CHAPTER 6
OPTIONS

6.1 GENERAL

This chapter provides information on the following LA210 Letterprinter options.

- Font cartridges
- Font ROM chips
- Parallel interface

Font cartridges and font ROM chips store dot pattern sets (DPSs). The parallel interface lets the printer receive parallel data from the host.

6.2 FONT CARTRIDGES AND ROM CHIPS

The LA210 Letterprinter uses dot pattern sets (DPSs) to select different fonts, character sets, or character pitches. The DPSs are stored on font cartridges and ROM chips. There are two types of ROM fonts: internal ROMs and ROM cartridges. Internal ROMs plug into slots on the logic board (Figure 5-11). The ROM cartridges are inserted in two slots on the font assembly (Figure 6-1).

The printer stores from one to five DPSs (three internal, two external) at any given time. A DPS consists of either one or two 94-character ROMs. A DPS consisting of only one standalone ROM is called a primary ROM. If the DPS consists of two ROMs, one is the primary ROM and the other is the complementary ROM, or overlay. Appendix C lists the different DPSs that you can order.

In the standard configuration, the printer has three internal DPS ROMs on the logic board. From the control panel, you can force (select) a DPS whether it is installed in the printer or on a ROM cartridge. You can also select a DPS by sending an escape sequence from the host.

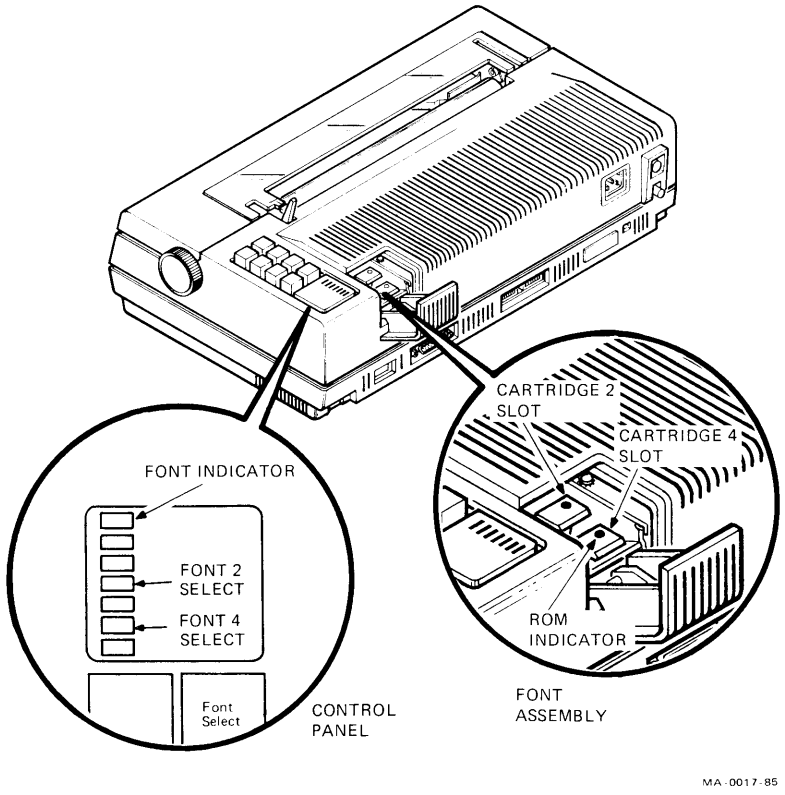

Figure 6-1 Font Assembly

6.2.1 Font Cartridges

The font assembly is under the door next to the control panel. The font assembly has two slots -- one for font cartridge 2 and one for font cartridge 4. Each slot has a microswitch that sends a signal when you insert or remove a cartridge. Use the **Font Select** switch on the control panel to select the fonts. The control panel also has five font indicators. Each indicator corresponds to a DPS.

You can insert a primary cartridge in either slot 2 or 4. When you install two cartridges, the primary must go in slot 2 and the overlay in slot 4. The overlay cartridge does not print when used alone.

6.2.1.1 Checkout -- The following tests and procedures check that the ROM cartridge is installed correctly.

Cartridge electrical insertion test (If correct, font cartridge indicator lights.)

Insertion power-up/checksum test

Status test

NOTE

The selected DPS remains active until you either turn off the power to the printer, remove the DPS, or press the Font Select switch again.

When you select a DPS by pressing the Font Select switch, only those DPSs installed (in the font ROMs) are available.

If the appropriate font indicator does not light when you insert a font cartridge, remove the cartridge and then reinstall it. If the indicator still does not light, replace the cartridge.

6.2.2 Power-Up Checksum Test -- When you turn on the power or insert a cartridge, the printer performs an internal check. It tries to access the DPS ROMs. Any DPS ROM present is tested. If the test fails, the printer indicates the faulty DPS ROM by flashing the data set ready and power/fault indicators (Table 7-1).

If the test detects an error, turn off the power to the printer. The test checks the DPS ROMs sequentially until it detects a failure. If there is a failure, make sure the cartridge is correctly installed. If there is still no change, replace the faulty cartridge and then turn the power back on.

6.2.2.1 Status Test -- Print the status message to check that the printer recognizes an installed DPS. The third line of the status message lists a different 3-digit ROM identification code for each DPS installed. Table 6-1 lists the DPSs available and the corresponding ROM identification codes.

Table 6-1 ROM Identification Codes

ROM Cartridges ID Code	DPS
001	US/UK Gothic 10 high density primary
002	International Gothic 10 high density overlay
003	US/UK Gothic 12 high density primary
004	International Gothic 12 high density overlay
005	US/UK Courier 10 high density primary
006	International Courier 10 high density overlay
007	US/UK Courier 12 high density primary
008	International Courier 12 high density overlay
009	US/UK Orator 10 high density primary
010	International Orator 10 high density overlay
069	US/UK Courier 10 medium density primary
070	International Courier 10 medium density overlay
073	US/UK Orator 10 medium density primary
074	International Orator 10 medium density overlay
120	Symbol 10 high density primary
002	Multinational Gothic 10
004	Multinational Gothic 12
006	Multinational Courier 10
008	Multinational Courier 12
010	Multinational Orator 10
070	Multinational Courier 10
074	Multinational Orator 10
131	VT100 10 characters/inch
133	VT100 12 characters/inch
193	VT100 10 characters/inch
131	Olde English primary
136	DEC Technical
144	Katakana 10 overlay
169	Optical Character Reader A 10 primary
171	Optical Character Reader B 10 primary
Cartridges	
001	Gothic 10
002	Gothic 10 overlay
002	Multinational Gothic 10
004	Gothic 12 overlay
004	Multinational Gothic 12
005	Courier 10
006	Multinational Courier 10
008	Multinational Courier 12
008	Courier 12 overlay
010	Multinational Orator 10
011	Italics

Table 6-1 ROM Identification Codes (Cont)

ROM Cartridges ID Code	DPS
069	Courier 10 80 cps
070	Courier 10 80 cps overlay
070	Multinational Courier 10
073	Orator 10 80 cps
074	Orator 10 overlay
074	Multinational Orator 10
131	Olde English primary
131	VT100 10 characters/inch
135	DEC Technical
133	VT100 12 characters/inch
136	APL 10 overlay
137	MX80 Mosaic
139	IBM Line Drawing
141	IBM Foreign
143	Graftrax
144	Katakana 10 overlay
169	Optical Character Reader A 10 primary
171	Optical Character Reader B 10 primary
193	VT100 10 characters/inch

1 -- 64 = High density standard DPS
65 -- 128 = Medium density standard DPS
129 -- 192 = High density special purpose DPS
192 -- 200 = Medium density special purpose DPS

NOTE

A standard DPS with an odd ID code indicates a primary DPS containing the US and UK character sets. A standard DPS with an even ID code indicates an overlay DPS containing the following character sets.

ISO United Kingdom
US ASCII
Digital Finnish
Digital Norwegian/Danish
Digital Swedish
ISO German
Digital French Canadian
ISO French
ISO Italian
ISO Spanish
Digital Multinational or VT100 Line Drawing

The printer prints a status message when the On Line/Off Line switch is in the off-line (down) position and the Normal/Self Test switch is pressed into the Self Test (down) position.

