which issues one or more Diagnostic IO descriptors, a CONTROL must first be selected. See the BOLT UNIT command for details on selecting a Control. All Optional Diagnostic Test Sections require that the CONTROL be selected.

Some Diagnostic test sections can only be run on a particular Printer Control. In such a case, the required Control must have been selected or the test section will be aborted. For example, section 55 (Simulate Test) can only be run on a Printer Control 7.

#### OPERATOR INTERVENTION WITH TEST SECTIONS

For those test sections requiring operator intervention, it is always assumed that the operator has done what is asked. For example, if a request is made to have the operator READY the selected Printer, the test section will assume that the Printer is indeed READY when it is continued. To continue a test section, one enters the "GO" command.

#### SEPARATING TEST SECTION OUTPUT

A SPACE/SKIP op (A1 00 0U, Skip To Channel 1) is issued at the beginning of all test sections which actually print data. This is done to separate the output of the test section being run from that of any test section run previously.

#### AN ASSUMPTION FOR PRINTER CONTROL 2

Printer Control 2 has a Soft Translator. Since no On-Line Test Section has any affect on the PC2 Translator Memory, each section makes the assumption that it is "loaded". Should some result descriptor indicate "TRANSLATOR UNLOADED", the operator should issue the "LT" MCP command to reload the Translator Memory.

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```
UNIT LPA; GO;
BEGINNING OF TEST FOR UNIT LPA
  LPA: BEGIN SECTION #1: ALPHANUMERIC RIPPLE TEST.
  LPA: END   SECTION #1: ALPHANUMERIC RIPPLE TEST.
  LPA: BEGIN SECTION #2: END ADDRESS TEST.
  LPA: END   SECTION #2: END ADDRESS TEST.
  LPA: BEGIN SECTION #3: BROADSIDE TEST.
  LPA: END   SECTION #3: BROADSIDE TEST.
  LPA: BEGIN SECTION #4: NO PAPER ADVANCE TEST.
  LPA: END   SECTION #4: NO PAPER ADVANCE TEST.
  LPA: BEGIN SECTION #5: VERIFY CHANNELS TEST.
  LPA: END   SECTION #5: VERIFY CHANNELS TEST.
  LPA: BEGIN SECTION #6: FASTEST PATTERN TEST.
  LPA: END   SECTION #6: FASTEST PATTERN TEST.
  LPA: BEGIN SECTION #7: SINGLE SPACE WRITE TEST.
  LPA: END   SECTION #7: SINGLE SPACE WRITE TEST.
  LPA: BEGIN SECTION #8: DOUBLE SPACE WRITE TEST.
  LPA: END   SECTION #8: DOUBLE SPACE WRITE TEST.
END OF TEST ON UNIT LPA -- 0 ERROR(S) REPORTED.
```

**FIGURE 1: EXAMPLE DEFAULT CONFIDENCE TEST SECTION OUTPUT**

This figure gives an example of what output the operator might see if the Default Confidence Test Sections were run on LPA. The indentation is for readability and this example only. Assumptions are that no errors are detected and the BOLT display options are enabled.

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```

UNIT LPA; GO;
BEGINNING OF TEST FOR UNIT LPA
  LPA: BEGIN SECTION #1: ALPHANUMERIC RIPPLE TEST.
  LPA: END   SECTION #1: ALPHANUMERIC RIPPLE TEST.
  LPA: BEGIN SECTION #2: END ADDRESS TEST.
    LPA: SEC #2: ERR #1: SKIP TO NEW PAGE BEFORE TEST FAILED.
    THE OP CODE ISSUED WAS:  A10000
    ID RESULT STATUS FIELD:  E00080
    THE FOLLOWING STATUS BITS ARE ON:
      RS BIT  1:  OPERATION COMPLETE
      RS BIT  2:  EXCEPTION
      RS BIT  3:  DEVICE NOT READY
      RS BIT 17:  OPERATION COMPLETE
    THE DEVICE WENT NOT READY DURING A TEST WHICH NEEDS IT READY.
    PLEASE MAKE THE LINE PRINTER READY.  THEN ENTER "GO".
GO
  LPA: END   SECTION #2: END ADDRESS TEST
    1 SECTION ERROR(S) REPORTED.
  LPA: BEGIN SECTION  3: BROADSIDE TEST.
  LPA: END   SECTION  3: BROADSIDE TEST.
  LPA: BEGIN SECTION  4: NO PAPER ADVANCE TEST.
  LPA: END   SECTION  4: NO PAPER ADVANCE TEST.
      :
      :
      :
END OF TEST ON UNIT LPA -- 1 ERROR(S) REPORTED.
  
```

FIGURE 2: EXAMPLE OUTPUT WHEN ERRORS ARE DETECTED

This figure gives an example of what output the operator might see if the Default Confidence Test Sections were run on LPA and the Line Printer were to go not ready just prior to the execution of test section #2. The indentation is for readability and this example. Assumptions are that the BOLT display options are enabled.

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## RUNNING OPTIONAL TEST SECTIONS

To run any Optional Test Section (Confidence or Diagnostic) the operator must select the section with the BOLT SECTION command. For example, input to select Optional Confidence Test Section #27 (Skip To Not Ready Printer) would be:

```
UNIT LPC;
SECTION 27;
```

This optional test requires that the device be Not Ready. When the GO command is entered the operator will see the following:

```
PLEASE MAKE THE LINE PRINTER NOT READY. THEN ENTER "GO".
```

At this time the operator should Not Ready the device, then enter the GO command. The section should run to completion.

Optional Diagnostic Test Sections are selected in the same manner as shown above. Recall, however, that all Diagnostic Test sections require that the Control be selected. Thus, to select and run Optional Diagnostic Sections 50 and 51 one enters the following:

```
UNIT CONTROL LPB;
SECTION 50, 51;
GO;
```

## LOGICAL COMMANDS

BOLT provides a means for the immediate execution of basic operations to each device using minimum operator input. This is accomplished with a set of logical commands. Logical commands use the zero (0) PCAP MODE IO descriptor; therefore, descriptor fields may be set by using the appropriate BOLT commands. Logical Commands cause an immediate action, implying that all descriptor fields must be changed before the logical command is issued (if the operator so desires). The result descriptor of any Logical IO may be viewed by entering the "DISPLAY DESC IO1" command. The list of valid logical commands for the Line Printer are shown below.

```
TES  -- 280000U2
        Send a TEST op to the selected Printer.

WRI  -- 240000U2
        Send a WRITE op to the selected Printer.
```

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## PRINTER OPERATIONS

The operation code (op code), variant bits, and unit number are contained in a 24-bit op field. The leftmost three bits of the field are used to designate the operation to be performed. The remaining bits are used to specify different variations of the operation designated. The Printer operation codes and a brief description of each are given below. All bits unassigned are reserved and are subject to assignment (an unassigned bit appears as a dot "." in the op code field). Until assigned, reserved bits should be left as zeros.

### WRITE

The WRITE op code has the following format:

```

-----
| 010V  SSSS  DDDP  ....  ..T.  UUUU  |
-----

```

Write data to the Printer. The Control will accept up to 132 columns of data, column one first. If fewer bytes of data are required by the Printer, the Control will terminate the data transfer from the system. If the system transfers fewer bytes than the Printer requires, the Control will supply trailing blanks.

SSSS = 0000	No paper advance	
0001	Skip to Channel 1 after printing	(top)
0010	Skip to Channel 2 after printing	
.		
.		
1010	Skip to Channel 10 after printing	
1011	Skip to Channel 11 after printing	
1100	Skip to Channel 12 after printing	(bottom)
	(valid only with PC 2/5/5)	
1101	Skip to first line of the form	
	(valid for 1500 LPM Printer only (PC 5))	
1110	Single Space after printing	
1111	Double Space after printing	

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### SPACE-SKIP

The SPACE-SKIP op code has the following format:

```

-----
| 101V  SSSS  DDDP  ....  ..T.  UUUU  |
-----

```

This op says to Space, or Skip, as specified by the SSSS variants in the 24-Bit op code field. Refer to the WRITE op for variant settings and meanings. Also see NOTES for the WRITE op.

T       = 0           Normal Space-Skip  
          = 1           T is 1 if any of the D variants are 1.

UUUU =               Unit Number of the selected Printer.

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## TEST

The TEST op code has the following format:

```
-----
| 1 100V   ....  DDD.   ....  ..T.  UUUU  |
|-----|
```

Test the Printer and Printer Control for all of the following conditions and information:

- |    |                       |                           |
|----|-----------------------|---------------------------|
| 1. | Not Ready condition   | (All PC's)                |
| 2. | Print check condition | (PC 3)                    |
| 3. | End of page           | (not for PC 2/4/7 if V=1) |
| 4. | Character set         | (PC 2/5/6)                |
| 5. | Paper in Motion       | (PC 2/3)                  |
| 6. | Translator Unloaded   | (PC 2)                    |
| 7. | Printer type ID       | (PC 5/6)                  |
| 8. | Control ID            | (All PC's)                |

V = 0      If V=0, the result is returned immediately except in the case of PC 5/6. If the Printer is READY, PC 5/6 will turn the train motor on if necessary and obtain a valid train ID before returning a result. Note that the control retains the train ID even though the train motor stops, as long as the Printer remains READY.

V = 1      If V = 1, the result is delayed until the Printer is ready and paper motion has stopped. PC5/6 will turn the train motor on, if necessary, and obtain a valid ID before returning the result. PC 4/7 will turn the train motor off if it is on.

DDD =      (Applicable to PC 7 only)  
 See P.S. 2203 3013 (Printer Controls)

T = 0      Normal Test  
 = 1      If PC 7 and any D variant is 1.

UUUU =      Unit Number of the selected Printer.

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#### PRINT CHECK

BIT 4: Control 3 sets bit 4 if a Print Check error signal is true from the Printer. The Print Check error signal refers to the previous WRITE operation, not the present. The present operation is executed.

#### INVALID GRAPHIC POSITION

BIT 4: Controls 5 and 6 set bit 4 if a graphic position number greater than that present on the train is obtained as a result of data translation during a WRITE operation.

#### INVALID CODE

BIT 5: Control 2 sets bit 5 if an Invalid Code was detected in the data stream during a WRITE operation.

Control 5 sets bit 5 if a graphic position number 128 or greater is obtained as a result of data translation during a WRITE operation. The graphic printed will be the graphic denoted by the given position number minus 128 provided that position is present on the chain. If the resultant position is not present bit 4 will also be set.

Control 6 sets bit 5 if a graphic position number 192 or greater is obtained as a result of data translation during a WRITE operation. The graphic printed will be the graphic denoted by two bits from the Character Size Register concatenated with the lower six bits from the translator memory provided that position is present on the chain. If the resultant position is not present bit 4 will also be set.

\*\*\*\* RESERVED \*\*\*\*

BIT 6: Bit 6 of the result status field is reserved and should always be zero.

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### CHAIN SYNC ERROR

**BIT 3:** Bit 3 is reported on a WRITE operation if a Chain Sync Level (CSL) occurs and the Chain Position Counter (CPC) is not equal to one. The Chain Position Counter counts occurrences of Printer Column Strobe Levels (PCSL's) and is reset to one after passage of each complete character set. A count not equal to zero at CSL time indicates a loss of one or more PCSLs. Bit 3 has this meaning only for Printer Controls 5 and 6.

### CHARACTER SET IDENTIFICATION

**BITS 8 - 10:** Bits 8, 9, and 10 are returned on a TEST operation by PC 2 to indicate the character set switch position on the Printer. The present assignments are:

000	-	64 Character Set EBCDIC or BCL
001	-	48 Character Set EBCDIC
010	-	16 Character Set EBCDIC
011	-	96 Character Set TEXT
100	-	48 Character Set FORTRAN
101	-	48 Character Set B500
110	-	48 Character Set RPG
111	-	48 Character Set FORTRAN Non-Standard

**BITS 9 - 14:** Bits 9, 10, 11, 12, 13, and 14 are returned on a TEST operation by Printer Controls 5 and 6 to indicate the character set (train module) on the Printer. Presently only the 1100 and 1500 LPM Printers have the automatic ID feature. Assignments for the EBCDIC trains are given below. Translation for these character sets is given in the Printer Controls Product Specification number P.S. 2208 3013.

