A·B QUALITY

Allen-Bradley

Dataliner DL50 Series Message Display

(Cat. No. 2706-F11J, -F11JC, -F21J, -F21JC)

Installation Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. "Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls" (Publication SGI-1.1) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual we use notes to make you aware of safety considerations.

> **ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attentions help you:
- identify a hazard
- avoid the hazard
- recognize the consequences

Note: Identifies information that is especially important for successful application and understanding of the product.

Installing the DL50 (continued)

Serial Communications

Chapter 5

Using This Manual

Chapter Objectives

Read this chapter to familiarize yourself with the rest of the manual. You will learn about:

- Contents of this manual
- Intended audience
- Conventions used
- Warnings and cautions
- Related publications

Overview of this Manual

This manual will instruct you on how to install and use your Dataliner DL50 Series Marquee Message Display. The manual is divided into the following chapters:

Table 1.A
Chapter Descriptions

Chapter	Title	Purpose
1	Using this Manual	Provides an overview of the manual.
2	Introduction to the DL50	Describes the main features and operating modes of the DL50.
3	Configuring the DL50	Provides instructions for configuring the DL50 using the configuration DIP switches.
4	Installing the DL50	Provides step-by-step instructions on how to install the DL50.
5	Serial Communications	Provides instructions on how to communicate with the DL50 through a host device.
6	Slave Mode Operation/Examples	Describes the operation of the DL50 while in the slave mode. Provides example messages (Simplex and Duplex protocols) for a variety of devices.
7	Bootstrap Mode	Describes how to update the DL50 firmware using the bootstrap mode.
8	Troubleshooting and Maintenance	Flow chart for troubleshooting a DL50. Includes general maintenance procedures.
9	Specifications	Provides electrical, mechanical, and environmental specifications.
	Appendices, Glossary, Index	

Intended Audience

Only qualified service personnel may configure and install Dataliner DL50 Message Displays. No operator access to internal configuration switches or connectors is required.

Conventions Used

The following conventions are used:

• The Catalog No. 2706-F11J, -F11JC, -F21J, and -F21JC DL50 Series Marquee Message Displays are referred to as the DL50.

• When an ASCII character (printable or non-printable) is specified, the character is always followed by the decimal equivalent in parentheses. Refer to Appendix B for an ASCII conversion chart.

> For example: When the DL50 receives a **Ctrl-F (decimal 6)**, it clears the buffer.

• DL50 displays are shown in a box. For example:

> ## Motor ON

Attention Symbol

An Attention symbol in this manual draws your attention to information that is especially important.

> ⚠ **ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

CE Directives

If the DL50 is installed within the European Union, Appendix H gives the legal requirements.

Related Publications

Table 1.B lists some publications that you may require for additional reference.

Table 1.B
Related Publications

Publication / Catalog Number	Title
2706-800	Dataliner™ DL10 Series User's Manual
2706-814	Dataliner™ DL20 Series User's Manual
2706-807	Dataliner™ DL40 Series Message Display User's Manual
2706-808	Dataliner™ DL40 Series Offline Programming Software
1771-6.5.13	ASCII I/O Module (Catalog No. 1771-DA) User's Manual
1771-6.5.34	BASIC Module (Catalog No. 1771-DB) User's Manual
1746-ND005	SLC 500™ BASIC Module (Catalog No. 1746-BAS) Design and Integration Manual
2760-ND001	Flexible Interface Module (Catalog No. 2760-RB) User's Manual
2760-ND003	DF1/ASCII Protocol Cartridge (Catalog No.2760-SFC1) (for 2760-RB module) User's Manual
2760-ND002	DH-485 Protocol Cartridge (Catalog No. 2760-SFC2) (for 2760-RB module) User's Manual
1775-6.5.4	Peripheral Communications Module (Catalog No. 1775-GA) User's Manual
1747-6.2	SLC 5/03™ (Catalog No. 1747–L532) User's Manual
1747-6.2	SLC 5/04™ (Catalog No. 1747–L542) User's Manual
1785–7.1	PLC-5™ Programmable Controller (Catalog No. 1785–LT2) Quick Reference

Introduction to the DL50

Chapter Objectives

This chapter describes the basic features, functions, and operating modes of the DL50.

Overview

The DL50 displays high visibility messages. Messages can be viewed from up to 240 feet (73.2 meters) away. This high visibility allows messages (fault, status, etc.) to be seen and responded to quickly.

Messages on the 2706-F11J and -F21J units are displayed in red. Messages on 2706-F11JC and -F21JC tricolor units may be displayed in red, green or amber, with individual character control.

The DL50 can receive message data from several sources. Messages are sent to the DL50 in a simple ASCII format. A DL20 or DL40 display can act as a controller, or messages can originate from a 1771-T60 Industrial Terminal running Allen-Bradley Distributed Diagnostics and Machine Control (DDMC) software. A DL50 can also receive message data from other intelligent devices such as a computer or BASIC Modules (Catalog No. 1771-DB / Catalog No. 1746-BAS).

Note: Refer to Chapter 9 for specifications and Appendix D for dimensions.

Features
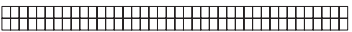
In addition, the DL50 has:

- RS-485 port for multidrop communications.
- RS-232 port for point-to-point communications.
- Relay output for turning on a lamp, audible alarm, etc.
- Anti-glare display window.
- Variety of display modes such as wiping, smooth scrolling, etc.
- Easy DIP switch configuration.
- Multiple mounting options including: Flush Mount, Back-to-Back Mounting, and Chain Suspension. Optional mounting brackets (Catalog No. 2706-NJ3) are also available.
- Enclosure rated for NEMA Type 12 & 13 (UL-listed) and designed but not UL listed for Type 4 (recommended for indoor use only).
- Universal power supply accepts 100–240 VAC and 50-60 Hz.
- Firmware (in flash EPROM) can be updated using a personal computer and Firmware Update Disk (2706-NR4).
- Fault isolation LEDs show DL50 status and aid in troubleshooting.
- Diagnostic modes help isolate faults down to a serviceable component.
- Reduced Brightness Mode prolongs the life of the display's electronics by reducing heat generated, thus preventing the DL50 from exceeding the internal operating temperature limit.