The status message has three parts: the DPS identification, the printer settings, and the communication settings. Figure 6-2 is a sample of the status message printout.

```
LA210  V2.1   R0
Emulation mode 0
2K Buffer
DPSs: 006...131......

*Printer Settings

Form Length (1/24):264
G0 Character set:United States
G1 Character set:Line drawing
G2 Character set:DEC Multinational
G3 Character set:United States
GL Set mapping:G0
GR Set mapping:G2
Pitch Mode:All Pitches
Horiz pitch (cpi):10
Vert pitch (lpi):6
End of line control:wrap mode
New Line request char.:none

*Communication Settings

Auto-answerback:Disabled
Disconnect on EOT:Disabled
Paper fault processing:XOFF (if enabled)
Parity:8/N
Receiver error:Print error block
Speed(bps):4800
Auto XON/XOFF:Enabled
Modem Control:No Modem Control-Restraint Mode
C1 receive:Disabled
C1 transmit:Disabled
```

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Figure 6-2 Status Message

NOTE

A DPS occupies a single position in the status message whether it contains only a primary DPS ROM or a primary DPS ROM and its overlay.

To be sure that the primary and the overlay ROMs are correctly installed, check that the DPS number in the status message matches the DPS ROM pair and not just the primary DPS ROM.

If you do not install the primary DPS ROM correctly, neither the primary DPS ROM nor the overlay is reported.

There is always a DPS in slot 1 (inside the printer), so the status message always prints a 3-digit code for DPS 1. If a DPS is installed in slot 2, the message has a 3-digit code for slot 2.

6.3 FONT ROM CHIPS

The plug-in ROM options are listed in Appendix C. The following paragraphs summarize functional and operational information. For detail on each ROM option, refer to the option installation guide.

6.3.1 General

A minimum of one and a maximum of three DPS ROMs are plugged into the printer's logic board at any given time.

A DPS is stored in a ROM. A single 64K ROM contains about 94 characters. A DPS can consist of either one or two 94-character ROMs. If the DPS consists of just one ROM, this standalone ROM is a primary ROM. When a DPS consists of two ROMs, one is a standalone ROM and the other is a complementary ROM, or an overlay. An overlay cannot be used by itself.

Three types of DPS ROMs are used with the printer.

28-pin Texas Instruments 2564 and equivalent EPROMs
24-pin Motorola 68766 and equivalent EPROMs
24-pin 64K ROMs

CAUTION

Use only DPS EPROMS approved for use in the LA21Ø.

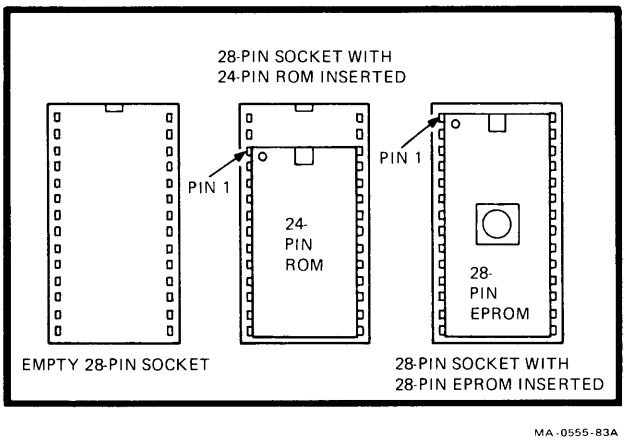

Figure 6-3 Inserting ROMs

Bottom justify 24-pin ROM/EPROMs by inserting pin 1 of the ROM/EPROM into pin 3 of the socket (Figure 6-3).

Install 28-pin EPROMs with pin 1 of the EPROM inserted into pin 1 of the socket.

6.3.2 Installation

You can install up to five DPSs at one time. Sockets 1, 3, and 5 are inside the printer. Sockets 2 and 4 are in the font assembly next to the control panel (Figure 6-1).

A DPS ROM must be installed in socket 1 or the printer cannot function. When you install a DPS with an overlay, you must install the primary ROM in socket 1 and the overlay in socket 5.

CAUTION

Always hold ROM chips by the plastic body. Be careful not to touch the pins with your hands. Static electricity buildup on the hands can damage the chip.

Remove a ROM chip as follows.

1. Turn off the power and unplug the power cord.

2. Remove the logic board (Paragraph 8.4).

3. Find the ROM you want to remove on the logic board (Figure 5-11).

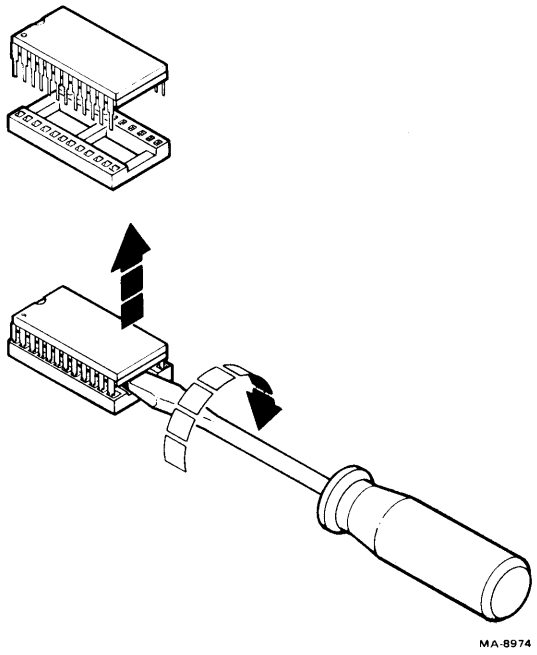

Figure 6-4 Removing Internal ROMs

4. Insert the tip of a small slotted screwdriver between the ROM and the receptacle. Then turn the screwdriver gently from side to side until the pins are free (Figure 6-4). Do not use a rocking motion to remove the ROM.

5. Remove the ROM. If you have a conductive carrier, mount the original ROM in the carrier for storage.

Install a ROM chip as follows.

1. Unpack the ROM and remove it from the shipping carton.

2. Ground your hand by touching a metal part on the printer mechanism assembly. Then check ROM for damage.

3. With pin 1 of the ROM (identified by a small dot) in the upper-left corner, carefully engage all pins in the connector sockets. Make sure to install the chip as shown in Figure 6-3.

4. Gently press the chip straight in until it is fully seated. Do not use a rocking motion to force the ROM in.

5. Make sure all ROM pins are engaged and the dot is in the upper-left corner.

6. Replace the logic board.

6.3.3 Checkout

Two tests verify that the DPS ROM is correctly installed -- a power-up test and the status test. Perform both tests to check for correct operation.

The most common mistakes made when installing the DPS ROMs are as follows.

Installing the DPS ROM in reverse (pin 1 of ROM inserted into pin 15 of socket)

Bent DPS ROM pins

24-pin ROM shifted (pin 1 of ROM in pin 1 or pin 2 of socket)

Wrong ROM slot used (inverting location of primary DPS ROM and overlay)

Installing an overlay with no primary DPS ROM

6.3.3.1 Power-Up Test -- When power is applied, the printer performs an internal check. The printer tries to access the DPS ROMs and if a DPS ROM is present, the printer performs the checksum test. If the test fails, the printer indicates the faulty DPS ROM by flashing the data set ready and power/fault indicators (Table 7-1).

NOTE

The DPS ROMs are checked sequentially and only the first failure is displayed.

Replacing a faulty DPS ROM incorrectly can cause another failure. For example, the printer may not power up at all, or it may be unable to access the ROMs.

Always reinstall the last DPS you inserted before replacing the DPS indicated by the power-up test. If the error persists after reinstalling the DPS, replace the DPS ROM.

6.3.3.2 Status Test -- You can print the status message to check if the printer recognizes an installed DPS (refer to Paragraph 6.2.2.3). The third line of the status message contains a different 3-digit code for each DPS installed. Table 6-1 lists the currently available DPSs and the corresponding ROM identification codes. Figure 6-5 shows the ROM identification codes in the status message.

There is always a DPS installed in slot 1 (inside the printer), so the status message always prints a 3-digit code for DPS 1. If a DPS is installed in slot 2, the message has a 3-digit code for slot 2.

For slots that do not have a DPS installed, or have a DPS installed incorrectly, the status message shows three periods. The status message in Figure 6-6 that the printer does not find a DPS in slot 2.