00 0000	=	Reserved for Printers without automatic ID
00 0001	=	18 Character Set
00 0100	=	48 Character Set
00 0101	=	72 Character Set
01 0000	=	96 Character Set

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### VALID RESULT BITS FOR EACH CONTROL

The tables below will explicitly show which result status bits are valid for each Control. Also shown is the operation for which a particular bit may be set. Any bit number which is not followed by a name will be zero for that Control. Bit 6 is "reserved" for each Printer Control, and will also be zero.

### PRINTER CONTROL 2

BIT NO.	MEANING	WRITE	SPACE	TEST	LOAD
1	Operation Complete	X	X	X	X
2	Exception Condition	X	X	X	
3	Not Ready	X	X	X	
4					
5	Invalid Code	X			
6					
7	End Of Page	X	X	X	
8 - 10	Character Set ID			X	
	000 - 64 Char EBCDIC or BCL				
	001 - 48 Char EBCDIC				
	010 - 16 Char EBCDIC				
	011 - 96 Char EBCDIC				
	100 - 48 Char FORTRAN (Standard)				
	101 - 48 Char B500				
	110 - 48 Char RPG				
	111 - 48 Char FORTRAN (Non-Standard)				
11					
12					
13	Paper In Motion			X	
14	Soft Translator Unloaded	X		X	
15					
16					
17	Operation Completed	X	X	X	X
18 - 24	Control Identification			X	
	001 0000				

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PRINTER CONTROLS 4 AND 7

BIT NO.	MEANING	WRITE	SPACE	TEST
1	Operation Complete	X	X	X
2	Exception Condition	X	X	X
3	Not Ready	X	X	X
4				
5				
6				
7	End Of Page	X	X	X
8				
9				
10				
11				
12				
13				
14				
15				
16				
17	Operation Completed	X	X	X
18 - 24	Control Identification			X
	001 0000 (PC 4)			
	000 0011 (PC 7)			

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## LINE PRINTER TEST INITIALIZATION PROCEDURES

### INITIALIZE/RESTORE PRINTER TEST

When the operator enters the BOLT "UNIT" command, selecting a Line Printer device, BOLT calls this special initialization procedure to do the following:

1. Put out welcoming messages to the operator
2. Try to open the SYSTEM/TRAINABLE file from which the Line Printer Test extracts translate table and character set information.
3. Issues a test op to the device to obtain the Printer Control ID, verifying that the ID is one that the Printer Test recognizes.
4. If the Test op completes without exception, and the SYSTEM/TRAINABLE is available, obtain the default character set to be used.

An example of the possible output from this initialization procedure can be seen in Figure 3 below.

Assume that the operator has previously entered the BOLT "UNIT" command selecting a Line Printer device (e.g. UNIT LPB). When the operator enters the BOLT "UNIT", "RESTART", or "BYE" command, the selected Printer device will be released back to MCP control. But first, the Line Printer Test must:

1. Make sure the soft translator memory is loaded on the Control if it is a PC 5/6.
2. Close the SYSTEM/TRAINABLE file.

An example of the output that one might see from this restoration process (assuming a PC 5/6 had been selected) can be seen in Figure 4 below.

It should be noted that this section of code is not something that the operator can select to run with the BOLT "SECTION" command. Its execution is BOLT controlled when a Line Printer device is selected and released.

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## INITIALIZATION ERRORS

Not all initialization errors are numbered, however the following errors can be reported by this section:

### SYSTEM/TRAINABLE NOT FOUND ON SYSTEM DISK

The Line Printer Test Routine needs the SYSTEM/TRAINABLE file for most of its test sections. It is from this file that translate table and character set information is extracted. The file was not found on system disk. There is a utility routine called "SYSTEM/BUILDTRAIN" which will build this information file. Build the SYSTEM/TRAINABLE file, then continue the execution of the Line Printer Test Routine.

### ERROR 70

During the Line Printer Test initialization process a TEST op 280000U2 is issued to the device to obtain the Printer Control id. The TEST op has failed or timed out. Unable to issue a successful TEST, the Line Printer Test aborts.

### CONTROL ID FOUND DOES NOT MATCH ANY KNOWN

The Line Printer Test has issued a TEST op 280000U3 to the device to obtain the Printer Control ID. The Control ID returned does not match any known to the Printer Test. The Printer Control is returning an incorrect ID, or it is one the Line Printer Test cannot exercise. The Line Printer Test aborts.

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### INITIALIZE PRINTER SECTION

The Initialize Printer Section routine is not a test section. It is called prior to the execution of any test section to check certain conditions, and take appropriate actions. The following are checked:

1. Does the test section to be require the SYSTEM/TRAINABLE file, and is it available.
2. Is it necessary to have the Control selected for the test section; if so, has the proper Control been selected ?
3. Is the test section to be executed length sensitive; if so, is the length (BOLT "LENGTH" command) value valid ?
4. Does the test section require a default data pattern and has one been selected (SYSTEM/TRAINABLE file).
5. Does the test section require that the Printer be ready initially ? If so, and if the Printer Control is a PC 5/6, then issue a dummy TEST op. The TEST op will clear any false not ready condition.

### SECTION INITIALIZATION ERRORS

The errors that can occur during the initialization of a test section are listed below. It should be noted that these error messages will be displayed before the 30J section message is displayed.

#### SYSTEM/TRAINABLE NOT FOUND ON SYSTEM DISK

The section being executed requires a default data pattern or a translate table must be extracted from the SYSTEM/TRAINABLE file. The file was not found on system disk, and the test section has been aborted. Use the BUILD/TRAINABLE utility program to build the information file then execute the test section again.

#### CONTROL MUST BE SELECTED FOR DIAGNOSTIC TEST SECTION

All Diagnostic test sections require that the Control be selected before they will execute (i.e. UNIT CONTROL LPB). Diagnostic sections are 50 through 61.

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## DEFAULT CONFIDENCE TEST SECTIONS

### Section #1 -- Alphanumeric Ripple Test

This test section consists of two parts. In Part One, a 120/132 character pattern is written to the selected Printer. Then the pattern is rotated one position to the left and printed again, using Single Space WRITE ops (4E 00 0U). This procedure is repeated approximately 150 times. Part Two of this test section is the same as Part One, except Double Space WRITE ops (4F 00 0U) are used when writing data.

DEFAULT DATA:	Printer and Control Dependent
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	A SPACE/SKIP op is issued between Part One and Part Two (A1 00 0U).
	When the End-Of-Page is detected a line is printed indicating so.

### ERROR 01

Before any output is produced by section 1 the paper is advanced to a new page. The SPACE/SKIP op 3A1000U3 was issued but failed, timed out, or completed with an exception condition.

### ERROR 02

In part one of section 1 approximately 150 Single Space WRITE ops (34E000U3) are issued, rippling the data pattern. One of these WRITE ops has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the I/O result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

### ERROR 03

When the End-Of-Page (EOP) is detected on a Single Space WRITE operation (34E000U3) a line will be printed with a message indicating so. The EOP message WRITE (35E000U3) op has failed, timed out, or completed with an exception condition.

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## Section #2 -- End Address Test

This test section prints a 120/132 character pattern to the selected Printer. The rightmost character is then eliminated from the pattern and it is printed again. This sequence of events is repeated until the pattern contains only one character and that character has been printed. Single Space WRITE ops (4E 00 00) are used when writing to the Printer.

DEFAULT DATA:	Printer and Control Dependent
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	Varying, 120/132 to 1
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	When the End-Of-Page is detected a line is printed indicating so.

### ERROR 01

Before any output is produced by section 2 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

### ERROR 02

Section 2 issues 132 Single Space WRITE ops (@4E000U@) to test the addressing capability of the Printer being tested. One of these WRITE ops has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the I/O result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

### ERROR 03

When the End-Of-Page (EOP) is detected on a Single Space WRITE operation (@4E000U@) a line will be printed with a message indicating so. The EOP message WRITE (@5E000U@) op has failed, timed out, or completed with an exception condition.

### ERROR 80, 85

See Initialize Printer Section.

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### Section #3 -- Broadside Test

Three lines, with the same character in every position, are written to the selected Printer (the first two lines are written with Single Space WRITE ops (4E 00 0U) and the third line is written using a Double Space WRITE op (4F 00 0U). The character is changed and the procedure is repeated until all the characters on the Printer Train have been printed.

DEFAULT DATA:	Printer and Control dependent
DATA SENSITIVE:	No
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	When the End-Of-Page is detected a line is printed indicating so.

#### ERROR 01

Before any output is produced by section 3 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

#### ERROR 02

Section 3 makes sure that each character in the Line Printers Character set can be printed (consistently). It does this by selecting the next character and printing a full line of it three times. The first line is printed with a Single Space WRITE op @4E000U@. The WRITE op has failed, timed out, or completed with an exception condition.

#### ERROR 03

When the End-Of-Page (EOP) is detected on the Single Space WRITE operation (@4E000U@) a line will be printed with a message indicating so. The EOP message WRITE (@5E000U@) op has failed, timed out, or completed with an exception condition.

#### ERROR 04

Section 3 makes sure that each character in the Line Printers Character set can be printed (consistently). It does this by selecting the next character and printing a full line of it three times. The second line is printed with a Single Space WRITE op @4E000U@. The WRITE op has failed, timed out, or completed with an exception condition.

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#### Section #4 -- No Paper Advance Test

This test section will test the Printer Control's ability to suppress the movement of paper after a print operation. A line with the single word "OVERPRINT" is written to the selected Printer with no paper advance (50 00 00, V=1). Then another WRITE op is issued to the printer, this time with two such words. This procedure is repeated, adding another word each time, until five (5) write ops have been issued. The net result is that the number of overprints per word will decrease from left to right on the printed line. That is, the first word "OVERPRINT" will have been overprinted 4 times, the second 3 times, and so on. The last "OVERPRINT" (rightmost) on the line will have been printed only once.

Should the Printer Character Set not support alphabetic characters, the word "OVERPRINT" will be replaced by the sequence of digits "123456789" to avoid the printing of invalid characters.

DEFAULT DATA:	As stated above
DATA SENSITIVE:	No
DEFAULT LENGTH:	Varying
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	The default data is Character Set dependent.

#### ERROR 01

Before any output is produced by section 4 the paper is advanced to a new page. The SPACE/SKIP op 3A1000U3 was issued but failed, timed out, or completed with an exception condition.

#### ERROR 02

Section 4 issues five NO ADVANCE WRITE ops (250000U3) to test the Printers ability to suppress paper motion. The first of the five NO ADVANCE WRITE ops has failed, timed out, or completed with an exception condition.

#### ERROR 03

Section 4 issues five NO ADVANCE WRITE ops (250000U3) to test the Printers ability to suppress paper motion. The second of the five NO ADVANCE WRITE ops has failed, timed out, or completed with an exception condition.

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## Section #5 -- Verify Channels Test

This section tests the Format Control Tape detection by skipping to all valid channels. Valid channels are 1 through 12. (for most Printer Controls). The information printed each time will be the words "SKIPPING TO CHANNEL" followed by the channel that is being skipped to. For example, "SKIPPING TO CHANNEL 1" would be the first output line from this test section. The Format Tape described earlier (see FORMAT TAPE) is assumed to be present for this test section. This test section will probably not run properly if a different Format Tape is used.

Should the Printer Character Set not support Alphabetic Characters, the words "SKIPPING TO CHANNEL" will be replaced by the number of the channel being skipped to. Thus, "SKIPPING TO CHANNEL 1" would be replaced by the string of digits "01010101010101010101". This is done to avoid the printing of invalid characters.

DEFAULT DATA:	As stated above
DATA SENSITIVE:	No
DEFAULT LENGTH:	22 Characters
LENGTH SENSITIVE:	Use the correct FORMAT TAPE.
WARNINGS:	None
NOTES:	Not all Channels are valid for all Controls. See the op code description.

The default data is Character Set dependent.

### ERROR 01

Before any output is produced by section 5 the paper is advanced to a new page. The SPACE/SKIP op 2A1000U2 was issued but failed, timed out, or completed with an exception condition.