Character Number and Size

The size and number of characters depends on the size of the DL50 display. Select the size of the characters based upon visibility requirements and message length.

Table 2.A
DL50 Display:Color; Number and Size of Characters

Catalog No.	Display Color	Number of Characters	
		4.8 inch (122 mm)	2.1 inch (53 mm)
2706-F11J	Red	1 line of 10	2 lines of 20
2706-F11JC	Red, Green, Amber	1 line of 10	2 lines of 20
2706-F21J	Red	1 line of 20	2 lines of 40
2706-F21JC	Red, Green, Amber	1 line of 20	2 lines of 40

Major Components

Refer to Figure 2.1 and Figure 2.2 for the location of the major features/components. Following the illustrations are descriptions of each.

Figure 2.1
Major Features

① Over Temperature Indicator

② Status Indicators
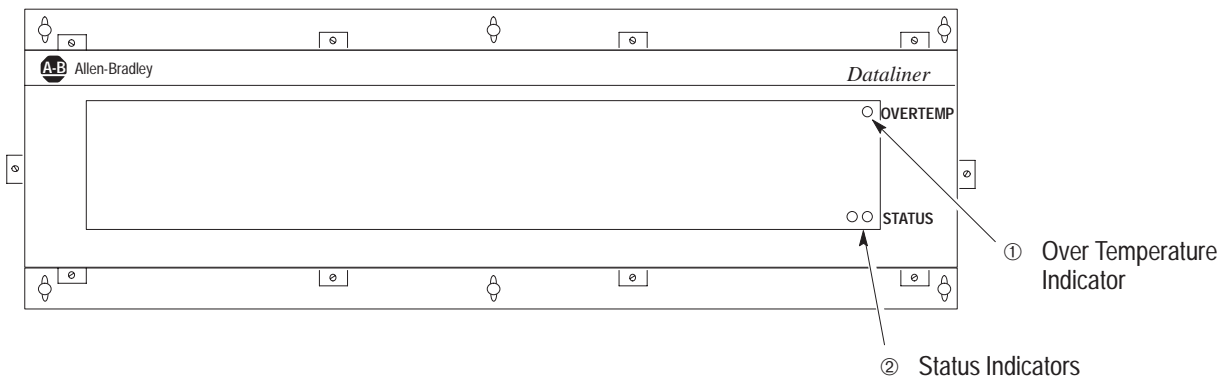
Catalog No. 2706-F11J, -F11JC shown, Catalog No. 2706-F21J and F21JC are similar

Figure 2.2
Major Components

Catalog No. 2706-F11J, -F11JC

Conduit Openings ⑨

⑨ Conduit Openings

Installation /
Diagnostic
Information Label

Processor Board

④ Power Connections

③ Relay Output Connections

⑧ RS-485 Port Connections

⑦ RS-232 Port Connections

RESET

RESET

⑤ Reset Button

⑥ Configuration DIP Switches

Catalog No. 2706-F21J, -F21JC

Installation /
Diagnostic
Information Label

Processor Board

⑨
Conduit
Openings

⑨
Conduit
Openings

Descriptions

① **OVERTEMP Indicator**

The LED on the upper right hand corner of the display indicates if the DL50 is in the Reduced Brightness Mode. This LED is normally off. If the temperature inside the DL50 reaches its internal operating limit, the DL50 will enter the Reduced Brightness Mode, and this LED will begin flashing. If the LED is on steady, the DL50 is in an automatic shutdown mode. The ambient temperature must be reduced to continue operation.

② **STATUS Indicators**

The two LEDs at the lower right hand corner of the display indicate the status of the display. When operating, the LEDs are on continuously. If a hardware fault is detected, the LEDs will flash.

③ **Relay Output Connections**

These connections provide both normally open and normally closed contacts. The relay contacts are energized when a message is received which has a line number of 48. The relay contacts are de-energized when a message is received with a line number of 49. The relay contact terminals are labeled:

Terminal Number*	Label	Definition
1	NO	Normally Open
2	NC	Normally Closed
3	COM	Common

* Terminal #1 is top terminal.

ATTENTION:
Do not use the relay outputs for control purposes. These contacts are for annunciation purposes only.

④ **Power Connections**

Connect the DL50 power source to these terminals:

Terminal Number*	Label	Definition
1	L1	Line 1 (Hot)
2	L2N	Line 2 (Neutral)
3	E. GND	Earth Ground

* Terminal #1 is top terminal.

⑤ **Reset Button**

This momentary contact switch re-initializes the DL50. After DIP switch configurations have been changed, the DL50 must be reset before the new configuration takes effect.

⑥ **Configuration DIP Switches**

Use these DIP switches to select:

- Slave Address
- Protocol (Simplex or Duplex)
- Duplex Checksum (On or Off)
- Character Height
- Default Color (Tri-color displays)
- Baud Rate
- Mode Select
- Hardware Type

Chapter 3 provides a complete description of these switches.

⑦ **RS-232 Port Connections**

The RS-232 communications port allows point-to-point communications between the DL50 and a host at distances of up to 50 feet (15.2 meters). The following terminal connections are provided:

Terminal Number*	Label	Definition
1	T	Transmit Line
2	R	Receive Line
3	G	Signal Ground

* Terminal #1 is top terminal.

⑧ **RS-485 Port Connections**

The RS-485 communications port allows multi-drop communications. The cable distance between the last DL50 and host device (master) may be up to 4,000 feet (1219 meters). The following terminal connections are provided:

Label	Function	Definition
1	E. GND	Earth Ground
2	Shield	Shield
3	COM	Common
4	+	RS-485 + (B)
5	-	RS-485 - (A)
6	TERM	Termination

⑨ **Conduit Openings**

External power and communications lines enter the enclosure through these openings.

Operating Modes

The DL50 operates in one of three modes:

- Slave Mode. (Chapter 6)
  Slave mode is the normal operating mode of the DL50. In this mode the DL50 will accept packets of data from either the RS-232 or RS-485 port. The DL50 supports both simplex and duplex communications.

- Diagnostic Mode. (Chapter 8)
  Use this mode if the DL50 is not functioning properly. The diagnostic mode helps isolate faults down to a serviceable component.