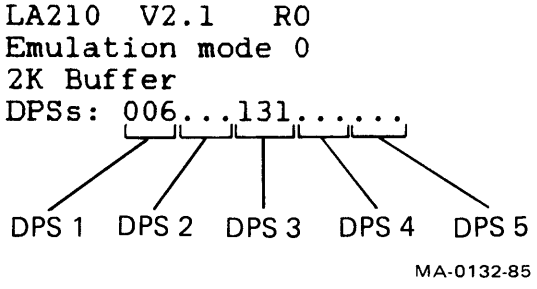

Figure 6-5 ROM ID in Status Message

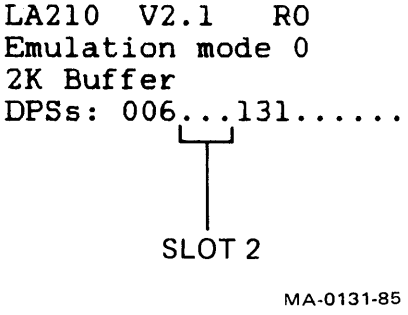

Figure 6-6 No DPS Found in Slot 2

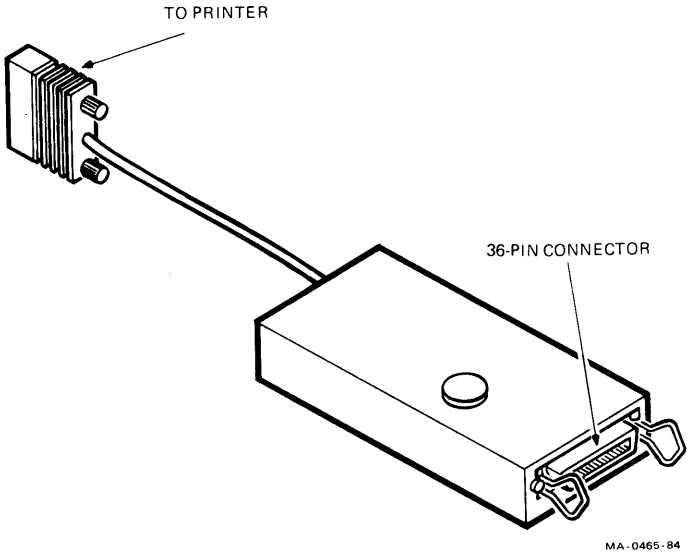

Figure 6-7 LA1ØX-EP External Parallel Interface Adapter

6.4 LA1ØX-EP EXTERNAL PARALLEL INTERFACE

The LA1ØX-EP parallel interface allows the printer to receive parallel data from a host. It converts parallel data to EIA RS232C format and transmits this data to the printer's control/logic board.

The LA1ØX-EP is a small, standalone metal box with a single-height board inside. The LA1ØX-EP connects to the printer by a hardwired cable with the standard EIA 25-pin connector. External interface with the host computer is through a 36-pin connector (Figure 6-7). The LA1ØX-EP is easy to remove and install.

For more information, see the LA1ØX-EP External Parallel Interface Adapter User Guide (EK-L1ØEP-UG).

6.4.1 Interface Cables

The LA1ØX-EP can use either a DEC communications cable (PN 7Ø21511) or an IBM/TI/Centronics cable (vendor PN RØØ17).

CHAPTER 7
TROUBLESHOOTING

7.1 GENERAL

This chapter has troubleshooting and testing information for the LA21Ø Letterprinter. You can use this chapter together with Chapter 5 and the LA21Ø Field Maintenance Print Set to help identify and solve any failure in the printer.

7.2 TROUBLESHOOTING FLOW

Troubleshoot a failure by first identifying the symptoms. Refer to the troubleshooting chart (Figure 7-1) and the troubleshooting tables (Paragraph 7.2.3) to find out which field replaceable unit (FRU) probably caused the failure. Troubleshooting uses two kinds of tests -- the self-tests and the functional tests. The self-tests check the printer operating modes. The functional tests troubleshoot down to the component level.

The symptoms displayed can represent more than one failure. Also, the symptoms can change as you replace FRUs. Always base your troubleshooting on the current symptoms.

Newly replaced parts are sometimes faulty. Remember that a corrected failure can happen again, even though you have just replaced the faulty FRU.

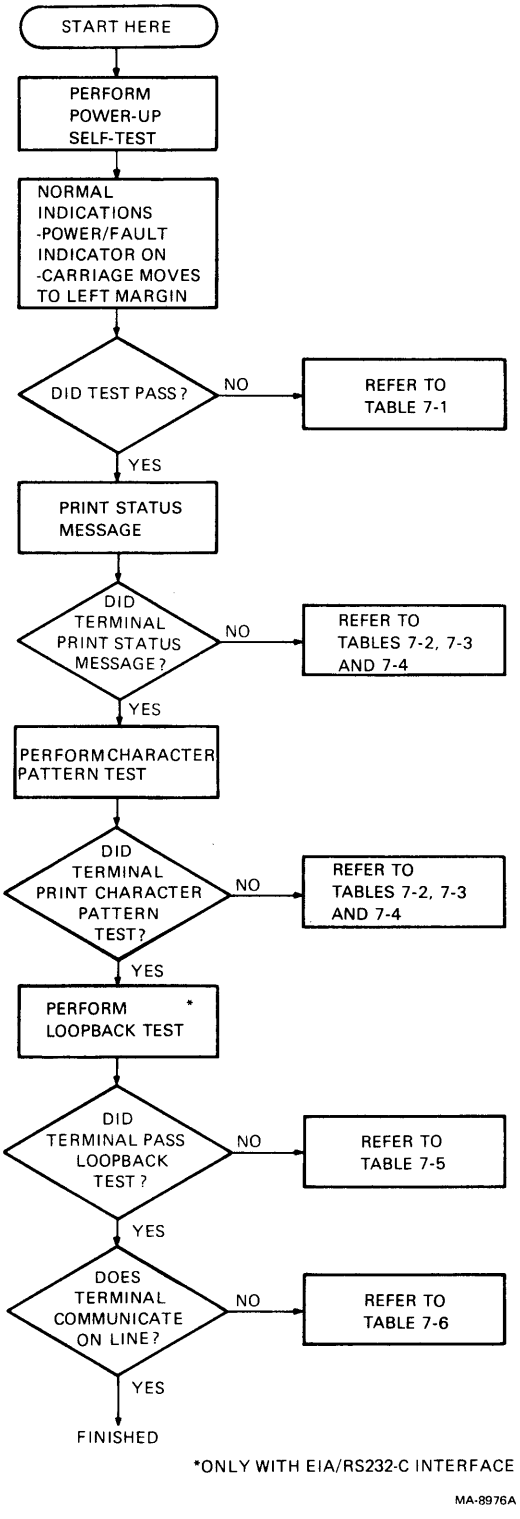

Figure 7-1 Troubleshooting Chart

7.2.1 Self-Tests

The printer has self-tests that check printer operation and the major components. Paragraph 3.5 describes the power-up and printer self-tests. Most of the printer self-tests provide a printout. When troubleshooting, compare the test output with the examples in Paragraph 3.5. The status message printout (Figure 7-2) shows the current microcode version, the DPSs installed and the features set in operating memory.

NOTE

Run a printer self-test and get a status message after performing any test or repair.

```
LA210  V2.1   R0
Emulation mode 0
2K Buffer
DPSs: 006...131......

*Printer Settings

Form Length (1/24):264
G0 Character set:United States
G1 Character set:Line drawing
G2 Character set:DEC Multinational
G3 Character set:United States
GL Set mapping:G0
GR Set mapping:G2
Pitch Mode:All Pitches
Horiz pitch (cpi):10
Vert pitch (lpi):6
End of line control:wrap mode
New Line request char.:none

*Communication Settings

Auto-answerback:Disabled
Disconnect on EOT:Disabled
Paper fault processing:XOFF (if enabled)
Parity:8/N
Receiver error:Print error block
Speed(bps):4800
Auto XON/XOFF:Enabled
Modem Control:No Modem Control-Restraint Mode
C1 receive:Disabled
C1 transmit:Disabled
```

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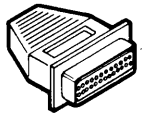
Figure 7-2 Status Message



FROM PIN	TO PIN	TO PIN
2	3	–
4	5	–
20	6	–
19	22	–
12	23	8

EIA

MA-7266C

Figure 7-3 Loopback Connector

7.2.2 Loopback Test

The loopback test checks the printer's communication control signals. It also checks the printer's ability to transmit and receive characters. During the loopback test, the loopback connector connects the transmit and receive lines (Figure 7-3). The loopback test is described in the following paragraphs.

The loopback test requires an EIA/RS232-C interface. There is no loopback test for the parallel interface configuration. In the loopback test, the printer transmits characters on the transmit lines and receives the characters on its receive lines. The printer checks the control signals as well as the baud rate and parity. The printer compares the transmitted data with the received data and prints two of the following messages (one for the control lines, the other for the data path).

```
Control line OK
Control lines failed (20 mA ?, jumpers ?)
Data path OK
Data path failed
Data path stopped
```

NOTE

The printer prints

Control lines failed

when the EIA circuit jumpers are removed. In this case, the control lines are not used.