### ERROR 02

Section 5 issues up to twelve (12) SPACE/SKIP ops, varying the SSSS variant of the op code field each time. One of these SPACE/SKIP ops has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

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## Section #6 -- Fastest Pattern Test

This test section prints a character pattern that causes the fastest paper motion possible on the selected Printer. Since the fastest character pattern is Printer Control and Printer dependent, character patterns may differ in this test section. Single Space WRITE ops (SE 00 00, V=1) are used when printing data. The RECORD command may be entered to vary the number of lines printed.

DEFAULT DATA:	Printer and Control dependent
DATA SENSITIVE:	No
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	Yes
DEFAULT RECORDS:	500
RECORDS SENSITIVE:	Yes
WARNINGS:	None
NOTES:	None

### ERROR 01

Before any output is produced by section 6 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

### ERROR 02

Section 6 issues 500 Single Space WRITE ops @SE000U@ (V=1, ignore EOP) by default, or the number specified in the BOLT "RECORDS" command. One of these writes has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

### ERROR 80, 85

See Initialize Printer Section.

### ERROR 90

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @S0000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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## Section #8 -- Double Space Write Test

This test section is designed to establish confidence in the double spacing ability of the selected Printer. Double Space WRITE ops (5F 00 0U, V=1) are issued to the Printer. The operator may vary the number of records written by entering the RECORD command.

DEFAULT DATA:	Printer and Control Dependent
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	Yes
DEFAULT RECORDS:	500
RECORDS SENSITIVE:	Yes
WARNINGS:	None
NOTES:	None

### ERROR 01

Before any output is produced by section 7 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

### ERROR 02

Section 8 issues 500 Double Space WRITE ops @5F000U@ (V=1, ignore EDP) by default, or the number specified in the BOLT "RECORDS" command. One of these writes has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

### ERROR 80, 85

See Initialize Printer Section.

### ERROR 90

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @30000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 85**

See Initialize Printer Section.

**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops 330000Ua are issued to the device to see if it is ready. A TEST oo has either failed or timed out.

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### Section #27 -- Test Op, Printer Not Ready

The operator is asked to NOT READY the selected Printer. A normal TEST op (80 00 00) is sent to the NOT READY device. The result descriptor is checked to make sure the NOT READY bit was flagged.

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

### ERROR 01

The operator is asked to make the Printer not ready, then a TEST op @800000@ is issued to the device. The TEST op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT READY result bits are expected to be on.

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### Section #29 -- Test and Wait For Ready

The operator is asked to NOT READY the selected Printer. A TEST AND WAIT FOR READY op (90 00 0U, V=1) is sent to the NOT READY device. The control should hang and the op should go to completion when the Printer is made ready. **The operator must Ready the Printer within 1 and 1/2 minutes.** Successful completion of the op satisfies the test. If the test hangs, a Control failure is presumed.

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be NOT READY or READY as requested.

Further testing can be done in the event of a failure if PC 7 is being tested. See test section 55.

### ERROR 01

The operator is asked to make the Printer not ready, then enter the GO command. TEST ops 280000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

### ERROR 02

Once the device is made not ready, a TEST/WAIT FOR READY op 290000U0 is issued to the device. (The operator is given 1 1/2 minutes to make the Printer ready again). The TEST/WAIT op has failed, timed out, or completed with an exception condition.

If the TEST/WAIT op timed out the operator should clear the device by making it ready. If ops continue to timeout to this device, power it off and then back on.

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#### ERROR 03

Once the device is made not ready a sequence of six invalid ops (a000000Ua, a111111Ua, a222222Ua, a333333Ua, aCCCCCUa, and aDDDDDUa) are issued. In this case, the a111111Ua op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

#### ERROR 04

Once the device is made not ready a sequence of six invalid ops (a000000Ua, a111111Ua, a222222Ua, a333333Ua, aCCCCCUa, and aDDDDDUa) are issued. In this case, the a222222Ua op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

#### ERROR 05

Once the device is made not ready a sequence of six invalid ops (a000000Ua, a111111Ua, a222222Ua, a333333Ua, aCCCCCUa, and aDDDDDUa) are issued. In this case, the a333333Ua op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

#### ERROR 06

Once the device is made not ready a sequence of six invalid ops (a000000Ua, a111111Ua, a222222Ua, a333333Ua, aCCCCCUa, and aDDDDDUa) are issued. In this case, the aCCCCCUa op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

#### ERROR 07

Once the device is made not ready a sequence of six invalid ops (a000000Ua, a111111Ua, a222222Ua, a333333Ua, aCCCCCUa, and aDDDDDUa) are issued. In this case, the aDDDDDUa op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

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**ERROR 03**

Once the device is made ready a sequence of six invalid ops (000000UA, 011111UA, 022222UA, 033333UA, 044444UA, and 055555UA) are issued. In this case, the 011111UA op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

**ERROR 04**

Once the device is made ready a sequence of six invalid ops (000000UA, 011111UA, 022222UA, 033333UA, 044444UA, and 055555UA) are issued. In this case, the 022222UA op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

**ERROR 05**

Once the device is made ready a sequence of six invalid ops (000000UA, 011111UA, 022222UA, 033333UA, 044444UA, and 055555UA) are issued. In this case, the 033333UA op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

**ERROR 06**

Once the device is made ready a sequence of six invalid ops (000000UA, 011111UA, 022222UA, 033333UA, 044444UA, and 055555UA) are issued. In this case, the 044444UA op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

**ERROR 07**

Once the device is made ready a sequence of six invalid ops (000000UA, 011111UA, 022222UA, 033333UA, 044444UA, and 055555UA) are issued. In this case, the 055555UA op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

**ERROR 85**

See Initialize Printer Section.

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**ERROR 02**

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the WRITE ops in this section. The LOAD op @50000U@ was issued but failed, timed out, or completed with an exception condition.

**ERROR 03**

The operator is asked to make the Printer not ready, then enter the GO command. TEST ops @80000U@ are issued to see if the device is not ready. A TEST op has failed or timed out.

**ERROR 04**

A Single Space WRITE op @4E000U@ is issued to the not ready device. The WRITE op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

**ERROR 05**

The operator is asked to make the Printer ready, then enter the GO command. TEST ops @80000U@ are issued to see if the device is ready. A TEST op has failed or timed out.

**ERROR 06**

Once the Printer has been made ready a SPACE/SKIP op @A1000U@ (Skip To Channel #1) is issued to separate the test section output from any other test output. The SPACE/SKIP op has failed, timed out, or completed with an exception condition.

**ERROR 07**

A Single Space WRITE op @4E000U@ is issued to the ready device. The WRITE op has failed, timed out, or completed with an exception condition.

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### Section 34 -- Specific Column Test

This test section provides the capability to exercise a single column. The letter H, by default, is printed in column one (by default) continuously. The operator may select the column to be exercised by entering the BOLT "LENGTH" command (i.e. LENGTH 25 will cause column 25 to be exercised. The test section terminates on abnormal conditions, operator termination, or when the device goes not ready.

The operator may change the data character by entering the BOLT DATA command (e.g. DATA "F"). The data character is set once printing has begun.

DEFAULT DATA:	"H" character
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	1
LENGTH SENSITIVE:	Yes
WARNINGS:	None
NOTES:	The BOLT LOCK feature has not been implemented for this test section.

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops 280000U0 are issued to see if the device is ready. A TEST op has either failed or timed out.

#### ERROR 02

Before any output is produced by section 34 the paper is advanced to a new page. The SPACE/SKIP op 2A1000U2 (Skip To Channel #1) was issued but failed, timed out, or completed with an exception condition.

#### ERROR 03

Section 34 issues Single Space WRITE ops 25E000U2 (V=1, ignore EDP exception) to the device. One of these WRITE ops has failed, timed out, or completed with an exception condition.

#### ERROR 85

See Initialize Printer Section.

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### Section #51 -- Unload And Display Print Line Buffer

An (UN)LOAD op (60 40 00) is issued to the Control, unloading the Print Line Buffer. The information is displayed to the devices selected by the BOLT operator. If no BOLT display options are on the operator is informed that the Print Line Buffer cannot be displayed. If the BOLT "ODT" option is not on then the Print Line Buffer contents will not be displayed to the ODT. An appropriate message will be given. The format of display depends on the current setting of the BOLT "HEX" and "ALPHA" display options.

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	257 Characters
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	Control must be selected for this test section. See UNIT command.

The Printer may be READY or NOT READY for this test section.

The data displayed may contain non-graphic characters.

#### ERROR 01

The Printer Control Print Line Buffer is unloaded by issuing the (UN)LOAD op 36040203 (DDD=010, T=1). The (UN)LOAD op has failed, timed out, or completed with an exception condition.

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#### ERROR 02

Once the device has been made not ready, the Printer Control 5/6 soft translator memory is loaded with the 8-bit binary sequence @0A@, @0B@, ... etc. by issuing the LOAD op @60000U@. The LOAD op has failed, timed out, or completed with an exception condition.

#### ERROR 03

After the translator has been loaded with the binary sequence (see ERROR 02) the operator is asked to make the device not ready. TEST ops @80000U@ are issued to see if the device is not ready. A TEST has failed or timed out.

#### ERROR 04

Once the device has been made not ready a diagnostic WRITE op @4E8020@ (DDD=100, T=1) is issued, writing (and translating) the 8-bit binary sequence @00@, @01@, @02@, ... etc. The diagnostic WRITE op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, NOT\_READY, and INVALID\_CODE result bits are expected to be on.

#### ERROR 05

After the 8-bit binary sequence is written and translated, the Printer Control 5/6 Print Line Buffer is unloaded (to obtain the translated data) by issuing the (UN)LOAD op @604020@ (DDD=010, T=1). The (UN)LOAD op has failed, timed out, or completed with an exception condition.

#### ERROR 06

Once the translated data has been obtained from the PC 5/6 Print Line Buffer, it is checked to see that the translation was as expected. The translation was not as correct. If the BOLT "ODT" option was on at the time the data was compared, the expected and observed data will be displayed to the ODT, marking all data mismatches.

#### ERROR 85

See Initialize Printer Section.

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**ERROR 05**

The invalid code was selected and must be loaded into the Printer Control 5/6 soft translator memory. A LOAD op 260000U2 was issued but failed, timed out, or completed with an exception condition.

**ERROR 06**

Once the invalid code has been loaded into the Printer Control 5/6 soft translator memory, a Single Space WRITE op 24E000U2 is issued to the (ready) device. The WRITE op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and INVALID\_CODE result bits are expected to be on.

**ERROR 85**

See Initialize Printer Section.

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OPTIONAL DIAGNOSTIC TEST SECTIONS -- PRINTER CONTROL 7

Section #55 -- Simulate Test

The operator is asked to make the selected Printer NOT READY. A simulate TEST op (80 30 2U, DDD=100, T=1) is performed to the NOT READY device. (A simulate TEST op forces Printer Ready and Chain Ready conditions). The TEST op should complete with no exception conditions. Failure to complete the op indicates a Control failure.

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

Control must be selected for this test section. See UNIT command.

ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops @80000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

ERROR 02

Once the Printer has been made not ready, a SIMULATE TEST op @30802U@ (DDD=100, T=2) is issued to the device. The SIMULATE TEST op has failed, timed out, or completed with an exception condition. Failure to complete this op indicates a Printer Control failure. Successful completion indicates an interface problem.

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Section #57 -- Not Implemented This Release

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### Section #59 -- Write Flag Bit Test

The operator is asked to NOT READY the selected Printer. A Diagnostic WRITE op (40 60 2U) is issued to the NOT READY device, the data being a single character. Then the data is read back by issuing another Diagnostic WRITE op (40 C0 2U). When read back, the data should be followed by one additional byte containing the Write Flag Bit. The Write Flag will be the Most Significant Bit of the extra 8-Bits, and it should be set to one (1). The returned print data will have translated, however, it is not checked in this test section. This WRITE-READ cycle is repeated, increasing the number of characters by one each time, until a full 132 character line has been written and read back, verifying the Write Flag Bit each time.

DEFAULT DATA:	3 Bit binary sequence
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	Varying, 1 to 132
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

Control must be selected for this test section. See UNIT command.