- Bootstrap Mode. (Chapter 7)
  Use the bootstrap mode if the firmware needs to be updated to incorporate new features. The DL50 may be reprogrammed using either the RS-232 or RS-485 communications ports. You may program multiple DL50s simultaneously on an RS-485 network.

Reduced Brightness Mode
In addition to the three operating modes, the DL50 may enter a Reduced Brightness Mode if the temperature inside the enclosure exceeds acceptable limits ($+167°F / +75°C$). In this mode, the DL50 turns on the OVERTEMP Indicator and reduces the brightness of the display LEDs. This reduces current consumption which reduces the amount of heat generated. If the temperature remains too high in the reduced brightness mode, the DL50 will shut down completely. In the shutdown mode, the DL50 clears the display leaving only the OVERTEMP LED on.

Note: If the DL50 is operated in its specified ambient temperature range and operating conditions, the DL50 should be able to operate at full brightness.

Communications Overview

The DL50 has both an RS-232 and an RS-485 communications port. Figure 2.3 illustrates some of the most common point-to-point and network applications.

Figure 2.3
Communications Overview
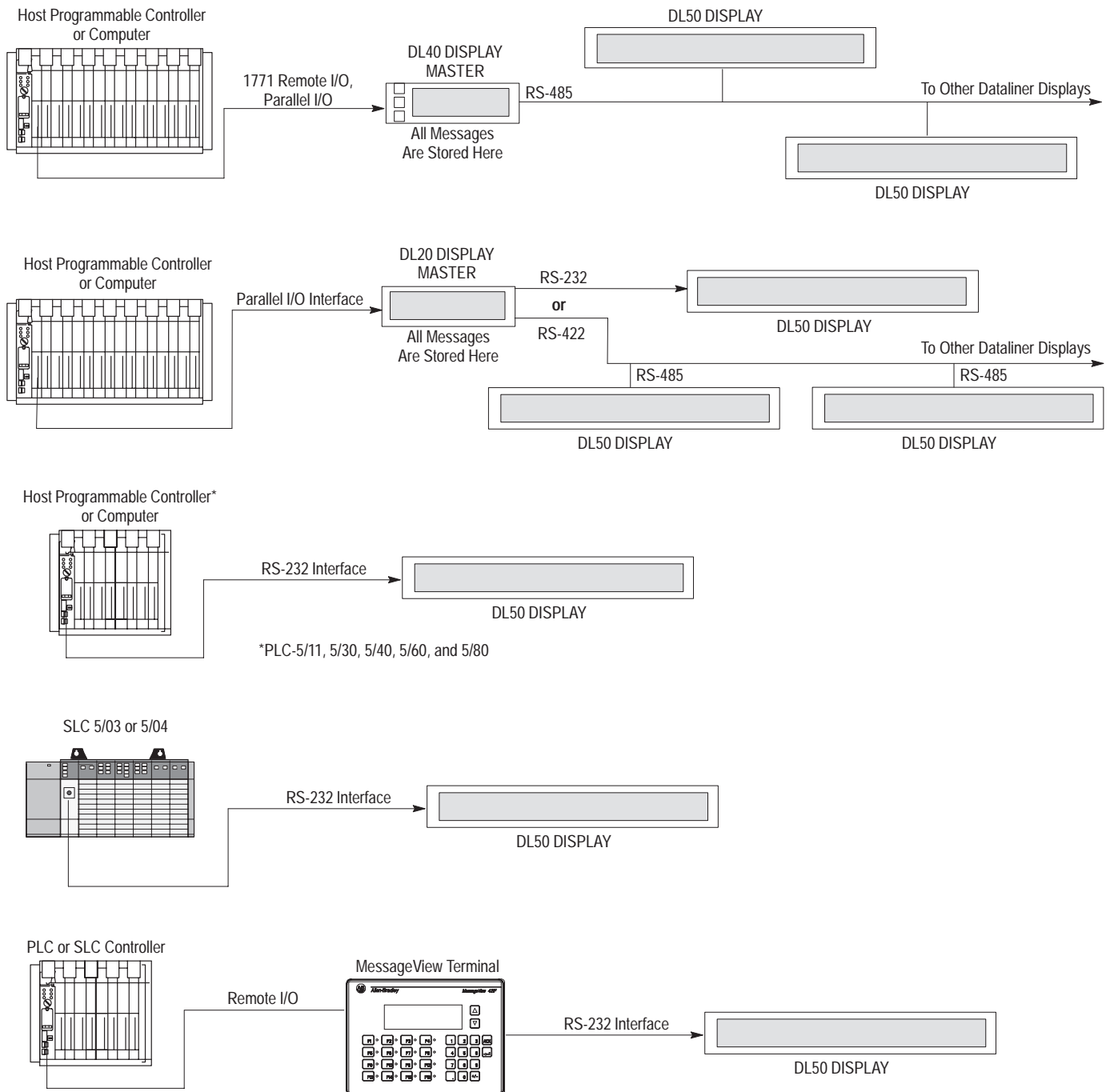
Figure 2.3
Communications Overview (continued)

Host Programmable Controller,
Computer or Workstation

RS-232 Interface →

DL50 DISPLAY

Host Programmable Controller,
Computer or Workstation

RS-232 Interface →

RS-232 ⇆ RS-485
Converter

RS-485

To Other Dataliner Displays →

RS-485

RS-485

DL50 DISPLAY

DL50 DISPLAY

Host Programmable Controller

To Other Dataliner Displays →

RS-485

RS-485

DL50 DISPLAY

DL50 DISPLAY

RS-232

DL50 DISPLAY

BASIC Module (Catalog No. 1771-DB)
Peripheral Communications Module (Catalog No. 1771-GA)
ASCII I/O Module (Catalog No. 1771-DA)
Flexible Interface Module (Catalog No. 2760-RB)

Communication Examples

Refer to Chapter 6 (Slave Mode Operation / Examples) and
Chapter 4 (Installing the DL50) for specific host device interface connections
and programming examples.

Configuring the DL50

Chapter Objectives

This chapter describes how to configure the DL50 using DIP switches.