7.2.2.1 Loopback Test Procedure -- The following procedure describes how to run the loopback test.

1. Turn off the power.

2. Unplug the communication cable from the back of the printer.

3. Connect the loopback connector to the printer EIA interface connector.

4. Turn on the power.

5. Press and lock the **On Line/Off Line** switch in the Off Line (down) position.

6. Press and lock the **Normal/Self Test** switch in the Self Test (down) position. The printer prints the status message (Figure 7-2).

> NOTE
> If the Normal/Self Test switch is already in the down position, release the switch and then return it to the down position.

7. Press the **Set Top of Form** switch to start the loopback test. When the test is complete (in about 2 minutes), the printer prints either a pass or fail message. Refer to Paragraph 7.2.2 for a sample pass message.

7.2.3 Troubleshooting Tables

Tables 7-1 through 7-7 list the most common printer failures, their symptoms, and corrective actions. Check for symptoms in the order given in the tables. Each table describes a different failure.

Table 7-1 Power-Up Failures
Table 7-2 Carriage Motion Failures
Table 7-3 Paper Feed Failures
Table 7-4 Print Quality Failures
Table 7-5 Loopback Test Failures
Table 7-6 Communication Failures

Table 7-1 Power-Up Failures

Symptom	Probable Cause	Solution
Data set ready (DSR) and Power/fault (P/F) indicators off, no carriage motion.	Power fuse (F1).	Replace fuse.
	Printer not plugged in.	Plug in.
	No power at wall receptacle.	Try a different receptacle. Next, check the breaker. Finally, call an electrician.
	Voltage select switch setting is incorrect.	Make sure voltage select switch on power supply is set to the proper range.
	Internal logic/ power cable.	Check cable.
	Power supply.	Replace power supply (Paragraph 8.6).
	Logic board.	Replace logic board (Paragraph 8.4).
DSR and P/F indicators off, but carriage moves.	Control panel cable.	Check control panel cable at J5 on logic board.
	Control panel assembly.	Replace control panel assembly (Paragraph 8.7).
	Logic board.	Replace logic board (Paragraph 8.4).
DSR and P/F flash one time.	ROM 1 defective or not present.	Replace logic board (Paragraph 8.4).
DSR and P/F flash two times.	Cartridge in slot 2 defective.	Replace cartridge (Figure 6-1).
	Bent pins in font assembly.	Replace font assembly (Paragraph 2.10).
DSR and P/F flash three times.	ROM 3 defective.	Replace logic board (Paragraph 8.4).

Table 7-1 Power-Up Failures (Cont)

Symptom	Probable Cause	Solution
DSR and P/F flash four times.	Cartridge in slot 4 defective.	Replace cartridge (Figure 6-1).
	Bent pins in font assembly.	Replace font assembly (Paragraph 2.10)
DSR and P/F flash five times.	ROM 5 defective.	Replace logic board (Paragraph 8.4).
DSR and P/F flash six times.	1st microcode ROM 0 defective.	Replace logic board (Paragraph 8.4).
DSR and P/F flash seven times.	2nd microcode ROM E defective.	Replace logic board (Paragraph 8.4).
DSR and P/F flash eight times.	RAM defective.	Replace logic board (Paragraph 8.4).
DSR and P/F flash nine times.	Input Buffer ROM defective.	Replace logic board (Paragraph 8.4).
DSR and P/F flash ten times.	ROM 0 defective.	Replace logic board (Paragraph 8.4).
DSR on or off, P/F flashing, no bell.	Access cover open, or paper fault.	Close cover, then press **Local Form Feed/(Reset)** switch.
	Cover interlock switch.	Replace interlock switch (Paragraph 8.16).
	Logic board.	Replace logic board (Paragraph 8.4).

NOTE

The access cover interlock switch is a magnetic proximity switch. Before replacing the switch, check the magnet in the access cover.

Table 7-1 Power-Up Failures (Cont)

Symptom	Probable Cause	Solution
DSR on or off, bell sounds, P/F flashing.	Head jam.	Clear jam. Check printhead gap. Press Local Form Feed/(Reset) switch.
	Carriage assembly.	Check carriage assembly to ensure that it moves freely.
	Servo motor/ encoder.	Check servo connector J1Ø on logic board, and connectors on servo motor/encoder assembly (Figure 8-6).
	Servo motor/ encoder assembly.	Replace servo motor/encoder assembly (Paragraph 8.1Ø).
	Logic board.	Replace logic board (Paragraph 8.4).
DSR and P/F on.	The printer is receiving the data set ready (DSR) signal and passes the power-up self-test.	
DSR off, P/F on.	The printer is not receiving the data set ready (DSR) signal and passes the power-up self-test.	

Table 7-2 Carriage Motion Failures

Symptom	Probable Cause	Solution
No printing, carriage does not move.	Paper-out switch.	If you are not feeding paper from bottom of printer, set switch to disable paper-out detection.
	Control panel cable.	Check cable connector at J5 on logic board (Figure 8-6).
	Control panel assembly.	Replace control panel assembly (Paragraph 8.7).
	Logic board.	Replace logic board (Paragraph 8.4).
	Power supply.	Replace power supply (Paragraph 8.6).
No printing, carriage moves.	Printhead adjustment.	Reset printhead adjust lever.
	Ribbon cartridge.	Replace ribbon cartridge.
	Printhead cable.	Check printhead cable connector at printhead and at J4 on logic board.
	Logic board.	Replace logic board (Paragraph 8.4).
	Printhead assembly.	Replace printhead assembly (Paragraph 8.2).
No printing, carriage slams to left or right.	Logic board.	Replace logic board (Paragraph 8.4).
	Servo motor/encoder assembly.	Check motor connections on logic board.
		Replace servo motor/ encoder assembly (Paragraph 8.10).
	Power supply.	Replace power supply (Paragraph 8.6).

Table 7-2 Carriage Motion Failures (Cont)

Symptom	Probable Cause	Solution
Printhead prints, but carriage does not move.	Logic board.	Replace logic board (Paragraph 8.4).
	Idler pulley.	Replace idler pulley (Paragraph 8.17).
	Timing belt broken or slipped out of carriage.	Check and replace timing belt if necessary (Paragraph 8.18).
	Servo motor/encoder assembly.	Replace servo motor/ encoder assembly (Paragraph 8.10).

Table 7-3 Paper Feed Failures

Symptom	Probable Cause	Solution
No line feeds.	Platen assembly not fully seated.	Check that drive gears are engaged correctly.
	Line feed motor connector.	Check line feed motor connector at J7 on logic board (Figure 8-6).
	Control panel cable.	Check cable connector at J5 on logic board (Figure 8-6).
	Control panel assembly.	Replace control panel assembly (Paragraph 8.7).
	Logic board.	Replace logic board (Paragraph 8.4).
	Line feed motor.	Replace motor (Paragraph 8.9).
	Antibacklash gear.	Replace gear.

Table 7-3 Paper Feed Failures (Cont)

Symptom	Probable Cause	Solution
No line feeds, cannot manually advance feed mechanism.	Logic board or line feed motor.	Replace board first. If problem continues, replace line feed motor (Paragraphs 8.4 and 8.9).
Bad line feeds (inconsistent vertical motion).	Paper path blocked.	Clear paper path.
	Platen assembly dirty.	Clean platen assembly.
	Platen assembly gears.	Check that gears are engaged correctly.
	Paper guide.	Check that paper guide is correctly seated.
	Line feed motor connector.	Check connector at J7 on logic board (Figure 8-6).
	Logic board.	Replace logic board (Paragraph 8.4).
	Line feed motor.	Replace line feed motor (Paragraph 8.9).
Continuous line feeds.	Control panel assembly.	Replace control panel assembly (Paragraph 8.7).
	Logic board.	Replace logic board (Paragraph 8.4).
Print line slanted up or or down during friction feed applications.	Friction feed.	Adjust or replace friction feed (Paragraph 8.11).
	Cams and paper release lever assembly.	Install new cam and lever assembly (Figure 8-10).
	Paper path blocked.	Clear paper path.

Table 7-3 Paper Feed Failures (Cont)

Symptom	Probable Cause	Solution
Print line slanted up or down during tractor feed applications.	Tractor assembly loose or twisted.	Check that sprockets are in line on both tractors. Check that tractor assembly is mounted correctly.
	Paper path.	Check that paper path is correct.
	Paper path blocked.	Clear paper path.
Flat descenders on characters (Figure 7-4).	Printhead cable.	Check printhead cable.
	Printhead/headlift cable assembly.	Replace cable assembly (Paragraph 8.14).