This test section should be run after section 58, and before test sections 60 and 61.

#### ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops @30000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

#### ERROR 02

Once the Printer has been made not ready a Diagnostic WRITE op @40202U@ (DDD=001 = translate only, T=1) is issued to the device. The op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

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### Section #60 -- Write Short Line, Verify Data

This test section checks to see that the Control is translating data properly when short lines are being written. The operator is asked to NOT READY the selected Printer. A diagnostic write (40 20 2U) is issued to the NOT READY device, loading the Print Line Buffer with two characters. The first character used in the WRITE is the next byte in the 8-bit binary sequence, starting at 0000. The second byte of each WRITE is the complement of the first (i.e. 00 FF, 01 FE, ..., FF 00). The Print Line Buffer is read back after each WRITE by issuing the Diagnostic WRITE op (40 60 2U). The data read back should be the translated ASCII characters of the original data sent. Both bytes are checked for correct translation.

DEFAULT DATA:	As stated above
DATA SENSITIVE:	No
DEFAULT LENGTH:	2 Characters
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

Control must be selected for this test section. See UNIT command.

This test section should be run after section 58 and/or 59 and before section 61.

#### ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops 080000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

#### ERROR 02

Once the Printer has been made not ready a Diagnostic WRITE op 040202U0 (DDD=001 = translate only, T=1) is issued to the device. The op has failed, timed out, or returned an improper result status field. The DP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

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### Section #61 -- Write Full Line, Verify Data

This test section checks to see that the Control is translating data properly when full lines are being written. The operator is asked to NOT READY the selected Printer. A diagnostic write (40 20 2U) is issued to the NOT READY device, loading the Print Line Buffer with the 8-Bit binary sequence, starting at 0000. The Print Line Buffer is read back after the WRITE by issuing the Diagnostic WRITE op (40 60 2U). The data read back should be the translated ASCII characters of the original data sent. All bytes are checked for correct translation. This process is repeated until all 256 possible combinations in the 8-Bit sequence have been written in all 132 Print Line Buffer positions (i.e. 00 01 ... 83, 01 02 ... 84, FF 00 01 ... 82).

DEFAULT DATA:	8-Bit binary sequences, rotated to every position.
DATA SENSITIVE:	No
DEFAULT LENGTH:	132 Characters
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

Control must be selected for this test section. See UNIT command.

This test section should be run after section 58 and/or 59. Optionally after 60.

#### ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops 08000000 are issued to see if the device is not ready. A TEST op has either failed, timed out, or the operator entered input to cause the test section to exit.

#### ERROR 02

Once the Printer has been made not ready a Diagnostic WRITE op 040202U0 (DDD=001 = translate only, T=1) is issued to the device. The op has failed, timed out, or returned an improper result status field. The DP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

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### APPENDIX A -- EXAMPLES

This appendix is provided to give the reader several examples of possible operator input to BOLT and the output that would probably be seen on the ODT from which BOLT was being executed. For the examples below, the BOLT job number is 10 and the BOLT "ODT" option is enabled.

#### ON-LINE TEACH INFORMATION

10AX TEACH LP 7

```

: BOLT=10 PRINTER: SECTION #7: SINGLE SPACE WRITE TEST
: BOLT=10 -----
: BOLT=10
: BOLT=10 THIS TEST SECTION IS DESIGNED TO ESTABLISH CONFIDENCE IN
: BOLT=10 THE SINGLE SPACING ABILITY OF THE SELECTED PRINTER. SINGLE
: BOLT=10 SPACE WRITE OPS (QSE 00 0UQ) ARE ISSUED TO THE PRINTER. THE
: BOLT=10 OPERATOR MAY VARY THE NUMBER OF RECORDS WRITTEN BY ENTERING
: BOLT=10 THE BOLT "RECORDS" COMMAND.
: BOLT=10
: BOLT=10 DEFAULT DATA: PRINTER AND CONTROL DEPENDENT
: BOLT=10 DATA SENSITIVE: YES
: BOLT=10 DEFAULT LENGTH: 120/132 CHARACTERS
: BOLT=10 LENGTH SENSITIVE: YES
: BOLT=10 DEFAULT RECORDS: 500
: BOLT=10 RECORD SENSITIVE: YES
: BOLT=10 NOTES: EOP SIGNAL WILL NOT BE REPORTED
: BOLT=10
: BOLT=10
: BOLT=10 ***** ENTER NEXT COMMAND *****
: BOLT=10 ACCEPT
  
```

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TEST EXECUTION -- SECTION 29

10AX SECTION 29; GO;

: BOLT=10 BEGINNING OF TEST ON LPA  
: BOLT=10 LPA: BEGIN SECTION 29: TEST AND WAIT FOR READY.  
: BOLT=10 PLEASE MAKE THE LINE PRINTER NOT READY. THEN ENTER "GO".  
: BOLT=10  
: BOLT=10 \*\*\*\*\* ENTER NEXT COMMAND \*\*\*\*\*  
: BOLT=10 ACCEPT

10AX GO

: BOLT=10  
: BOLT=10 A "TEST AND WAIT FOR READY" OP HAS BEEN ISSUED TO THE PRINTER.  
: BOLT=10 YOU HAVE 1 AND 1/2 MINUTES TO MAKE THE PRINTER READY AGAIN.  
: BOLT=10  
: BOLT=10 TEST/WAIT OP HAS COMPLETED WITHOUT EXCEPTION OR AS EXPECTED.  
: BOLT=10 LPA: END SECTION 29: TEST AND WAIT FOR READY.  
: BOLT=10 END OF TEST ON UNIT LPA -- 0 ERRORS REPORTED.  
: BOLT=10 \*\*\*\*\* ENTER NEXT COMMAND \*\*\*\*\*  
: BOLT=10 ACCEPT

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### REPEATING SECTIONS

```
10AX SECTION 7; REPEAT 5; GO;
: BOLT=10 BEGINNING OF TEST FOR UNIT LPA
: BOLT=10 LPA: BEGIN SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 REPEATING SECTION 7, 2 TIMES.
: BOLT=10 REPEATING SECTION 7, 3 TIMES.
: BOLT=10 REPEATING SECTION 7, 4 TIMES.
: BOLT=10 REPEATING SECTION 7, 5 TIMES.
: BOLT=10 LPA: END SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 END OF TEST ON UNIT LPA -- 0 ERRORS REPORTED.
```

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SELECTING A CHARACTER SET -- CHAIN COMMAND

```

10AX SECTION 8; CHAIN 24; GO;
: BOLT=10 BEGINNING OF TEST FOR LPA
: BOLT=10 PRINTER TEST MUST DETERMINE THE PRINTERS CHARACTER SET ID.
: BOLT=10 PRINTER TEST REALIZES THAT THE CHAIN COMMAND HAS BEEN ENTERED.
: BOLT=10 THE CHAIN ID ENTERED WAS TOO LARGE. VALID RANGE IS 1 TO 14.
: BOLT=10 OPERATOR: PLEASE ENTER THE CHAIN COMMAND, SELECT A CHAIN ID.
: BOLT=10 THEN ENTER GO.
: BOLT=10 ***** ENTER NEXT COMMAND *****
: BOLT=10 ACCEPT
10AX CHAIN 2; GO;
: BOLT=10 LPA DETERMINED TO BE A LOW SPEED (400/750) LPM PRINTER.
: BOLT=10 THE CHAIN ID ENTERED IS INVALID FOR LOW SPEED PRINTERS.
: BOLT=10 OPERATOR: PLEASE ENTER THE CHAIN COMMAND, SELECT A CHAIN ID.
: BOLT=10 THEN ENTER GO.
: BOLT=10
: BOLT=10          1 = EBCDIC 16          3 = EBCDIC 48
: BOLT=10          4 = FORTRAN 48        5 = FORTRAN NON STD 48
: BOLT=10          6 = B500 48          7 = RPG 48
: BOLT=10          8 = EBCDIC 64        13 = EBCDIC 96
: BOLT=10
: BOLT=10 ***** ENTER NEXT COMMAND *****
: BOLT=10 ACCEPT
10AX CHAIN 3; GO;
: BOLT=10 CHARACTER SET SELECTED BY PRINTER TEST IS = EBCDIC3.64
: BOLT=10 LPA: BEGIN SECTION 8: DOUBLE SPACE WRITE TEST.
: BOLT=10 LPA: END SECTION 3: DOUBLE SPACE WRITE TEST.
: BOLT=10 END OF TEST FOR LPA -- 0 ERRORS REPORTED.
: BOLT=10 ***** ENTER NEXT COMMAND *****
: BOLT=10 ACCEPT
  
```

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```

: BOLT=10                TEST  DESCR.
: BOLT=10                -----
: BOLT=10
: BOLT=10  OP:           A10000  AFIELD:    000000  RESULT:    300080
: BOLT=10  LINK:        -0000001  BFIELD:    000000  XRSLT1:   00000000
: BOLT=10  PRT/CH:      73        CFIELD:    000000  XRSLT2:   00000000
: BOLT=10                LENGTH:    000000 (000000)
: BOLT=10
: BOLT=10  ***** TRACE OF TEST SECTION DATA AFTER DISPATCHING:
: BOLT=10
: BOLT=10  ***** TRACE OF TEST SECTION DESCRIPTOR BEFORE DISPATCHING:
: BOLT=10                TEST  DESCR.
: BOLT=10                -----
: BOLT=10
: BOLT=10  OP:           5F0000  AFIELD:    019FFF  RESULT:    000000
: BOLT=10  LINK:        -0000001  BFIELD:    01A031  XRSLT1:   00000000
: BOLT=10  PRT/CH:      73        CFIELD:    000000  XRSLT2:   00000000
: BOLT=10                LENGTH:    000032 (000050)
: BOLT=10
: BOLT=10  ***** TRACE OF TEST SECTION DATA BEFORE DISPATCHING:
: BOLT=10
: BOLT=10  C1C1C1C1C1D4D4D4D4D4C3C3C3C3C3D4D4D4D4D4C1C1C1C1C1D4D4D4D4D4
: BOLT=10  C1C1C1C1C1D4D4D4D4D4C3C3C3C3C3D4D4D4D4D4
: BOLT=10
: BOLT=10  AAAAAA.....CCCCC.....AAAAA.....CCCCC.....AAAAA.....
: BOLT=10
: BOLT=10  ***** TRACE OF TEST SECTION DESCRIPTOR AFTER DISPATCHING:
: BOLT=10                TEST  DESCR.
: BOLT=10                -----
: BOLT=10
: BOLT=10  OP:           5F0000  AFIELD:    019FFF  RESULT:    300080
: BOLT=10  LINK:        -0000001  BFIELD:    01A031  XRSLT1:   00000000
: BOLT=10  PRT/CH:      73        CFIELD:    000000  XRSLT2:   00000000
: BOLT=10                LENGTH:    000032 (000050)
: BOLT=10
: BOLT=10  ***** TRACE OF TEST SECTION DATA AFTER DISPATCHING:
: BOLT=10
: BOLT=10  C1C1C1C1C1D4D4D4D4D4C3C3C3C3C3D4D4D4D4D4C1C1C1C1C1D4D4D4D4D4
: BOLT=10  C1C1C1C1C1D4D4D4D4D4C3C3C3C3C3D4D4D4D4D4
: BOLT=10
: BOLT=10  AAAAAA.....CCCCC.....AAAAA.....CCCCC.....AAAAA.....
: BOLT=10
: BOLT=10  LPA:  END      SECTION 3:  DOUBLE SPACE WRITE TEST.
: BOLT=10  END OF TEST ON UNIT LPA -- 0 ERRORS REPORTED.
: BOLT=10  ***** ENTER NEXT COMMAND *****
: BOLT=10  ACCEPT

```

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### REPEATING AND CYCLING ON TEST SECTIONS