DIP Switch Locations

Figure 3.1 shows the location of the DIP switches used for configuration.

Figure 3.1
DIP Switch Locations

DL50 Processor Board
(Refer to Figure 2.2 for Location)

DIP Switch S1   DIP Switch S2   DIP Switch S3
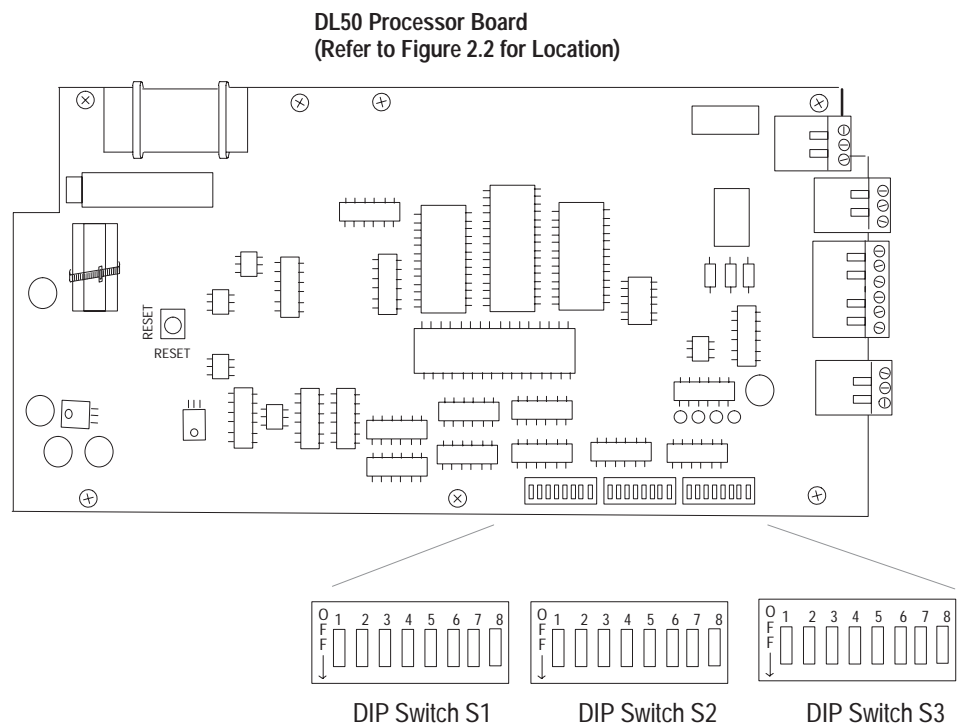
DIP Switch Functions

The three 8 position DIP switches select the following functions:

- Slave Address
- Duplex or Simplex Protocol
- Character Height
- Baud Rate
- Mode Selection
- Checksum Enable/Disable (Duplex protocol only)
- Default Color (Tri-color displays only)

Setting Switches

Figure 3.2 illustrates how to select the various functions with DIP switches.

Figure 3.2
DIP Switch Functions

S1

ON
OFF
1 2 3 4 5 6 7 8

SLAVE ADDRESS
(MSB ← LSB)

S2

ON
OFF
1 2 3 4 5 6 7 8

S3

ON
OFF
1 2 3 4 5 6 7 8

Reserved

PROTOCOL
1
ON = Duplex
OFF = Simplex

CHARACTER HEIGHT
2   3
OFF OFF = 2.1 INCH
OFF ON = 4.8 INCH
ON   OFF = Auto-Select

BAUD RATE
4   5
OFF OFF = 300
OFF ON = 1200
ON   OFF = 9600
ON   ON = 19200

OPERATING MODE
6   7
OFF OFF = Slave
OFF ON = Test

DUPLEX CHECKSUM
8
ON = Enabled
OFF = Disabled

DISPLAY TYPE
1   2
OFF OFF = 2706-F11J
OFF ON   = 2706-F21J
ON   OFF = 2706-F11JC
ON   ON   = 2706-F21JC

DEFAULT COLOR*
3   4
OFF OFF = Red
OFF ON = Green
ON   OFF = Amber
ON   ON = Reserved (Red)

*Tri-color displays only.

**BAD CODE
CHECKSUM**
8
ON = Bad Checksum
      Simulated
OFF = Normal
      Operation

Selecting Slave Address

If the "slave mode" has been selected, switches S1-1 through S1-8 define an address for the DL50 display. The values for each switch are illustrated below. The address of the DL50 is the sum of the values for all of the switches (1 - 8) that are turned on.

Note: SLAVE MODE is always selected for normal operation.

Slave Address

Switch Number	1	2	3	4	5	6	7	8
Value (decimal)	128	64	32	16	8	4	2	1

Addressing Example

Switch Number	1	2	3	4	5	6	7	8
Switch Position	ON	OFF	ON	OFF	OFF	ON	ON	OFF

The above example address = 128 + 32 + 4 + 2 = 166.

Note: Appendix D provides switch positions for all possible addresses.

Note: A display with a slave address of 127 (Simplex Protocol) or 255 (Duplex Protocol) will accept all messages regardless of the message address.

Addresses 6, 13, 16, and 18 are illegal DL50 addresses for all applications. Certain other slave addresses are not valid for DL50 displays when connected as slaves to a DL20 or DL40 master. The illegal DL20/DL40 decimal addresses are: 0, 4, 6, 7, 13, 16, 18, 20, 22, 43, 45, 48-57, and 128-255.

When multiple DL50 displays are placed on one RS-485 link, more than one DL50 can have the same address when using Simplex Protocol. DL50's with the same address respond to all commands addressed to them.

Note: DL50's operating in Duplex Protocol *cannot* have the same address with the exception of address 255.

Selecting Protocol

The DL50 communicates with a host device using strings of ASCII characters. The DL50 can communicate using one of two protocols:

- Simplex. When simplex protocol is selected, the DL50 does not provide any response to a master device. The master sends out packets of data, each containing message text and other information. The DL50 uses this information to display messages.

- Duplex. When duplex protocol is selected, the DL50 responds to messages with handshaking and checksum bytes.

Switch S2-1 selects the protocol:

Protocol Selection Switch

Protocol	Switch Number S2-1
Duplex	ON
Simplex	OFF

Note: Select Simplex when operating the DL50 as a slave to DL20 or DL40 message displays.