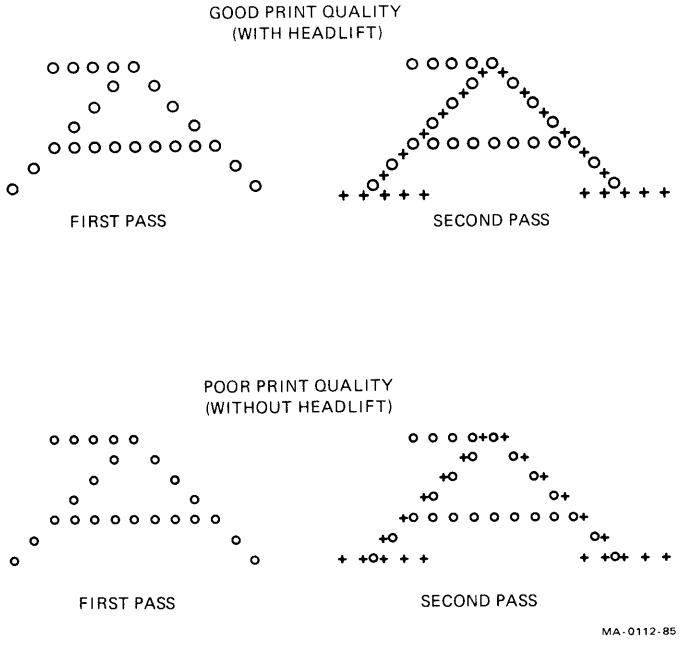


Figure 7-4 Flat Descenders Example

Table 7-4 Print Quality Failures

Symptom	Probable Cause	Solution
Characters missing.	Logic board.	Replace logic board (Paragraph 8.4).
Missing dots on all print characters. (Always same row missing.)	Printhead assembly.	Replace printhead assembly (Paragraph 8.2).
	Printhead cable.	Check connector at J4 on logic board (Figure 8-6).
	Logic board.	Replace logic board (Paragraph 8.4).
Missing dots on some characters.	Logic board.	Replace logic board (Paragraph 8.4).
	Ribbon cartridge.	Replace ribbon.
Incorrect characters print. (Character format correct.)	Incorrect character set selected.	Check character set selection.
	Logic board.	Replace logic board (Paragraph 8.4).
Print density drops off to no impression.	Printhead adjustment.	Reset printhead adjust lever.
	Ribbon cartridge.	Replace ribbon.
	Platen assembly.	Check if platen is seated correctly.
	Ribbon drive cables.	Check cables, replace if necessary (Paragraph 8.13).
	Ribbon drive pulley.	Replace printer mechanism (Paragraph 8.8).
Print density varies randomly across page.	Ribbon cartridge.	Replace ribbon.
	Ribbon drive cables.	Check cables and replace if necessary (Paragraph 8.13).
	Carriage assembly.	Replace printer mechanism (Paragraph 8.8).

Table 7-4 Print Quality Failures (Cont)

Symptom	Probable Cause	Solution
Prints light-to-dark or dark-to-light across page.	Printhead not parallel to platen.	Replace printer mechanism (Paragraph 8.8).
First few characters in line are light.	Ribbon cartridge.	Replace ribbon.
	Carriage bearings and shafts dirty.	Clean bearings and shafts. Relubricate.
	Ribbon drive cables.	Replace cables (Paragraph 8.13).
	Ribbon clutch.	Replace printer mechanism (Paragraph 8.8).
	Timing belt.	Replace timing belt (Paragraph 8.18).
Left or right margin moves in and out.	Timing belt.	Replace timing belt (Paragraph 8.18).
	Carriage bearings and shafts dirty.	Clean bearings and shafts. Relubricate.
	Ribbon cartridge.	Replace ribbon.
	Servo motor/encoder assembly	Replace servo motor/ encoder assembly (Paragraph 8.10).
	Logic board.	Replace logic board (Paragraph 8.4)

Table 7-5 Loopback Test Failures

NOTE
Check communication switch settings and jumpers on logic board.

Symptom	Probable Cause	Solution
Data error printout occurs.	Logic board.	Replace logic board (Paragraph 8.4).
	Power supply.	Replace power supply (Paragraph 8.6).
	Loopback connector.	Replace loopback connector.
Control line error occurs.	Logic board.	Replace logic board (Paragraph 8.4)
	Loopback connector.	Replace loopback connector.

NOTE
If a control line error occurs, check the EIA communication jumpers on the logic board. They must be in the factory configuration for RS232 interface.

Table 7-6 Communication Failures

NOTE
Check communication switch settings and jumpers on logic board.

Symptom	Probable Cause	Solution
No characters print.	Incorrect communication features selected.	Print status message. Check that correct features are selected.
	Modem unplugged or set up incorrectly.	Plug modem in. Check that correct features are selected. Refer to modem user guide.
Garbled characters print.	Incorrect communication features selected.	Print status message. Check that correct features are selected.
Double characters print.	Logic board	Replace logic board (Paragraph 8.4).
No answerback message.	Logic board.	Replace logic board (Paragraph 8.4).
No bell tone.	Control panel cable.	Check cable connector at J5 on logic board.
	Control panel assembly.	Replace control panel assembly (Paragraph 8.7).
	Logic board.	Replace logic board (Paragraph 8.4).

7.3 FUNCTIONAL TESTS

This section describes the functional tests that trained service personnel can use to troubleshoot a failure in the printer.

WARNING

Be careful when checking internal parts of the power supply. Exposed 120/230 Vac line voltage and internal voltages approaching 300 Vac are present.

CAUTION

The logic modules include static sensitive components. Before you handle these subassemblies for any reason, touch the printer chassis or some large metal object to remove static charges from your body.

NOTE

The functional tests may include several self-tests. These are described in Paragraphs 3.5 and 7.2 of this manual.

Figure 7-5 is a physical/functional block diagram of the printer. Refer to this figure when you perform the functional tests.

If you must remove the access cover for a functional test, first disable the access cover interlock switch. To do this, unplug P9 (Figure 7-5) and jumper J9 pin 5 and 6 together.