```

10AX SECTION 7-8; REPEAT 3; CYCLE; GO;
: BOLT=10 BEGINNING OF TEST FOR UNIT LPA
: BOLT=10 LPA: BEGIN SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 REPEATING SECTION 7, 2 TIMES.
: BOLT=10 REPEATING SECTION 7, 3 TIMES.
: BOLT=10 LPA: END SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 LPA: BEGIN SECTION 8: DOUBLE SPACE WRITE TEST.
: BOLT=10 REPEATING SECTION 8, 2 TIMES.
: BOLT=10 REPEATING SECTION 8, 3 TIMES.
: BOLT=10 LPA: END SECTION 8: DOUBLE SPACE WRITE TEST.
: BOLT=10 LPA: BEGIN SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 REPEATING SECTION 7, 2 TIMES.
: BOLT=10 REPEATING SECTION 7, 3 TIMES.
: BOLT=10 LPA: END SECTION 7: SINGLE SPACE WRITE TEST.
: BOLT=10 LPA: BEGIN SECTION 8: DOUBLE SPACE WRITE TEST.
: BOLT=10 REPEATING SECTION 8, 2 TIMES.
: BOLT=10 REPEATING SECTION 8, 3 TIMES.
: BOLT=10 LPA: END SECTION 8: DOUBLE SPACE WRITE TEST.
:
:
: ..... AND SO ON .....
:
:
: BOLT=10 END OF TEST ON UNIT LPA -- 0 ERRORS REPORTED.
  
```

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TEST EXECUTION -- SECTION 50

10AX SECTION 50; GO;

: BOLT=10 BEGINNING OF TEST ON LPA  
: BOLT=10 LPA: BEGIN SECTION 50: LOAD TRANSLATOR MEMORY.  
: BOLT=10 PLEASE MAKE THE LINE PRINTER NOT READY. THEN ENTER "GO".  
: BOLT=10  
: BOLT=10 \*\*\*\*\* ENTER NEXT COMMAND \*\*\*\*\*  
: BOLT=10 ACCEPT

10AX GO

: BOLT=10 LPA DETERMINED TO BE A HIGH SPEED (1100 OR 1500 LPM) PRINTER.  
: BOLT=10 PRINTER CONTROL 5/6 SOFT TRANSLATOR LOADED WITH EBCDIC96  
: BOLT=10 LPA: END SECTION 50: LOAD TRANSLATOR MEMORY.  
: BOLT=10 END OF TEST ON LPA -- 0 ERRORS REPORTED.  
: BOLT=10 \*\*\*\*\* ENTER NEXT COMMAND \*\*\*\*\*  
: BOLT=10 ACCEPT

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### SELECTING A LINE PRINTER DEVICE

10AX UNIT CONTROL LPA

: BOLT=10

UNIT TABLE INFORMATION

: BOLT=10

: BOLT=10

: BOLT=10 TOTAL UNITS OBTAINED = 01

: BOLT=10 UNIT NAME = LPA PORT = 7 CHANNEL = 3 UNIT = 0

: BOLT=10

: BOLT=10

LINE PRINTER TEST -- VERSION AA

: BOLT=10

: BOLT=10

: BOLT=10

DEFAULT CONFIDENCE TEST SECTIONS ARE 1 - 8

: BOLT=10

OPTIONAL CONFIDENCE TEST SECTIONS ARE 25 - 34

: BOLT=10

OPTIONAL DIAGNOSTIC TEST SECTIONS ARE 50 - 61

: BOLT=10

: BOLT=10

FOR A DESCRIPTION OF THE LINE PRINTER TEST ENTER "TEACH LP".

: BOLT=10

ENTER "TEACH LP <SECTION-NUMBER>" FOR THE DESCRIPTION OF ANY

: BOLT=10

TEST SECTION LISTED ABOVE. SECTIONS 1-8 ARE READY TO RUN.

: BOLT=10

: BOLT=10

CHARACTER SET SELECTED BY PRINTER TEST IS = EBCDIC96

: BOLT=10

: BOLT=10

\*\*\*\*\* ENTER NEXT COMMAND \*\*\*\*\*

: BOLT=10

ACCEPT

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**ERROR 03**

The translated data (see ERROR 02) plus one extra byte containing the Write Flag Bit must be read back. The data will be checked for correct translation. A Diagnostic WRITE op 34060202 (DDD=011, T=1) is issued to the (not ready) device. The WRITE (READ) op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

**ERROR 04**

Once the translated data (ASCII translation of the data written) has been obtained it is compared to the expected data. The translated data is not correct. If the BOLT "ODT" option was on when the data was compared, the expected and observed data will be displayed to the ODT, marking all data mismatches. (See BOLT "COMPARE" command for details on displayed data).

**ERROR 95**

This test section requires that the Line Printer be not ready throughout its entirety. Should the device go ready, the error is displayed and the operator will be asked to make the Printer not ready again. TEST ops 380000U2 are issued to the device to see if it is not ready. A TEST op has failed or timed out.

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**ERROR 03**

The translated data (see ERROR 02) plus one extra byte containing the Write Flag Bit must be read back. The data will be checked for correct translation. A Diagnostic WRITE op 24060202 (DDD=011, T=1) is issued to the (not ready) device. The WRITE (READ) op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

**ERROR 04**

Once the translated data (ASCII translation of the data written) has been obtained it is compared to the expected data. The translated data is not correct. If the BOLT "ODT" option was on when the data was compared, the expected and observed data will be displayed to the ODT, marking all data mismatches. (See BOLT "COMPARE" command for details on displayed data).

**ERROR 95**

This test section requires that the Line Printer be not ready throughout its entirety. Should the device go ready, the error is displayed and the operator will be asked to make the Printer not ready again. TEST ops 280000U2 are issued to the device to see if it is not ready. A TEST op has failed or timed out.

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**ERROR 03**

The translated data (see ERROR 02) plus one extra byte containing the Write Flag Bit must be read back and verified. A Diagnostic WRITE op 34060200 (DDD=011 = read back, T=1) is issued to the (not ready) device. The WRITE (READ) op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

**ERROR 04**

The Write Flag Bit (most significant bit of the extra byte read back) was checked and was found to be set incorrectly.

**ERROR 95**

This test section requires that the Line Printer be not ready throughout its entirety. Should the device go ready, the error is displayed and the operator will be asked to make the Printer not ready again. TEST ops 38000000 are issued to the device to see if it is not ready. A TEST op has failed or timed out.

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### Section #58 -- Write Line Buffer

This section tests the Controls ability to load the Print Line Buffer with data. The operator is asked to NOT READY the selected Printer. A diagnostic WRITE (40 20 2U, DDD=001, T=1) is issued to the Printer Control, writing 132 bytes of the 3-bit binary sequence. The binary sequence is rotated one position to the left and is written again. This procedure is repeated until all 256 possible combinations have been tested in each of the 132 Print Line Buffer positions (i.e 00 01 ... 83, 01 02 ... 84, FF 01 .. 82).

DEFAULT DATA:	8 Bit binary sequence, rotated
DATA SENSITIVE:	No
DEFAULT LENGTH:	132 Characters
LENGTH SENSITIVE:	Yes
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

Control must be selected for this test section. See UNIT command.

This test section should be run before section 59.

#### ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops @80000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

#### ERROR 02

Once the Printer has been made not ready, a series of Diagnostic WRITE ops @40202U@ (DDD=001 = translate only, T=1) are issued to the (not ready) device. One of these WRITE ops has failed, timed out, or return an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

#### ERROR 95

This test section requires that the Line Printer be not ready throughout its entirety. Should the device go ready, the error is displayed and the operator will be asked to make the Printer not ready again. TEST ops @80000U@ are issued to the device to see if it is not ready. A TEST op has failed or timed out.

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**Section #56 -- Not Implemented This Release**

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### Section #54 -- Attempt To Print Non-Existent Link

The operator is asked to READY the selected Printer. The Print Translator is loaded with 256 bytes of 2702 (112), and one additional byte of 2032 using the LOAD op (60 00 0U). Then a Single Space WRITE op (4E 00 0U) of 132 characters is issued to the device. The WRITE should result in an EXCEPTION condition being flagged, it being INVALID\_GRAPHIC\_POSITION (RS Bit 4). The result descriptor is checked for the proper bit settings.

NOTE: This section overwrites the PC 5/6 Translator memory with an Invalid Link Number. Run section 50 after this section to restore the Translate Table.

DEFAULT DATA:	Pattern of 23F2
DATA OPERATOR SENSITIVE:	Yes
DEFAULT LENGTH:	132 Characters
LENGTH OPERATOR SENSITIVE:	Yes
WARNINGS:	Section overwrites translator memory.
NOTES:	The Printer must be READY for this test section.

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST op 280000U0 are issued to see if the device is ready. A TEST op has failed or timed out.

#### ERROR 05

An invalid link is selected and must be loaded into the Printer Control 5/6 soft translator memory. A LOAD op 260000U2 was issued but has failed, timed out, or completed with an exception condition.

#### ERROR 06

Once the invalid link has been loaded into the Printer Control 5/6 soft translator memory, a Single Space WRITE op 24E000U2 is issued to the (ready) device. The WRITE op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and INVALID\_GRAPHIC\_POSITION result bits are expected to be on.

#### ERROR 85

See Initialized Printer Section.

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### Section #53 -- Print Invalid Code Test

The operator is asked to READY the selected Printer. Then the PC 5/6 Translator Memory is loaded. An Invalid Code is chosen and loaded into all locations of the Translator Memory with the LOAD op (60 00 0U). Any character written to the Printer will now translate incorrectly. A Single Space WRITE op (4E 00 0U) is issued, writing invalid characters to the Printer. The result descriptor is checked to see that the INVALID\_CODE bit (RS Bit 5) is set.