Selecting Character Height

When using Simplex Protocol, switches S2-2 and S2-3 determine character height as shown below.

Character Height Switches

Character Height	Switch Number S2-2	Switch Number S2-3
2.1 inch (53.4 mm)	OFF	OFF
4.8 inch (114 mm)	OFF	ON
Auto-Select	ON	OFF
Reserved	ON	ON

If you are using a 4 line DL20 or DL40 as a master, the Auto-Select function allows the DL50 to select the character height based upon the line number as shown in Table 3.A.

When using duplex protocol, message attributes such as character height are selected using slave mode commands (refer to Chapter 5).

Table 3.A
Character Height With Auto-Select Enabled

Line Number From Master	Text is Displayed On This Line	Auto-Select Character Height
1	1	2.1 inches (53.4 mm) ①
2	2	2.1 inches (53.4 mm)
3	1 ②	4.8 inches (121.9 mm)
4	③	Not Applicable
30	1 & 2 ④	2.1 inches (53.4 mm)

① Line height is for multiple line messages. If a one line message is received, line height is 4.8 inches (121.9 mm).

② Only a 4 line Dataliner can send out line number 3.

③ Message packet is ignored.

④ A line number of 30 indicates that the host is requesting that the text be displayed on both lines 1 and 2. The first 20 characters (small display) or 40 characters (large display) will be displayed on line 1, and the second 20 characters (small display) or 40 characters (large display) on line 2. If more than 40 characters (small display) or 80 characters (large display) are received, characters (41-80) or (81 to 160) will be displayed on the second screen and characters (81-120) or (161 to 240) will be displayed on the third screen, etc.

Selecting Baud Rate

The baud rate must be set to match the baud rate of the host device.
The DL50 will display the selected baud rate as one of its initial power up prompts.

Baud Rate Switches

Baud Rate	Switch Number S2-4	Switch Number S2-5
300	OFF	OFF
1200	OFF	ON
9600	ON	OFF
19200	ON	ON

Note: When operating the DL50 as a slave to a DL20 or DL40, 9600 Baud is recommended.

Selecting Operating Mode

Slave mode is the standard operating mode for the DL50. If the DL50 is not operating properly, the Diagnostic mode will help isolate the problem (refer to Chapter 8).

Operating Mode Switches

Mode	Switch Number S2-6	Switch Number S2-7
Slave Mode	OFF	OFF
Diagnostics Mode	OFF	ON
Reserved	ON	OFF
Reserved	ON	ON

Enabling/Disabling Checksum

This switch enables and disables the checksum for duplex protocol messages. Duplex messages to the DL50 require a checksum field. However with the checksum disabled, the contents of the checksum field are ignored.

Duplex Checksum Switch

Checksum	Switch Number S2-8
Enabled	ON
Disabled	OFF

Selecting Display Type

This switch is factory set for the type of display hardware being used. Do not change the setting of this switch. The chart below is for reference only.

Display Type Switches

Type	Switch Number S3-1	Switch Number S3-2
Catalog No. 2706-F11J	OFF	OFF
Catalog No. 2706-F21J	OFF	ON
Catalog No. 2706-F11JC	ON	OFF
Catalog No. 2706-F21JC	ON	ON

Selecting Default Display Color

This switch applies to the tri-color displays (Catalog No. 2706-FllJC, -F21JC). These switches have no affect on the single color displays. If a message does not specify display colors, the default color is used.

Display Type Switches

Default Color	Switch Number S3-3	Switch Number S3-4
Red	OFF	OFF
Green	OFF	ON
Amber	ON	OFF
Reserved (Red)	ON	ON

DL50 Reset

The DL50 loads DIP switch settings on power-up and when the RESET button is pressed. The RESET switch is located on the left side of the processor board (refer to Figure 3.3).

Figure 3.3
Reset Switch
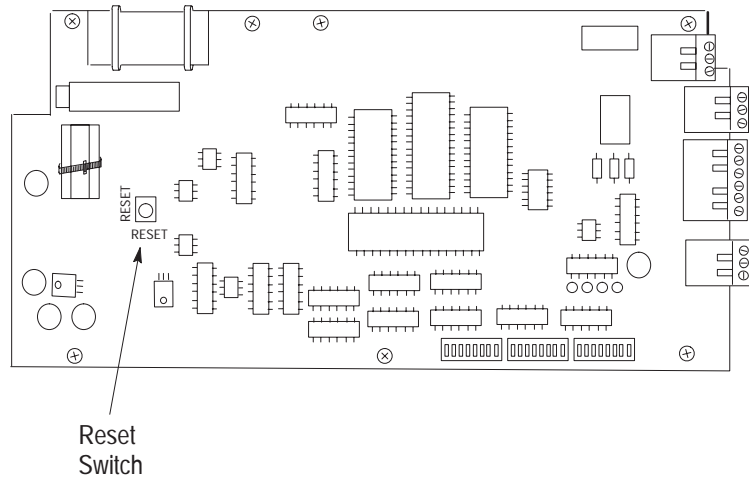
Reset
Switch

Press this momentary switch to begin the reset. The DL50 will enter the self-test mode and display power-up status information as shown in Figure 3.4.

Figure 3.4
DL50 Self-Test Sequence

Slave Address

> SLAVE ADDR: XXXX
> SUB-ADDR: XXXX

Self Test
Baud Rate

> SELF TEST: PASS
> Baud Rate: XXXXX   ← 300, 1200, 9600, 19200

Protocol
Text Mode

> Protocol: DUPLEX
> Checksum: ON

ON, OFF

Simplex →
or
← Duplex
Mode

> Protocol: SIMPLEX
> Mode: Small Text

Small Text, Large Text
Auto-Select

DL50 Type
Firmware Version

> DL50 F11JC TRI-COLOR
> Firmware Ver: X.XX   ← F11J, F21J RED
> F11JC, F21JC TRI-COLOR

Left Side LEDs
Illuminated ①

Right Side LEDs
Illuminated ①

Diagonal Line
Scrolls
Right to Left ②

> /

① On tri-color versions of the DL50, the LEDs on the left and right sides are momentarily illuminated in red, green and amber.