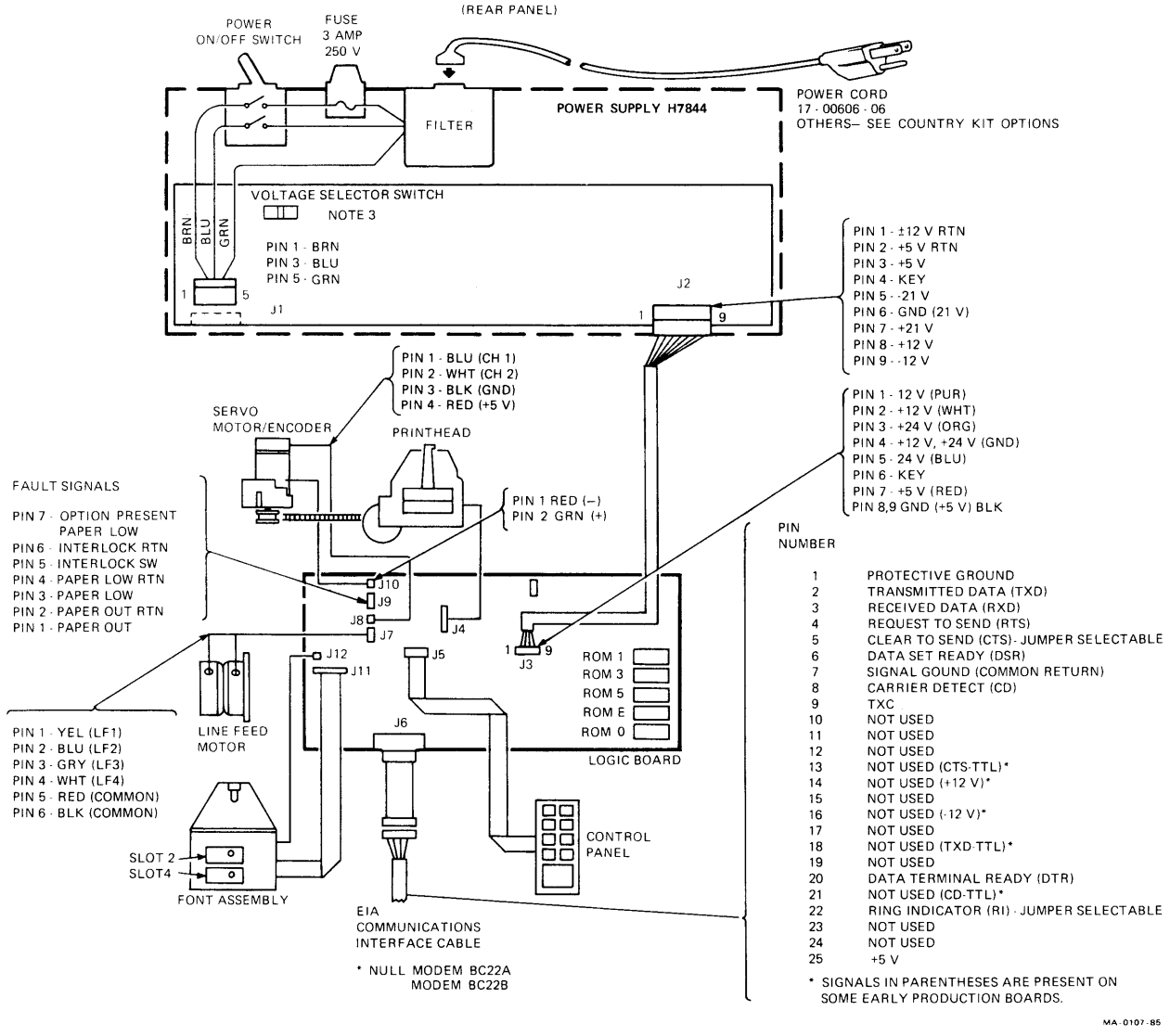


Figure 7-5 Physical/Functional Block Diagram

7.3.1 Power Supply Check

Table 7-7 lists the dc voltages and test points. You should check J3/P3 on the logic board with a digital voltmeter when under load. Do not unplug P3 from the logic board when making these measurements.

Table 7-7 DC Voltage Supply

Voltage (V)	Tolerance (V)	Logic Board Test Points (Figure 7-5)
+5.1	+/- Ø.25	P3-7 (red)
+12	+/- Ø.6	P3-2 (white)
-12	+/- Ø.6	P3-1 (purple)
+24	+/- 2.4	P3-3 (orange)
-24	+/- 2.4	P3-5 (blue)
Ø-24 (ground)	--	P3-4 (black) P3-9 (black)
Ø (logic ground)	--	P3-8 (black)

7.3.2 Basic Logic Board Tests

The following tests check the basic responses of the logic board.

7.3.2.1 Wake-Up Test -- This test checks the power-up response of the logic board.

CAUTION

Some logic board components get very hot. Wait at least 15 minutes before handling resistor R162 and transistors Q7 through Q24.

WARNING

Set the power switch to Ø (off) and disconnect the ac power cord.

1. Place a cushion on the work surface.
2. Rest the back of the printer on the cushion.

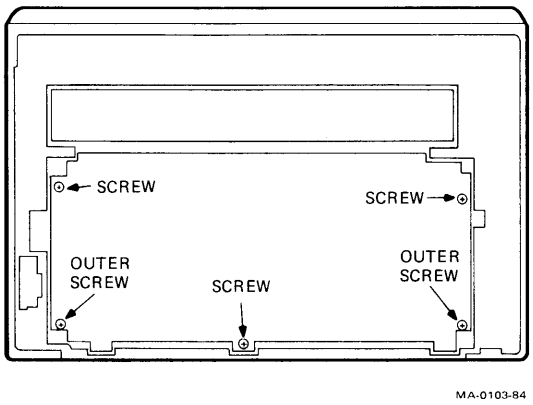


Figure 7-6 Logic Board Access

3. Loosen the two outer screws holding the logic board to the back edge of the printer (Figure 7-6). Remove the other three screws.

4. Carefully pull the logic board away from the printer.

5. Connect channel 1 of a scope to E16-4/6 (+2.4 V). Connect channel 2 of the scope to signal WU at E16-1. Set the scope as shown in Figure 7-7.

6. Apply power to the printer and check for the waveform in Figure 7-7. The wake-up (WU) signal should go high approximately 150 ms after +2.4 V reaches the peak of its ramp. Turn the power off and on to repeat the waveform.

NOTE

Leave the power off for a few seconds to allow for capacitor discharge. Otherwise, the +2.4 V ramp and WU delay will not appear in the same relationship.

5. Remove power from the printer and remove the scope leads.

7.3.2.2 System Clocks -- The clock test checks the operation of the 8 MHz crystal and the divider network in the 8085A microprocessor chip.

1. Check crystal input to the microprocessor by connecting channel 1 of the scope to E26-1. The waveform should be sinusoidal with a period of 125 ns at approximately 4 V peak-to-peak.

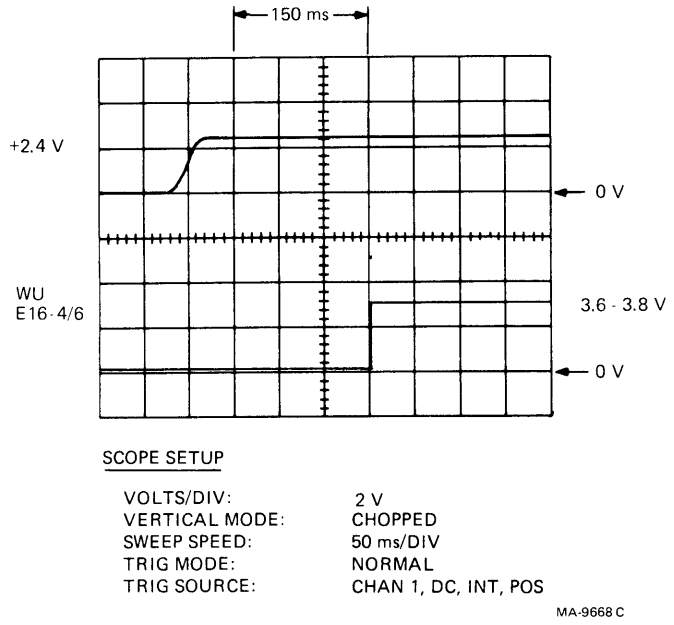


Figure 7-7 DC Wake-Up Waveform

2. Move the scope probe to E26-37. The system clock output should be a 4 MHz (250 ns) square wave.

3. Move the scope probe to E25-5. Clock input CLKB should be a 2 MHz (500 ns) square wave.

7.3.2.3 Interrupts -- The printer controller supplies a 2.5 ms interrupt to the microprocessor so it can perform certain software routines regularly. This test checks that an interrupt and the resulting acknowledge signal are returned from the microprocessor. If the test is successful, the microprocessor chip and supporting microprogram memory are probably operating correctly.

1. Connect channel 1 of a scope to E26-10 (signal INTR B). A positive going pulse with a period of 2.5 ms indicates that the interrupt is operating correctly.

2. Connect the scope probe to E26-11 (signal not INTA). A negative going pulse with a period of 2.5 ms indicates that the microprocessor is acknowledging the printer controller's interrupt.

7.3.3 Bell Test

Use the following procedure to test the sanity of the logic board.

1. Perform steps 1 through 4 of the procedure in Paragraph 7.3.2.1 to access the logic board.

2. Connect channel 1 of the scope to E69-3 (-BELL). Set up the scope according to Figure 7-8.

3. Use a jumper to defeat the interlock.

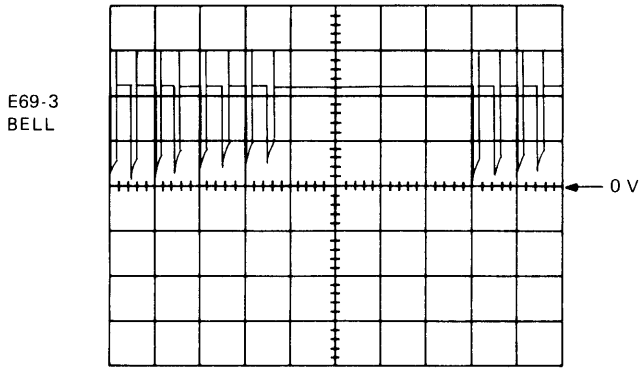
4. Apply power to the printer and set it to local.

5. Simulate a jam condition. The waveform displayed on the scope should be similar to Figure 7-8. The microprocessor and print controller generate a pattern of 8 chopping pulses every 400 microseconds, for a tone of 2.5 kHz.

7.3.4 DC Servo/Encoder Test

The following procedure tests the dc servo/encoder circuits on the logic board.

1. Perform steps 1 through 4 of the procedure in Paragraph 7.3.2.1 to access the logic board.



SCOPE SETUP

VOLTS/DIV:	10 V
VERTICAL MODE:	CH 1
SWEEP SPEED:	50 µs/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, NEG

MA-9669C

Figure 7-8 Bell Test Waveform

2. Check the print carriage for freedom of movement on the carriage rails. Check the timing belt. If there is any sign of wear (fraying or teeth missing), replace the worn belt.