NOTE: This section overwrites the PC 5/6 Translator Memory with an Invalid Code. Section 50 should be run after this section to restore the Translate Table.

DEFAULT DATA:	Pattern of all "1" (i.e. @F1@)
DATA OPERATOR SENSITIVE:	Yes
DEFAULT LENGTH:	132 Characters
LENGTH OPERATOR SENSITIVE:	Yes
WARNINGS:	Section overwrites translator memory.
NOTES:	The Printer must be READY for this test section.

The data printed should be ?'s

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops @30000U@ are issued to see if the device is ready. A TEST op has failed or timed out.

#### ERROR 02

Once the device has been made ready, the Printer Control 5/6 soft translator memory will be loaded with the default translation table by issuing the LOAD op @60000U@. The LOAD op has failed, timed out, or completed with an exception condition.

#### ERROR 03

The invalid code to be loaded into the Printer Control 5/6 soft translator memory is chosen. If the Printer is not ready the operator is asked to make it not ready, then enter the GO command. TEST ops @80000U@ are issued to see if the device is ready. A TEST op has failed or timed out.

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## Section #52 -- Verify Write Data Translation

The operator is asked to NOT READY the selected Printer. The Translator Memory is loaded with 256 bytes of the 8-bit binary sequence, starting at 20A2, and one additional byte of 2032, using the LOAD op (60 00 0U). Then a Diagnostic Single Space WRITE op (4E 80 2U, DDD=100, T=1) is issued to the NOT READY device. The data for the WRITE op is 132 characters of the 8-bit binary sequence (00, 01, ..., 83). The WRITE result descriptor should have the OP COMPLETE, EXCEPTION, NOT\_READY, and INVALID\_CODE bits set. The data written should be translated as follows:

00 translated to 0A  
 01 translated to 0B  
 :  
 76 translated to 80  
 77 translated to 01 for PC 5, and 81 for PC 6  
 78 translated to 02 for PC 5, and 82 for PC 6  
 :  
 83 translated to 0C for PC 5, and 8C for PC 6

Next a Print Line Buffer UNLOAD op (60 40 2U, DD=01, T=1) is issued, reading back the translated data from the previous WRITE operation. The data is checked to make sure that the translation was as specified above. Since data translation differs between PC5 and PC6, but the Line Printer Test does not know the difference between the the controls, only 119 (2762) of the 132 characters translated will be checked. Appropriate messages, indicating success or failure, will be given.

NOTE: This section overwrites the PC 5/6 Translation Memory. Section 50 should be run after the section to restore the Translate Table.

DEFAULT DATA:	8-bit binary sequence, 00, 01, ..
DATA SENSITIVE:	No
DEFAULT LENGTH:	132 Characters
LENGTH SENSITIVE:	No
WARNINGS:	Section overwrites translator memory.
NOTES:	Control must be selected for this test section. See UNIT command.

### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops 280000U are issued to see if the device is ready. A TEST op has either failed or timed out.

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OPTIONAL DIAGNOSTIC TEST SECTIONS -- PC 5 & 6

Section #50 -- Load Translator

The operator is asked to READY the selected Printer. Then a LOAD op (60 00 0U) is sent to the Printer Control, loading the Translator Memory with the proper Translation Table and Character Set Size information (Printer and Control dependent).

DEFAULT DATA:	Printer and Control dependent
DATA OPERATOR SENSITIVE:	No
DEFAULT LENGTH:	257 Characters
LENGTH OPERATOR SENSITIVE:	No
WARNINGS:	None
NOTES:	Control must be selected for this test section. See UNIT command.

ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops 380000U0 are issued to see if the device is ready. A TEST op has failed or timed out.

ERROR 02

Once the device has been made ready, the Printer Control 5/6 soft translator memory will be loaded with the default translation table by issuing the LOAD op 260000U3. The LOAD op has failed, timed out, or completed with an exception condition.

ERROR 85

See Initialize Printer Section.

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### Section 33 -- Walking Column Test

This test section provides the capability to exercise a single column. The letter H, by default, is printed in column one continuously. When the operator makes the device not ready then ready again, the data character is stepped to column two; then three,

...  
 etc. The test section terminates on abnormal conditions, operator termination, or when the column has been stepped to the last printer column.

The operator may change the data character by entering the BOLT DATA command (e.g. DATA "F"). The new data character will be printed whenever the device is made not ready then ready again.

DEFAULT DATA:	"H" character
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	Varying 1 to 120/132
LENGTH SENSITIVE:	No
WARNINGS:	None
NOTES:	The BOLT LOCK feature has not been implemented for this test section.

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops @30000U0 are issued to see if the device is ready. A TEST op has either failed or timed out.

#### ERROR 02

Before any output is produced by section 33 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ (Skip To Channel #1) was issued but failed, timed out, or completed with an exception condition.

#### ERROR 03

Section 33 issues Single Space WRITE ops @5E000U@ (V=1, ignore EOP exception) to the device. One of these WRITE ops has failed, timed out, or completed with an exception condition.

#### ERROR 85

See Initialize Printer Section.

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### Section #32 -- Verify Print Line Buffer Cleared

This test section requires visual verification by the operator, and consists of two parts.

Part 1: If the Control being tested is Printer Control 5 or 6, then the Translator Memory is loaded. The operator is asked to NOT READY the selected Printer. Next a Single Space WRITE op (4E 00 0U) of 132 characters is sent to the NOT READY device (The operator has no control over the DATA and LENGTH for this op). The WRITE op should cause no Printer action and the result descriptor should indicate the NOT READY and EXCEPTION conditions.

Part 2: The the operator is asked to READY the Printer. A Single Space WRITE is again issued to the device, which is now READY (As shown below, the DATA and LENGTH may be set by the operator for this WRITE). The Line Printer should print data from the second Single Space WRITE only. Any data appearing from the previous write indicates that the Print Line Buffer was not cleared properly. The operator is asked to observe the line just printed. If the default data was used, he should see the line shown below. Otherwise, he should see only the data he specified for the second WRITE op.

Should the Printer Character Set not support Alphabetic Characters, the default data used will be a pattern of all ASTERISKS. This is done to avoid the printing of invalid characters.

NOTHING PRINTED TO THE RIGHT OF THE ASTERISK --- (\*)

DEFAULT DATA:	As stated above
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	50 Characters
LENGTH SENSITIVE:	Yes
WARNINGS:	None
NOTES:	Operator entered LENGTH should be less than 120/132 characters.

#### ERROR 01

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the WRITE ops in this section. If the device is not ready the operator is asked to make it ready, then enter the GO command. Test ops 380000Ua are issued to see if the device is ready. A TEST op has failed or timed out.

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### Section #31 -- Invalid Ops, Printer Ready

The operator is asked to READY the selected Printer. Several invalid op codes are sent to the READY device, checking the result descriptor of each to insure that the op has been detected as being invalid. (NOTE: There is no INVALID OP CODE bit in the result descriptor. The only conditions flagged should be OPERATION COMPLETE and EXCEPTION). The following invalid op codes are sent:

000 00 000	011 11 100	022 22 200	033 33 300
00C CC 000	00D DD 000		

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be READY for this test section.

This section cannot be run on Printer Controls 2/3/4.

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. TEST ops 0000000 are issued to see if the device is ready. A TEST op has either failed or timed out.

#### ERROR 02

Once the device is made ready a sequence of six invalid ops (0000000, 0111110, 0222220, 0333330, 000000C, and 000000D) are issued. In this case, the 0000000 op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

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### Section #30 -- Invalid Ops, Printer Not Ready

The operator is asked to NOT READY the selected Printer. Several invalid op codes are sent to the NOT READY device, checking the result descriptor of each to insure that the op has been detected as being invalid. (NOTE: There is no INVALID OP CODE bit in the result descriptor. The only conditions flagged should be OPERATION COMPLETE and EXCEPTION). The following invalid op codes are sent:

```

000 00 0U0      011 11 1U0      022 22 2U0      033 33 3U0
00C 0C 0U0      00D 0D 0U0

```

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

This section cannot be run on Printer Control 2/3/4.

#### ERROR 01

If the Printer is ready the operator is asked to make it not ready, then enter the GO command. TEST ops 030000U0 are issued to see if the device is not ready. A TEST op has failed or timed out.

#### ERROR 02

Once the device is made not ready a sequence of six invalid ops (000000U0, 011111U0, 022222U0, 033333U0, 0CCCCCU0, and 0DDDDDU0) are issued. In this case, the 000000U0 op has failed, timed out, or returned an incorrect result status field. The OP\_COMPLETE result bits (1,17) are expected to be on.

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### Section #28 -- Write Op, Printer Not Ready

If the Line Printer being tested is attached to Printer Control 5 or 6 then the Translator Memory is loaded. The operator is asked to NOT READY the selected Printer. Then a Single Space WRITE op (4E 00 0U) is sent to the NOT READY device. The result descriptor is checked to make sure the NOT READY bit was flagged.

DEFAULT DATA:	Printer and Control Dependent
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	Yes
WARNINGS:	None
NOTES:	The Printer must be NOT READY for the WRITE op.

Operator entered data and length should not affect the outcome of this test section.

#### ERROR 01

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the WRITE op in this section. If the device is not ready the operator is asked to make it ready, then enter the GO command. Test ops are issued to see if the device is ready. A TEST op 280000U2 has failed or timed out.

#### ERROR 02

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the WRITE op in this section. The LOAD op 260000U2 was issued but failed, timed out, or completed with an exception condition.

#### ERROR 03

The operator is asked to make the Printer not ready, then a Single Space WRITE op 24E000U2 is issued to the device. The WRITE op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

#### ERROR 80, 85

See Initialization Printer Section.

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### Section #26 -- Space/Skip Op, Printer Not Ready

The operator is asked to NOT READY the selected Printer. A SPACE/SKIP op (A1 00 0U, SSSS=0001 indicating Skip to Channel #1) is sent to the NOT READY device. The result descriptor is checked to make sure the NOT READY bit was flagged.

DEFAULT DATA:	Not Applicable
DATA SENSITIVE:	Not Applicable
DEFAULT LENGTH:	Not Applicable
LENGTH SENSITIVE:	Not Applicable
WARNINGS:	None
NOTES:	The Printer must be NOT READY for this test section.

### ERROR 01

The operator is asked to make the Printer not ready, then a SPACE/SKIP op @A1000U@ (Skip To Channel #1) is issued to the device. The SPACE/SKIP op has failed, timed out, or returned an improper result status field. The OP\_COMPLETE, EXCEPTION, and NOT\_READY result bits are expected to be on.

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## OPTIONAL CONFIDENCE TEST SECTIONS

### Section #25 -- Character Alignment Test

This test section is designed to aid the Field Engineer in aligning characters on the Printer. The operator is asked to READY the selected Printer. Then a Single Space WRITE op (5E 00 00, V=1) is issued to the device, writing the selected data pattern. The line is repeated fifty (50) times by default, or as specified by the operator in the RECORDS command. The operator is asked to, and should, visually verify the character alignment after the test section.

DEFAULT DATA:	Pattern of all "H"
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	Yes
DEFAULT RECORDS:	50
RECORDS SENSITIVE:	Yes
WARNINGS:	None
NOTES:	Section requires visual verification

#### ERROR 01

If the Printer is not ready the operator is asked to make it ready, then enter the GO command. Test ops are issued to see if the device is ready. A TEST op @30000U@ has failed or timed out.

#### ERROR 02

Before any output is produced by section 25 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

#### ERROR 03

Section 25 loops on a Single Space WRITE op @5E000U@ (V=1, ignore EOP exception), repeating the character alignment pattern fifty (50) times, or as specified using the BOLT "RECORDS" command. One of these WRITE ops has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the I/O result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

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### Section #7 -- Single Space Write Test

This test section is designed to establish confidence in the single spacing ability of the selected Printer. Single Space WRITE ops (5E 00 0U, V=1) are issued to the Printer. The operator may vary the number of records written by entering the RECORD command.

DEFAULT DATA:	Printer and Control Dependent
DATA SENSITIVE:	Yes
DEFAULT LENGTH:	120/132 Characters
LENGTH SENSITIVE:	Yes
DEFAULT RECORDS:	500
RECORDS SENSITIVE:	Yes
WARNINGS:	None
NOTES:	None

#### ERROR 01

Before any output is produced by section 7 the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

#### ERROR 02

Section 7 issues 500 Single Space WRITE ops @5E000U@ (V=1, ignore EDP) by default, or the number specified in the BOLT "RECORDS" command. One of these writes has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

#### ERROR 80, 85

See Initialize Printer Section.

#### ERROR 90

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @30000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 85**

See Initialize Printer Section.

**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @80000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 04**

Section 4 issues five NO ADVANCE WRITE ops (@50000U@) to test the Printers ability to suppress paper motion. The third of the five NO ADVANCE WRITE ops has failed, timed out, or completed with an exception condition.

**ERROR 05**

Section 4 issues five NO ADVANCE WRITE ops (@50000U@) to test the Printers ability to suppress paper motion. The fourth of the five NO ADVANCE WRITE ops has failed, timed out or completed with an exception condition.

**ERROR 06**

Section 4 issues five NO ADVANCE WRITE ops (@50000U@) to test the Printers ability to suppress paper motion. The fifth of the five NO ADVANCE WRITE ops has failed, timed out, or completed with an exception condition.

**ERROR 85**

See Initialize Printer Section.

**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @30000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 05**

When the End-Of-Page (EOP) is detected on the Single Space WRITE operation (Q4E000UQ) a line will be printed with a message indicating so. The EOP message WRITE (Q5E000UQ) op has failed, timed out, or completed with an exception condition.

**ERROR 06**

Section 3 makes sure that each character in the Line Printers Character set can be printed (consistently). It does this by selecting the next character and printing a full line of it three times. The third line is printed with a Double Space WRITE op Q4F000UQ. The WRITE op has failed, timed out, or completed with an exception condition.

**ERROR 07**

When the End-Of-Page (EOP) is detected on the Double Space WRITE operation (Q4F000UQ) a line will be printed with a message indicating so. The EOP message WRITE (Q5E000UQ) op has failed, timed out, or completed with an exception condition.

**ERROR 80, 85**

See Initialize Printer Section.

**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops Q30000UQ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops 380000U2 are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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**ERROR 04**

Before any output is produced by part 2 of this section the paper is advanced to a new page. The SPACE/SKIP op @A1000U@ was issued but failed, timed out, or completed with an exception condition.

**ERROR 05**

In part two of section 1 approximately 150 Double Space WRITE ops (@4F000U@) are issued, rippling the data pattern. One of these WRITE ops has failed, timed out, or completed with an exception condition. The record in error will be displayed, in addition to the I/O result descriptor, if the BOLT "ODT" option was on at the time the error occurred.

**ERROR 06**

When the End-Of-Page (EOP) is detected on a Double Space WRITE operation (@4F000U@) a line will be printed with a message indicating so. The EOP message WRITE (@5E000U@) has failed, timed out, or completed with an exception condition.

**ERROR 80, 85**

See Initialize Printer Section.

**ERROR 90**

This test section requires that the Line Printer be ready throughout its entirety. Should the device go not ready the exception is displayed and the operator will be asked to make the Printer ready again. TEST ops @80000U@ are issued to the device to see if it is ready. A TEST op has either failed or timed out.

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#### TEST SECTION NEEDS PRINTER CONTROL 5 OR 6

The test section (50-54) cannot be executed unless the Printer Control is 5 or 6, and the CONTROL has been selected with the BOLT "UNIT" command (e.g. UNIT CONTROL LPC).

#### TEST SECTION NEEDS PRINTER CONTROL 7

The test section (55-61) cannot be executed unless the Printer Control is a PC 7, and the CONTROL has been selected with the BOLT "UNIT" command (e.g. UNIT CONTROL LPS).

#### USER ENTER LENGTH IS TOO LARGE FOR PRINTER DEVICES

The test section being executed is LENGTH sensitive, and the LENGTH value entered by the operator exceeds 132 columns. Set LENGTH properly and run the test section again. Sections 6, 7, 8, 25, 28, 32, 34, 53, 54 and 58 are LENGTH sensitive.

#### ERROR 80

The test section being executed requires a default data pattern which comes from the SYSTEM/TRAINABLE file. The data pattern has not yet been extracted from that file, or the operator has entered the BOLT "CHAIN" command. To extract character set information from the SYSTEM/TRAINABLE file the Line Printer Test must know what type of Printer (high or low speed) is connected to the Control. TEST ops are issued to the device to obtain this information. A TEST op has failed or timed out.

#### ERROR 85

If the Printer being tested is connected to a Printer Control 5/6 and the test section requires that the Printer be ready, a dummy TEST op is issued to the device. This is done to clear a possible false not ready condition common on these controls. The TEST op has failed or timed out.

Sections 1-8, 25, 28, 31, 33-34, 50, and 53-54 require that the Printer be ready initially.

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## RESTORATION ERRORS

Restoration errors occur when the operator wishes to release a previously selected Line Printer device back to MCP control. See Figure 4 above for an example.

**WARNING:** If any of the errors listed below occur during the restoration process there is a good possibility that the Printer Control 5/6 translator memory is not loaded with the proper translate table. The operator is advised to issue the MCP "LT" command to insure the device is properly restored.

### ERROR 75

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the Line Printer Test is exited. If the device is not ready the operator is asked to make it ready, then enter the GO command. TEST ops 280000U2 are issued to see if the device is ready. A TEST op has failed or timed out.

### ERROR 76

If the Printer being tested is connected to a Printer Control 5 or 6 then the soft translator memory must be loaded before the Line Printer Test is exited. The LOAD op 260000U2 was issued but failed, timed out, or completed with an exception condition.

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LINE PRINTER TEST -- VERSION AA  
 -----

DEFAULT CONFIDENCE TEST SECTIONS ARE 1 - 8  
 OPTIONAL CONFIDENCE TEST SECTIONS ARE 25 - 34  
 OPTIONAL DIAGNOSTIC TEST SECTIONS ARE 50 - 61  
 (50 - 53 FOR PC 5/6, 54 - 61 FOR PC 7)

ENTER "TEACH LP" FOR LINE PRINTER TEST DESCRIPTION. ENTER  
 "TEACH LP <SECTION-NUMBER>" FOR A DESCRIPTION OF ANY TEST  
 SECTION LISTED ABOVE. SECTIONS 1 - 8 ARE READY TO RUN.

**FIGURE 3: EXAMPLE OUTPUT FROM INITIALIZATION PROCESS**

This figure is an example of what the operator might see when the  
 BOLT "UNIT" command has been entered, selecting a Line Printer  
 device (e.g. UNIT LPB).

PRINTER TEST HAS BEGUN RESTORATION PROCESS OF SELECTED UNIT.  
 THE PRINTER CONTROL 5/6 TRANSLATE TABLE MUST BE RESTORED.  
 PRINTER CONTROL 5/6 SOFT TRANSLATOR LOADED WITH EBCDIC96  
 PRINTER TEST HAS ENDED RESTORATION PROCESS OF SELECTED UNIT.  
 LPC RELEASED BY BOLT.

**FIGURE 4: EXAMPLE OUTPUT FROM RESTORATION PROCESS**

This figure is an example of what the operator might see when a  
 previously selected Line Printer device is being released back to  
 MCP control. In this example, the Printer is attached to a PC  
 5/6 and the unit mnemonic is LPC.

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PRINTER CONTROL 5 AND 6

BIT NO.	MEANING	WRITE	SPACE	TEST	LOAD
1	Operation Complete	X	X	X	X
2	Exception Condition	X	X	X	
3	Not Ready	X	X	X	
4	Invalid Graphic Position (Printer Control 5 only)	X			
5	Invalid Code	X			
6					
7	End Of Page	X	X	X	
8	Chain Sync Error	X			
9 - 14	Character Set ID			X	
	00 0000 No automatic ID				
	00 0001 18 Char EBCDIC				
	00 0010 48 Char FORTRAN				
	00 0011 48 Char B500				
	00 0100 48 Char EBCDIC				
	00 0101 72 Char EBCDIC				
	00 1111 72 Char ASCII				
	01 0000 96 Char EBCDIC				
	01 0010 72 Char Alphabetized				
	01 0100 48 Char RPG				
	11 0100 144 Char Thailand				
15 - 16	Printer Type ID			X	
	00 - 400/750 LPM				
	01 - 1100 LPM				
	10 - ***** RESERVED *****				
	11 - 1500 LPM				
17	Operation Completed	X	X	X	X
18 - 24	Control Identification			X	
	011 1113 (PC 5/6)				

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PRINTER CONTROL 3

BIT NO.	MEANING	WRITE	SPACE	TEST
1	Operation Complete	X	X	X
2	Exception Condition	X	X	X
3	Not Ready	X	X	X
4	Print Check	X	X	X
5				
6				
7	End Of Page	X	X	X
8				
9				
10				
11				
12				
13	Paper In Motion			X
14				
15				
16				
17	Operation Completed	X	X	X
18 - 24	Control Identification 001 0000			X

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#### PAPER IN MOTION

BIT 13: Bit 13 is reported on a test operation to indicate Printer paper motion. This bit is reported only for Printer Controls 2 and 3.

#### TRANSLATOR UNLOADED

BIT 14: Bit 14 is reported on a TEST or a WRITE operation to indicate that the soft translator in the Control must be loaded. This bit is valid for Printer Control 2 only.

#### PRINTER TYPE IDENTIFICATION

BITS 15 - 16: On a TEST operation, bits 15 and 16 indicate the Printer type. Printer types are field changeable. These bits are set by Printer Controls 5 and 6.

00	=	400/750 LPM	01	=	1100 LPM
10	=	** reserved **	11	=	1500 LPM

#### OPERATION COMPLETE (BIT 17)

BIT 17: Bits 1 and 17 are set to indicate that the operation is complete.

#### CONTROL IDENTIFICATION

BITS 18 - 24: On a TEST operation, bits 18 through 24 are reported to indicate the Control type. Control Identifications are given below:

18	19	20	21	22	23	24	Control Number
----	----	----	----	----	----	----	-----
0	0	1	0	0	0	0	PC 2, 3, or 4
0	1	1	1	1	1	0	PC 5 or 6
0	0	0	0	0	1	1	PC 7

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#### END OF PAGE

BIT 7: The End of Page signal does not terminate any operation. It is reported via bit 7 if the signal is true, at the start of a TEST, WRITE or SPACE/SKIP operation unless the V variant specifies no report.

#### Exceptions:

1. EDP is reported by PC 3 on SKIP regardless of the V variant and by PC 2 on SKIP if V variant = 0.
2. Printer Controls 2, 4, and 7 will report EDP in the result on a SPACE (V=0) or WRITE-SPACE (V=0) operation even though the EDP signal was not true prior to the start of the operation should the EDP signal become true during the paper motion of the same operation and the result of the operation was still awaiting acceptance by the system. In this case, EDP could be reported on the next operation as well since the EDP signal will still be true.
3. EDP is not reported by PC 2/4/7 on a TEST operation if variant V = 1.

#### Notes:

1. All Printers signal EDP if the condition was detected during a Single or Double Space operation.
2. Printers attached to PC 3 have the EDP signal reset by the Control prior to receiving paper motion information from the Control.
3. Printers attached to PC 2/5/6 reset EDP when an operation which moves paper is received.
4. Printers attached to PC 4/7 reset EDP when the hole in Channel 1 is sensed.

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## RESULT STATUS FIELDS

The Result Status Field for Printer operations is a twenty-four (24) bit information field. For simplicity, bits are referenced by their bit number, the first bit being bit 1 (leftmost) and the last bit being bit 24 (rightmost). Bit meanings are discussed below.

### RESULT STATUS BIT MEANINGS

Conditions reported in the result status field are described in the following paragraphs. The tables to follow show the reader which result bits are valid for each of the Controls. A result status bit is set only if the condition is true, otherwise it is cleared to zero. Note that some result bits have different meanings for different Printer Controls.

#### OPERATION COMPLETE (BIT 1)

BIT 1: Bits 1 and 17 are set to indicate that the operation is complete.

#### EXCEPTION CONDITION

BIT 2: Bit 2 indicates an exception condition and is set if one or more of bits 3 through 8 are set (Dependent on the Printer Control). PC 5/6/7 will also set the exception bit if an invalid op (000 or 011) is received.

#### NOT READY

BIT 3: If at the start of any operation except TEST (V=1), the unit is NOT READY or goes NOT READY, the operation is terminated immediately and bit 3 is set. In the case of write, all controls will accept one buffer of write data before the result is returned.

For PC 5/6, NOT READY is reported on WRITE and SPACE/SKIP operations and the operation is not performed (even though the Printer is READY) if either a System Clear Signal was received or the Printer has changed from READY to NOT READY since the last operation. This permits software to test for change in Train ID.

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**LOAD-TRANSLATOR (PC 2/5/6 Only)**

The LOAD-TRANSLATOR op code has the following format:

```

-----
I  011V  ....  DD..  ....  ..T.  UUUU  I
-----
  
```

This op is valid only for Printer Controls 2/5/6. Load data to the Translator Memory. For PC 2 the data must define the code for the 192 graphics on the train plus the code for blank. For PC 5/6, the data must define a graphic position for all possible (256) internal codes plus one 8-bit binary code indicating the number (0 = 16 and 13; 1 = 43; 2 = 64 and 72; 3 = 96; 4/12/20/24 = 192) of graphics in the set. For PC 6, the 4-th and 5-th bits from the right of the byte used to indicate the 192 graphic train are used to partially define the graphic to be printed for invalid codes.

V = 1 Enable hard translation of 1100 0000 and 1101 0000 for PC 2 and PC 2K and hard translation of 1011 1110 for PC 2K.

DD = (Applicable to PC 5/6 only)  
 See P.S. 2208 3013 (Printer Controls)

T = 0 Normal Load  
 = 1 T is 1 if any of the D variants are 1.

UUUU = Unit Number of the selected Printer.

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V = 1 If this operation calls for single or double spacing and if the EOP signal from the Printer is true, then skip to Channel 1 after printing instead of spacing. Do not report the EOP.

DDD = (Applicable to PC 5/6/7 only)  
See P.S. 2208 3018 (Printer Controls)

P = (Applicable to PC 7 only)  
See P.S. 2208 3018 (Printer Controls)

T = 0 Normal Write  
1 If PC 5/6/7 and any D variant is 1.

UUUU = Unit Number of the selected Printer.

NOTES:

Printer Control 2 will execute a skip to Channel 1 after printing if V=1 and the EOP signal is true even though the operation calls for a skip. Therefore, V=1 and the skip are not a permitted combination.

If the operation calls for Double Spacing and should the STOP button be depressed during the operation, causing the Printer to go not ready after skipping only one line PC-4/7 will wait until the Printer becomes ready, then execute the second line of spacing and then return a result. The result status field should indicate a ready condition.

PC4/7 requires a field adjustment if the 12-Channel tape is not installed in the Printer in order to invert the always true state of the EOP signal. In this case an EOP true signal is impossible. Also, when the 12-Channel tape is not installed all skips, except skip to Channel 1, will result in a skip to Channel 2.

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FFD -- 2A1000U2  
 Send a SPACE/SKIP oo, skip to Channel 1.

SKI -- 2AE000U3  
 Send a SPACE/SKIP oo, single space variant.

EXAMPLE -- LOGICAL COMMAND

Assume that the Field Engineer wished to visually verify the character alignment of LPA on a given system. A printed line of the character "H" is known to be a fast and easy means for visually verifying character alignment for a print chain. The BOLT commands necessary to accomplish this task are shown below. (Anything following the "%" is a comment to the reader and would not be present in operator input).

UNIT CONTROL LPA;	% Get LPA & Control for testing
DATA [0] "H";	% Data pattern of all "H"
LENGTH [0] 132;	% One complete (132 char) line
WRI;	% Write H's to LPA
DISP DESC [0];	% Look at result descriptor
:	
:	

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## ERROR DOCUMENTATION

When an error is detected during the execution of a test section the operator is informed of the device being tested, the current section number, the error number, and what error occurred. For example, from Figure 2 we have:

LPA: SEC #2: ERR #2: SINGLE SPACE WRITE OP FAILED.

To find further explanation of the error, one would look in this document for the description of Section #2 (End Address Test), looking specifically at the documentation for ERROR #2. The error is described in more detail, methods for possible correction are sometimes given, and other tests (if any) that can be run are specified. For error 2 of section 2 one would find the following explanation:

### ERROR 02

Section 3 makes sure that each character in the Line Printers Character Set can be printed (consistently). It does this by selecting the next character and printing a full line of it three times. The first line is printed with a Single Space WRITE op @4E000U@. The WRITE op has failed, timed out, or completed with an exception condition.

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#### WHEN AN ERROR IS DETECTED

The previous section assumed that no errors were detected during the execution of test sections. When an error is detected during the execution of any test section, and the BOLT display options are enabled, the operator will see the following information displayed.

1. An error message telling what the error was, which section it occurred in, and the error number.
2. If the error was on an IO then the result descriptor will be shown with a list of the bits that are on.
3. If the error was on a data compare then a portion of the expected data and data obtained are displayed with mismatches marked. The total number of data mismatches will be given. See BOLT COMPARE command for more details.

For example, assume that the Default Confidence Test Sections are being executed, as in the previous section, and that the Line Printer goes Not Ready just before Section #2 (End Address Test) starts. The resulting output is shown in FIGURE 2 below.

The ERROR DOCUMENTATION section of this document describes what the operator should do in case an error is detected.

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## SUGGESTED TESTING PROCEDURE

Given below is a suggested testing procedure which should, hopefully, produce optimum results.

## RUN THE DEFAULT TEST SECTIONS

When testing any printer device for which the On-Line Line Printer Test Routine is written, the Default Confidence Test Sections should be executed first, using the default parameters for those tests. To run the default test sections in this manner one need only enter the UNIT command, specifying the mnemonic of the Line Printer to be tested, followed by the GO command. Of course this assumes that the unit is available for BOLT. For example, assume the device to be tested is LPA. The minimum operator input would be:

```
UNIT LPA; GO;
```

When the unit specified (LPA) is successfully obtained for use, BOLT loads the list of Default Confidence Test Sections. Then it calls a special test initialization procedure in the Line Printer Test which makes sure the unit is valid (PC2 - PC7) and tries to determine the Printer Chain Id (see CHARACTER SET IDENTIFICATION). These actions are caused by the UNIT command. See INITIALIZE/RESTORE PRINTER TEST for more details.

The GO command causes the execution of the test sections loaded by the UNIT command. Execution is achieved by calling the Line Printer Test with the number of the test sections to be run. If for some reason the Printer Chain Id could not be determined during test initialization, the operator will be asked to supply that information before execution begins. See INITIALIZE PRINTER SECTION for more details.

When the default sections (or any sequence of test sections) run, the operator should see a 30J message for the Line Printer Test, a 30J and 40J message for each section run, any errors detected during execution, an 40J message for the Line Printer Test, and the number of errors detected during the execution of all test sections. FIGURE 1 below gives an example of the ODT output if the default sections are run on LPA, and no errors were detected.

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#### DEFAULT PARAMETERS (DATA, LENGTH, RECORDS)

The default data, default length (of data), and default records (to be printed) will vary from test section to test section. Obviously, a length greater than 132 is invalid for any Printer, and thus any Printer Test Section.

If a test section is sensitive to LENGTH, and LENGTH is greater than 132, an error message will be given and the test section will not be run. If a test section is not LENGTH sensitive, but LENGTH is greater than 132, a warning message will be given and the test section will be run. See INITIALIZE PRINTER SECTION for more details.

Default data patterns should be such that invalid characters are not printed. Operator entered data, for data sensitive test sections, may cause invalid characters to be printed; thus raising unexpected exception conditions. As a result, the test section may not run as expected.

In test sections where the operator can change test parameters (DATA, LENGTH, RECORDS), those parameters are fixed once the test section has begun. Also, once a default parameter has been changed for one test section, any test section which is operator sensitive to that parameter is also affected.

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2. Printer Controls 5 and 6 also return the same Control Id. High Speed Printers attached to these controls return a Character Set Id; Low Speed Printers do not. If an invalid Character Set Id is returned, or the Printer is Low Speed, the operator will be asked to select and enter the Character Set using the BOLT "CHAIN" command.
3. Printer Control 7 returns a unique Control Id but no Character Set Id. However, only the 48, 64, and 96 EBCDIC Character Sets can be present. The Printer Test defaults to the 64 EBCDIC Character Set.

The BOLT operator may override the Printer Tests Character Set selection by entering the BOLT "CHAIN" command.

#### SYSTEM/TRAINABLE FILE

On system disk there should be a file called "SYSTEM/TRAINABLE" which the MCP uses to extract translate table and character set information. The On-Line Line Printer Test Routine also makes use of this file for the same reason. To run most Printer Test Sections the file must be present on disk. More details on when this file is needed are given in the "INITIALIZE/RESTORE PRINTER TEST" and "INITIALIZE PRINTER SECTION" portions of this document.

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## CHARACTER SET IDENTIFICATION

If the On-Line Printer Test cannot determine the proper Character Set for the selected Printer the operator will be asked to supply that information. At present the Printer Test can recognize the following character sets:

1	--	16 CHARACTER EBCDIC
2	--	18 CHARACTER EBCDIC
3	--	48 CHARACTER EBCDIC
4	--	48 CHARACTER FORTRAN (Standard)
5	--	48 CHARACTER FORTRAN (Non-Standard)
6	--	48 CHARACTER 3500
7	--	48 CHARACTER RPG
8	--	64 CHARACTER EBCDIC OR BCL
9	--	72 CHARACTER EBCDIC
10	--	72 CHARACTER ASCII
11	--	72 CHARACTER ALPHABETIZED
12	--	72 CHARACTER NUMERIZED
13	--	96 CHARACTER EBCDIC
14	--	144 CHARACTER THIALAND

(The number before the character set indicates the internal code used by the Printer Test)

Character set selection depends on the Printer Control Id and the Character Set Id returned in a Test op result status field (for those printers returning such information). The following notes will be helpful in determining when the Printer Test can and cannot determine the Character Set Id.

1. Printer Controls 2, 3, and 4 return the same Control Id, but only PC2 returns a Character Set id. Character Set Ids returned by PC2 are:

0	--	64 CHARACTER EBCDIC OR BCL
1	--	48 CHARACTER
2	--	16 CHARACTER EBCDIC
3	--	96 CHARACTER EBCDIC
4	--	48 CHARACTER FORTRAN (STANDARD)
6	--	48 CHARACTER RPG
7	--	48 CHARACTER FORTRAN (NON-STANDARD)

Printer Controls 3 and 4 will return the equivalent of a 64 CHARACTER EBCDIC set since they do not set the ID field in a TEST result descriptor.

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## OPERATING INSTRUCTIONS

This section of the document will familiarize the reader with the basics of running the On-Line Line Printer Test Routine. The first topic discussed is the "special requirements" of some of the test sections, followed by some facts the operator should be familiar with when running any test section. Next a suggested testing procedure is given, outlining a method of testing which should produce optimum results. Following that, the reader is informed of some special "Logical Commands" which are available for use with a Printer.

### ABOUT LINE PRINTER TEST SECTIONS

Line Printer Test Sections, for the most part, are pre-defined tests which run with some default parameters. Some test sections allow the operator to change default parameters. A Test Section is said to be "operator sensitive" if the BOLT operator can change test parameters using one of the valid BOLT commands. For example, the data pattern used for WRITE operation may be "operator sensitive". This means that the operator may enter the BOLT DATA command to alter data used for the WRITE operation. The ability to, or not to, change test section parameters becomes evident in the description of each test section.

Note that all test sections are "sensitive" to operator input in that the operator may enter a BOLT command to change the program flow (e.g. CLEAR, RESTART, EXIT, LOCK, ... etc). The above definition refers only to commands affecting test section parameters (e.g. DATA, LENGTH, and RECORDS).

### ON-LINE TEACH FACILITY

BOLT provides an On-Line teach facility for the Line Printer Test Routine. A brief description of the Printer Test can be obtained by entering "TEACH LP". Similarly, a brief description of any valid Line Printer Test Section can be obtained by entering "TEACH LP <number>".

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### BACKGROUND INFORMATION

It is intended that this section of the document give the reader enough background information about Printer Controls and Line Printers so that the sections to follow are easier to understand. In some cases, the reader is referred to related documents for more detailed information.

### GENERAL

As stated above, the On-Line Line Printer Test is written to test Printer Controls (PC) 2 through 7. Each Printer Control can control a variety of Printers. The table below gives the major characteristics of the Printers that can be controlled by each Printer Control.

CONTROL -----	PRINTER -----	LINES PER MINUTE -----	NUMBER OF COLUMNS -----
2	89247	400/750	120/132
3	89243	860/1100	120/132
	89240	475/700/1040	120/132
	89245	150/300/400	120/132
	89246	1300	132
4	89249	86/150/250/375	132
	89246	320/650	132
5	89247	400/750/1100/1500	120/132
6A	89247	1100/1500	132
7	89249	86/150/250/375	132
	89246	320/650	132

Printer Controls 3/4/6/7 each consist of one logic card. Printer Controls 2/5 each consist of two logic cards. PC-2/3/4/4/5/7 operate with a system clock of 2, 4, or 6 megahertz. A Control can be assigned any channel number from zero (0) to fifteen (15), except for PC 6 which can only be assigned a channel number from zero (0) to seven (7).

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## INTRODUCTION

The LINE PRINTER TEST is one test procedure in the BOLT software system. It is designed to test Line Printer Controls 2 through 7. Because of the On-Line diagnostic capabilities of some Printer Controls under the MCP, and the special requirements of some test sections, the Line Printer Test Sections have been divided into three logical groups. They are Default Confidence Test Sections, Optional Confidence Test Sections, and Optional Diagnostic Test Sections.

### DEFAULT CONFIDENCE TEST SECTIONS

Default Confidence Test Sections operate the Control as a whole unit, using operations similar to those that would be encountered in normal operation of the unit. These test sections are used to gain confidence in the reliability and operability of the Control. They are common to all Printer Controls, and will run by default.

### OPTIONAL CONFIDENCE TEST SECTION

The Optional Confidence Test Sections are basically functional tests, testing the Control's ability to recognize and report certain conditions (e.g. Not Ready, Ready, ... etc). They are common to all Printer Controls (with the exception of sections 30 and 31), but will not run by default because operator intervention is required for each.

### OPTIONAL DIAGNOSTIC TEST SECTIONS

The Optional Diagnostic Test Sections are a series of test routines designed to exercise all logic functions of the Printer Control that can be tested On-Line. Starting with the smallest subset of functions possible, each subsequent test section will attempt to activate a more complex operation, utilizing functions already tested previously. These test sections should aid the Field Engineer in locating the cause of a specific error. They are not common to all Printer Controls, and do not run by default.

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