② On tri-color versions of the DL50, red, green, and amber diagonal lines move simultaneously across the screen from right to left.

Installing the DL50

Chapter Objectives

This chapter describes how to mount the DL50. Instructions are also provided on connecting the DL50 to communications lines and power source.

Mounting Dimensions

Figure 4.1 shows the mounting dimensions of the displays.

Figure 4.1
Mounting Dimensions

3/4 inches
(19 mm)

19 3/16 inches
(487 mm)

19 3/16 inches
(487 mm)

Catalog No. 2706-F11J, -F11JC

10 11/16 inches
(271 mm)

40.4 inches
(1026.2 mm)

13/16 inches
(21.0 mm)

24 3/4 inches
(629 mm)

24 3/4 inches
(629 mm)

37 1/8 inches
(943 mm)

24 3/4 inches
(629 mm)

Catalog No 2706-F21J, -F21JC

10 11/16 inches
(271 mm)

76.0 inches
(1930.4 mm)
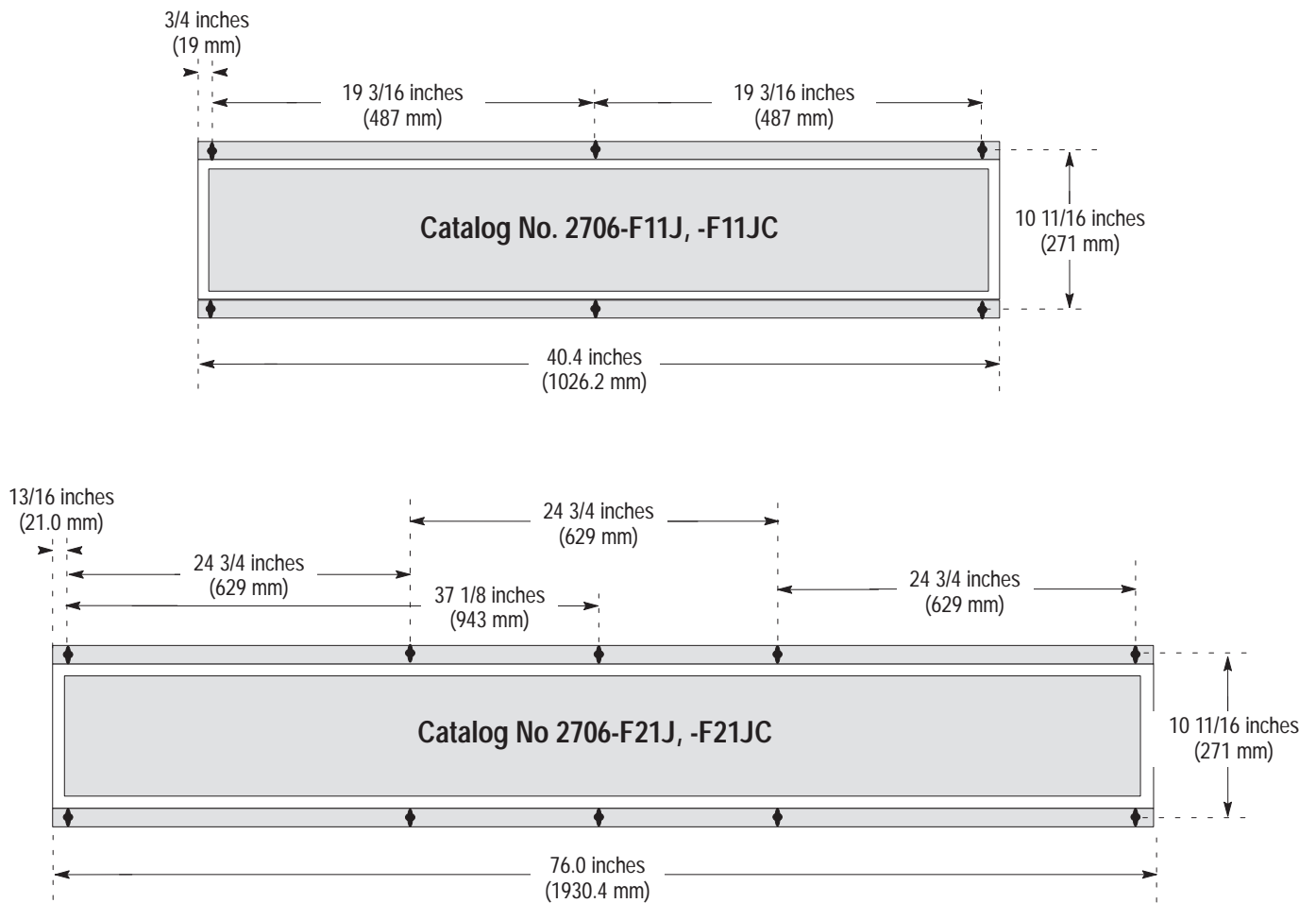
Mounting Methods

There are four methods of mounting the displays:

- Flush surface mount using the angle brackets supplied with the DL50.
- Surface mount using optional adjustable brackets (Catalog No. 2706-NJ3)
- Back-to-Back using adjustable brackets (Catalog No. 2706-NJ3).
- Chain suspended (individually or back-to-back)

⚠ **ATTENTION:**
The displays are heavy. Proper installation techniques are necessary to avoid injury from a falling display. Depending upon the display and type of installation, two or more people are required to install a display. Make sure the display is installed on a structure able to accommodate the weight of the display.

Catalog No. 2706-F11J, -F11JC: 40 pounds (18 kilograms)
Catalog No. 2706-F21J, -F21JC: 75 pounds (34 kilograms)

Surface Mounting

There are two methods of mounting the display on a vertical surface such as a wall:

- Directly mount the display to the wall using the angle brackets that are factory-installed before shipment. See Figure 4.2.
- Use the optional adjustable brackets (Catalog No. 2706-NJ3). See Figure 4.3.

⚠ **ATTENTION:**
Mount the display only to concrete walls or steel/wood beams. Do not mount the display on plaster or other soft material walls. Failure to follow this warning could result in personal injury or damage to the display.