3. Perform the procedure in Paragraph 8.18 to remove the timing belt from the servo pulley assembly.

4. Disconnect the servo motor by pulling the two clips off the motor terminals.

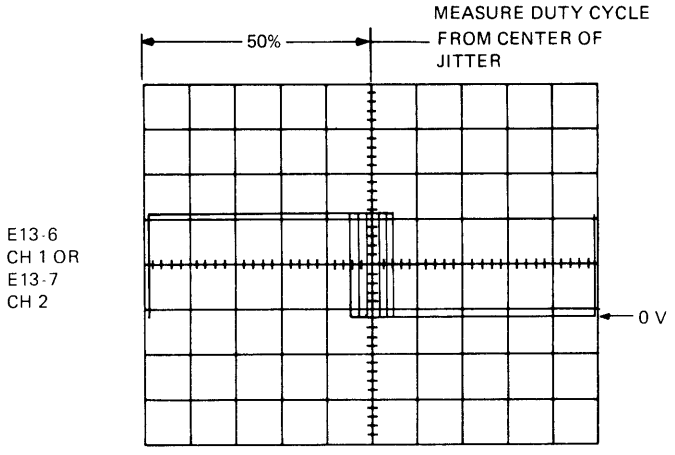
5. Apply 5 V to the motor by connecting the positive motor terminal to +5 V at capacitor C14 on the logic board (+ side) and the negative motor terminal to ground.

6. Connect the scope to E13-6 (encoder CH1). Set the scope as shown in Figure 7-9. Turn power on. The servo motor should turn counterclockwise. The waveform on the scope should be a square wave like Figure 7-9 with a duty cycle of 50 percent.

7. Move the scope probe to E13-7 (encoder CH2). Look for a similar waveform.

NOTE

The encoder duty cycle is not adjustable.



SCOPE SETUP

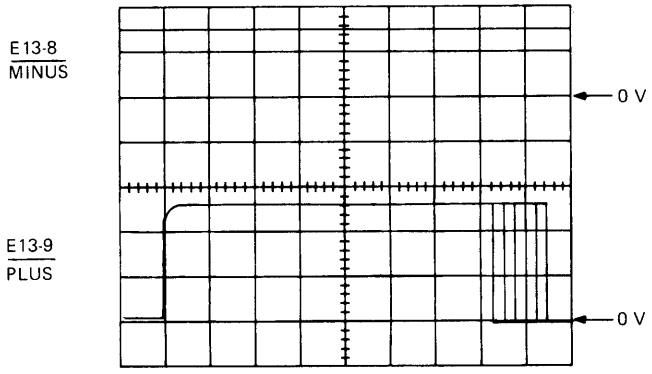
VOLTS/DIV:	2 V
VERTICAL MODE:	CHAN 1
SWEEP SPEED:	20 μs/DIV; ADJUST VARIABLE SWEEP SPEED FOR ONE CYCLE AS SHOWN
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, POS

MA-9670C

Figure 7-9 Encoder Output Waveform

8. Connect the scope to the printer controller servo output. Connect channel 1 to E13-8 (not MINUS) and channel 2 to E13-9 (not PLUS). Set the scope as shown in Figure 7-10. The waveform on the scope should match the waveform in Figure 7-10.

9. Turn off the power to the printer and reverse the jumpers that supply +5 V to the servo motor. This will cause the motor to turn in a clockwise direction.



SCOPE SETUP

VOLTS/DIV:	2 V
VERTICAL MODE:	CHOPPED
SWEEP SPEED:	50 μs/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	NORM, DC, INT, NEG

MA-9671C

Figure 7-10 DC Servo Motor Driven Counterclockwise

10. Set the scope as shown in Figure 7-11 and apply power to the printer. The waveform on the scope should match the waveform in Figure 7-11.

11. Turn off the power, but leave the scope probes connected as in step 8.

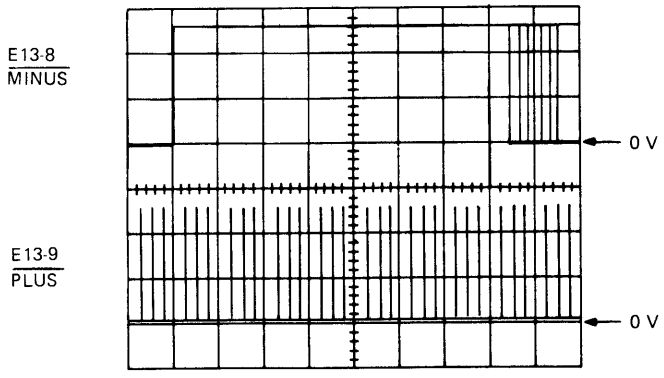
12. Reassemble the timing belt and idler pulley assembly. Reconnect the servo motor wires.

NOTE

In the following steps, you look at waveforms while the printhead is in motion.

Tape the printhead cable to the logic board so it does not snag on the printhead carriage.

13. Set the scope to high resolution as shown in Figure 7-11 and apply power to the printer. Put the printer into self-test and press the **Local Form Feed** switch three times to start the carriage motion (nonprinting) test.



SCOPE SETUP

VOLTS/DIV:	2 V
VERTICAL MODE:	CHOPPED
SWEEP SPEED:	50 µs/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, NEG

MA-9672C

Figure 7-11 DC Servo Motor Driven Clockwise

14. During left-to-right carriage motion, the waveform on the scope should match the waveform in Figure 7-12. Channel 2 should be at or near Ø V and channel 1 should be pulsing high.

15. Select the high resolution scope settings -- sweep 1Ø USEC per DIV and NORMAL trigger source. The waveform on the scope during a right-to-left carriage return should match the waveform in Figure 7-13.