The two flush wall-mount angle brackets (shipped pre-installed) may be removed and attached to the wall, then the DL50 can be mounted on them.

⚠ **ATTENTION:**
All angle bracket bolts must be torqued to 53-61 in.-lbs.

Wall Mounting- Using Angle Brackets

Mount the DL50 directly to a wall using screws and wall anchors as shown in Figure 4.2.

Figure 4.2
Using the Wall-Mounting Angle Brackets Provided on the Display
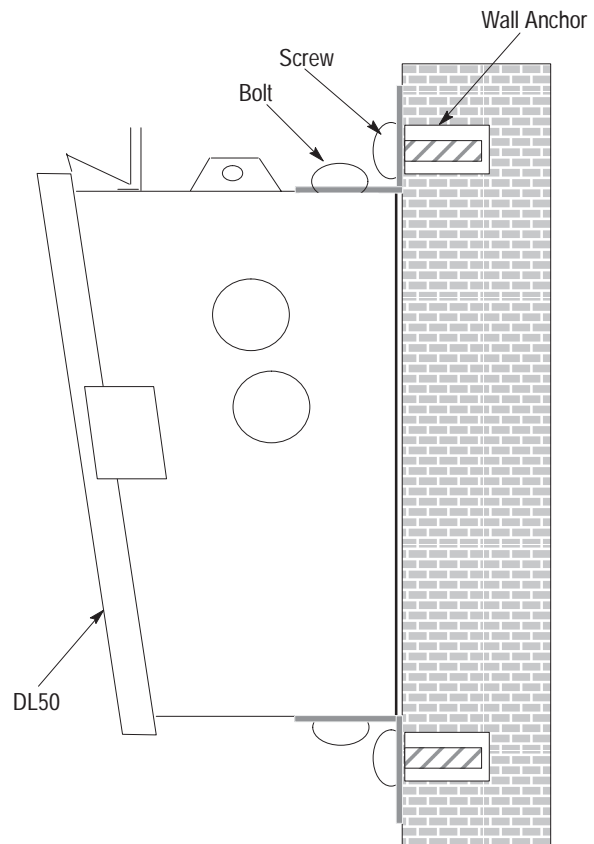
Wall Mounting- Using Adjustable Brackets (Catalog No. 2706-NJ3)

Mount the DL50 to a wall using Adjustable Brackets (Catalog No. 2706-NJ3) as shown in Figure 4.3.

Note: Catalog No. 2706-NJ3 contains 2 pairs of brackets. You will need 2 pairs of brackets to mount Catalog No. 2706-F11J, -F11JC and 4 pairs of brackets to mount Catalog No. 2706-F21J, -F21JC.

Figure 4.3
Wall Mounting With Adjustable Brackets
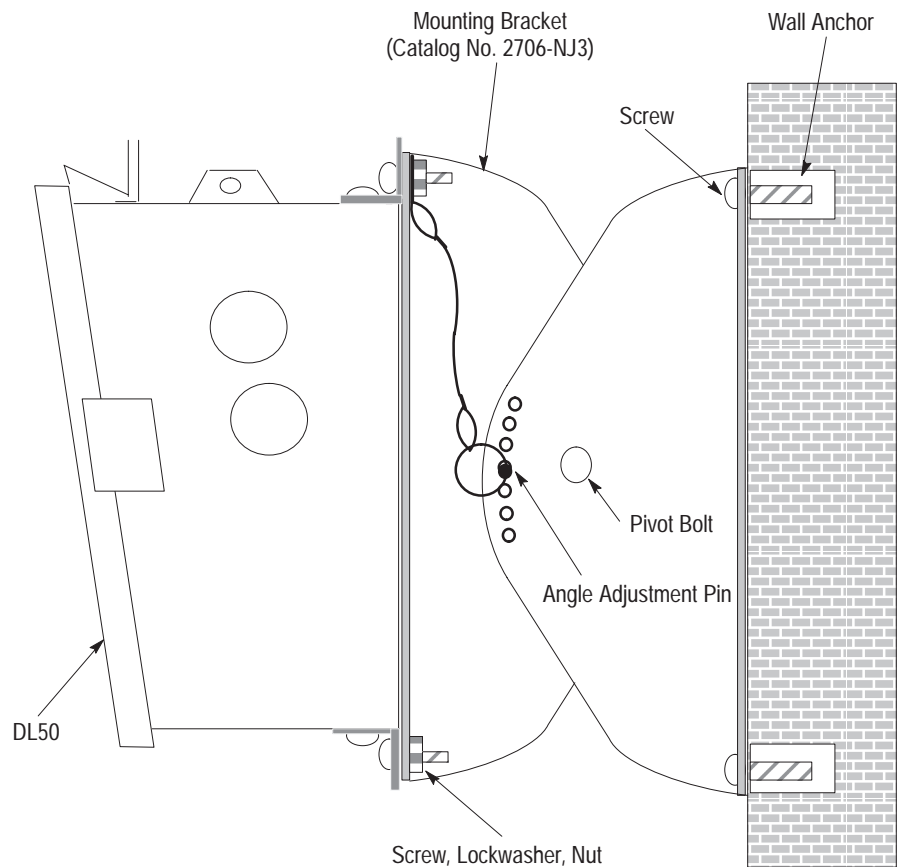
To adjust the viewing angle:

1) Support DL50 and remove Angle Adjustment Pin (see Figure 4.3)

2) Position DL50 at the proper angle.

3) Align bracket holes and re-insert Angle Adjustment Pin.

Chain Suspension

The DL50 can be suspended from a pair of chains. Each chain must be capable of supporting:

400 pounds (182 kilograms) for Catalog No. 2706-F11J, -F11JC

750 pounds (341 kilograms) for Catalog No. 2706-F21J, -F21JC

> ⚠ **ATTENTION:** Make sure the supporting chain meets the minimum specifications listed above. Failure to follow this warning could result in damage to the display and personal injury.