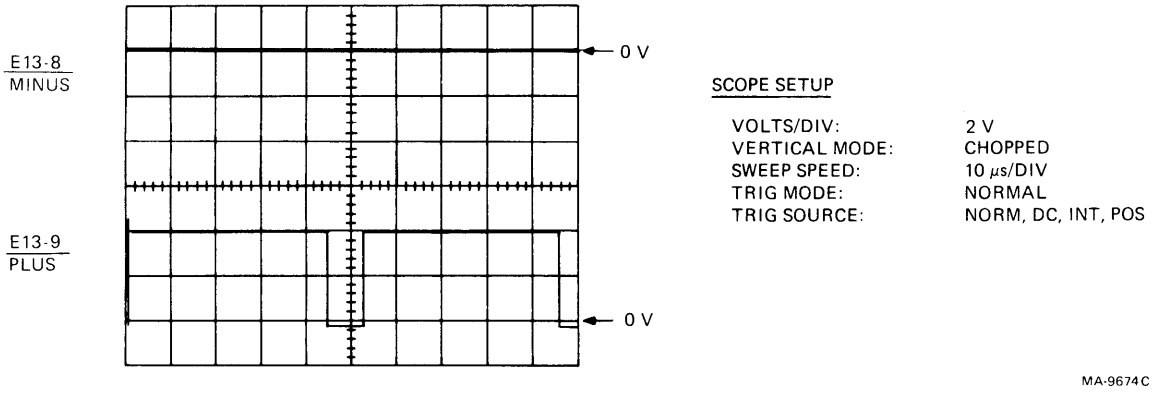


Figure 7-12 DC Servo Motor Driven Left to Right During Carriage Return

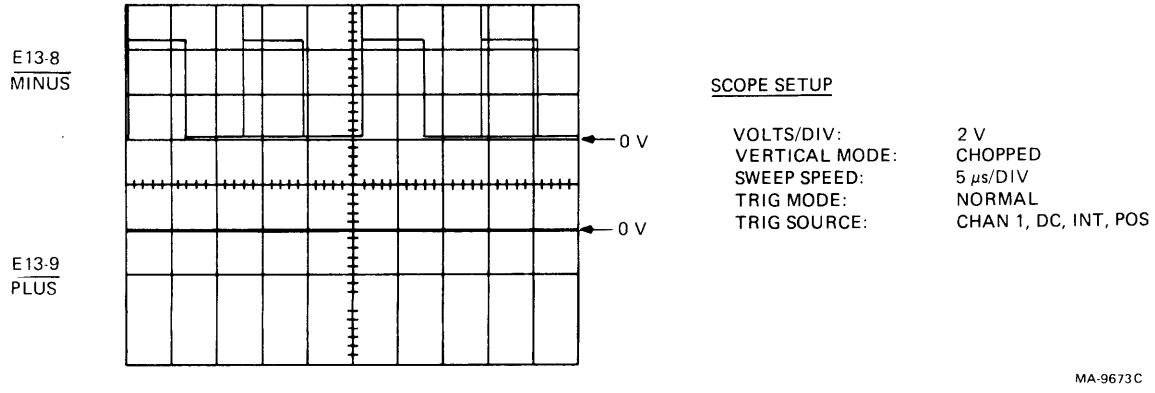


Figure 7-13 DC Servo Motor Stepped Right to Left

7.3.5 Print Character Test

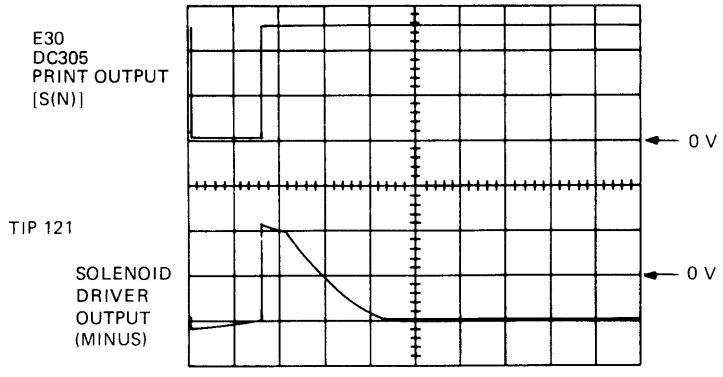
The print character test checks printhead operation and the circuits that process the character signal before it goes to the printhead. The test bar character (|) is used for the waveforms in this test. It is an ideal test character because it fires all nine wires in the printhead and fires them only once for each character. Other characters produce different waveforms according to which wires are fired and how many times they are fired.

1. Perform steps 1 through 4 of the procedure in Paragraph 7.3.2.1 to access the logic board.

> NOTE
> The following steps involve looking at waveforms while the printhead is in motion.
>
> Tape the printhead cable to the logic board so it does not snag on the printhead carriage.

2. Use an ohmmeter to check the continuity of the printhead solenoid in the defective channel. The resistance of a good printhead solenoid is about 9 ohms.

3. Connect channel 1 of a scope to the output of the printer controller defective channel. Set the scope as shown in Figure 7-14.



SCOPE SETUP

VOLTS/DIV:	CH1: 2 V, CH2, 20 V
VERTICAL MODE:	CHOPPED
SWEEP SPEED:	200 μs/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, NEG

MA-9675B

Figure 7-14 Print Solenoid Input Versus Output with Good Driver and Good Solenoid

4. Apply power to the printer. Put the printer in off-line mode.

5. Run the horizontal registration test. The test generates four lines of characters, one of which is the test bar (|) character.

6. A good solenoid circuit produces a waveform like the one in Figure 7-15.

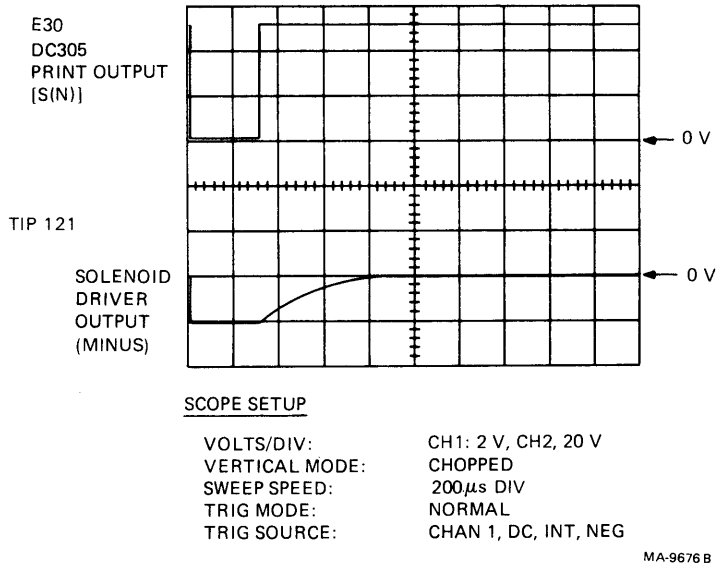


Figure 7-15 Print Solenoid Input Versus Output with Good Driver and Open Solenoid

7.3.6 Line Feed Test

The line feed test checks the printer controller, the line feed driver, and the stepper motor.

1. Perform steps 1 through 4 of the procedure in Paragraph 7.3.2.1 to access the logic board.

2. Disconnect the stepper motor connector from T2 on the logic board and check the stepper motor windings. Use an ohmmeter to check between the following pins on the stepper motor connector (not on the logic board).

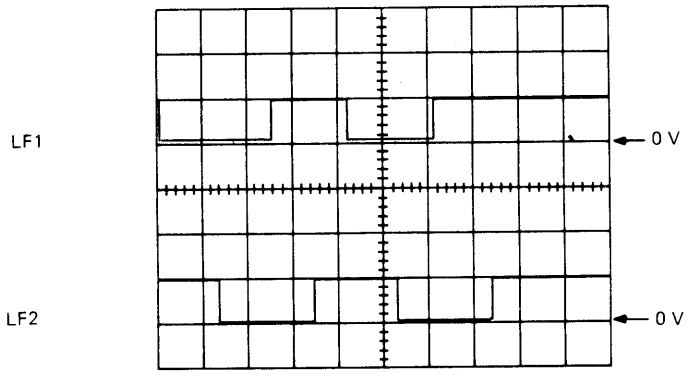
   5 and 1
   5 and 2
   6 and 3
   6 and 4

   All four readings should be 17.5 ohms +/- 10 percent.

3. Connect channel 1 of a scope to E13-13 (LF1). Connect channel 2 of the scope to E13-12 (LF2). Set the scope as shown in Figure 7-16.

4. Apply power to the printer and place it in local mode.

5. Press **Local Form Feed** and look at the two channel inputs to the line feed drivers. Check that the waveforms are like Figure 7-16.



SCOPE SETUP

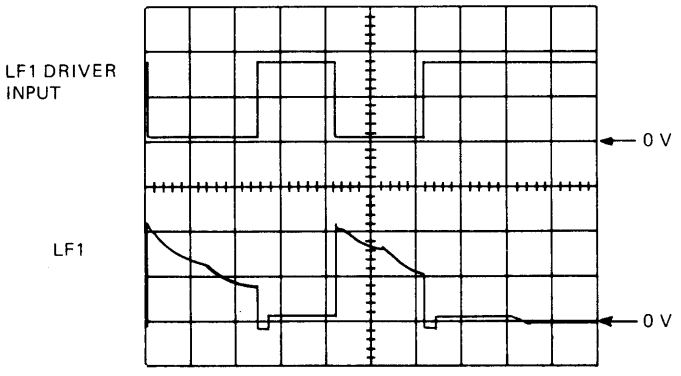
VOLTS/DIV:	5 V
VERTICAL MODE:	CHOPPED
SWEEP SPEED:	5 ms/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, NEG

MA-9677C

Figure 7-16 Line Feed Signal Output of Printer Controller

6. Check each phase of the quadrature phase line feed driver by connecting channel 1 of the scope to driver input and channel 2 to driver output. Set the scope as shown in Figure 7-17.

7. Press **Local Form Feed** and check for a waveform like Figure 7-17. The example given in the figure is for channel LF1 or LF2. Channels LF3 and LF4 are similar, except that the input phase is reversed (switch scope trigger from - to +). If only one or two outputs look bad, then the line feed driver may be faulty. If all outputs look bad, then the RUN line darlington switch (Q2) is probably defective.



SCOPE SETUP

VOLTS/DIV:	CH1: 2 V, CH 2, 20 V
VERTICAL MODE:	CHOPPED
SWEEP SPEED:	5 ms/DIV
TRIG MODE:	NORMAL
TRIG SOURCE:	CHAN 1, DC, INT, NEG

MA-9678C

Figure 7-17 Line Feed Input vs Output

7.3.7 USART Test

The USART test checks the baud rate generator section of the printer controller chip and the communication controller (USART) chip.

1. Perform steps 1 through 4 of the procedure in Paragraph 7.3.2.1 to access the logic board.

2. Connect the scope to E55-9 (TXC signal).

3. Set the speed to 1200 baud and parity to 7/space.

4. Observe a transmit clock with a period of 50 microseconds.

5. Move the scope probe to E55-25 (RXC signal).

6. Observe a receive clock with a period of 50 microseconds.

NOTE

You can run the test with different baud rates. Refer to Table 5-3 for a list of the different frequencies for each baud rate.

The following steps involve wrapping data transmitted by the printer back to its receive input. Use the loopback connector (PN 12-15336-01) for this purpose (Figure 7-3).