Figure 4.4
Chain Suspension

Chain Must Be Able To Support:
400 pounds (182 kg) when hanging Catalog No. 2706-F11J, -F11JC Displays
750 pounds (341 kg) when hanging Catalog No. 2706-F21J, -F21JC Displays

Adjust Length of This Chain To Change Viewing Angle

DL50

Angle Mounting Bracket
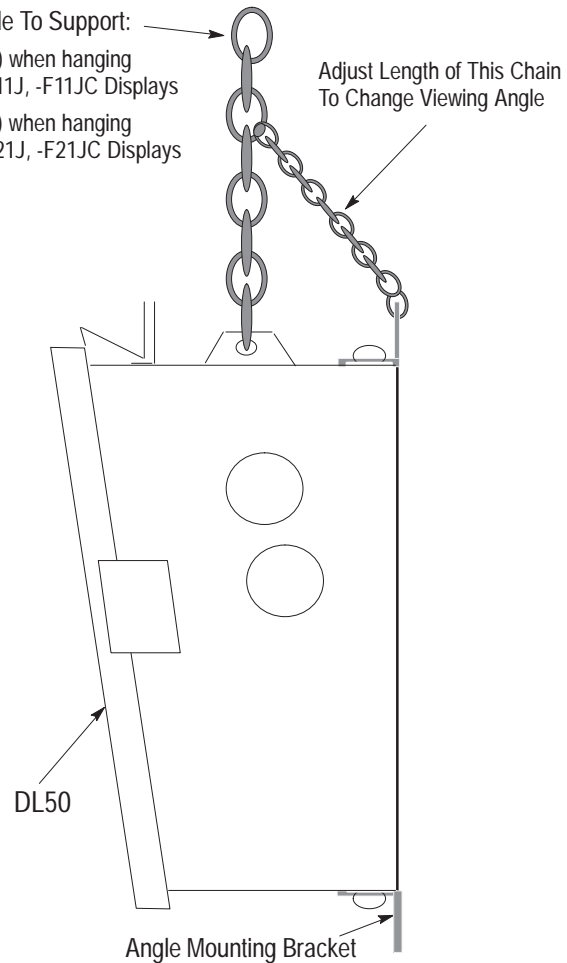
Note: The angle mounting bracket may be removed for chain-suspended installations.

Back to Back Mounting

Mount two DL50 displays back-to-back with or without mounting brackets (Catalog No. 2706-NJ3). These mounting methods are illustrated in Figure 4.5 and Figure 4.6. The chains attached to each display must be able to support:

> 400 pounds (182 kilograms) for Catalog No. 2706-F11J, -F11JC
> 750 pounds (341 kilograms) for Catalog No. 2706-F21J, -F21JC

The chain supporting both displays must be able to support:

> 800 pounds (364 kilograms)
> for two Catalog No. 2706-F11J, -F11JC displays

> 1500 pounds (682 kilograms)
> for two Catalog No. 2706-F21J, -F21JC displays

⚠️ **ATTENTION:** Make sure the supporting chains meet the minimum specifications listed above. Failure to follow this warning could result in damage to the display and personal injury.

Figure 4.5
Back to Back Mounting Without Adjustable Brackets

Chain Must Be Able To Support:

800 pounds (364 kg) when hanging two
Catalog No. 2706-F11J, -F11JC Displays

1500 pounds (682 kg) when hanging two
Catalog No. 2706-F21J, -F21JC Displays

Chains Must Be Able To Support:

400 pounds (182 kg) when hanging two
Catalog No. 2706-F11J, -F11JC Displays

750 pounds (341 kg) when hanging two
Catalog No. 2706-F21J, -F21JC Displays

DL50   DL50
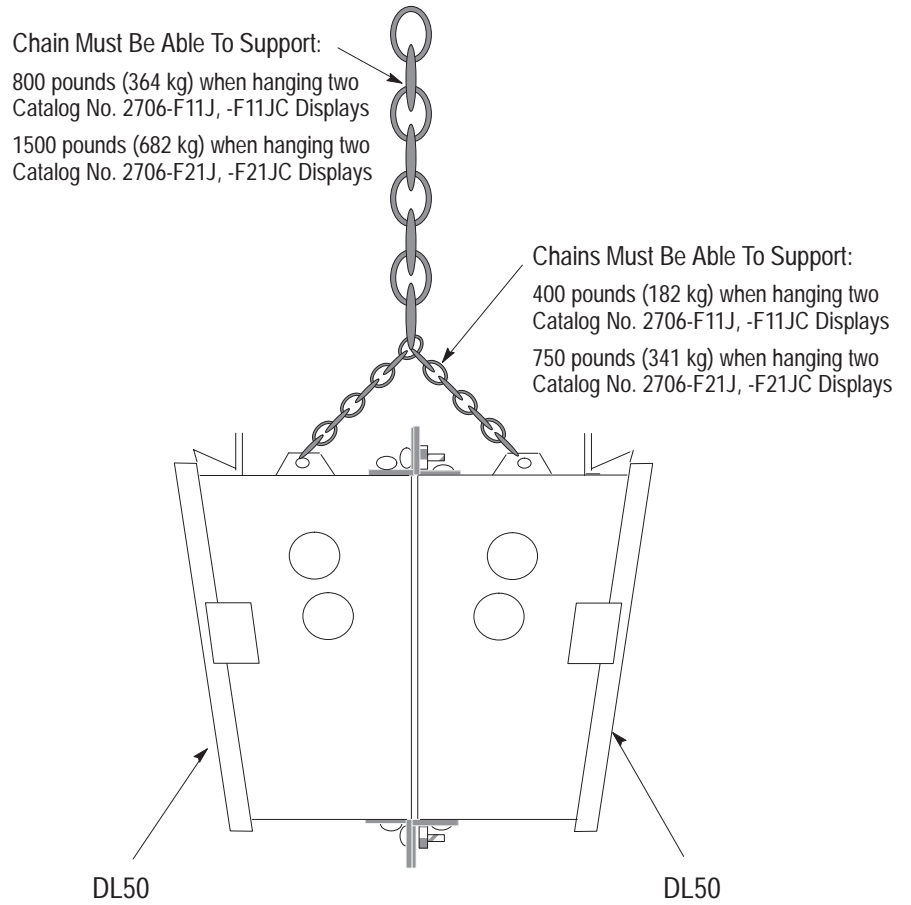
Figure 4.6
Back to Back Mounting With Adjustable Brackets
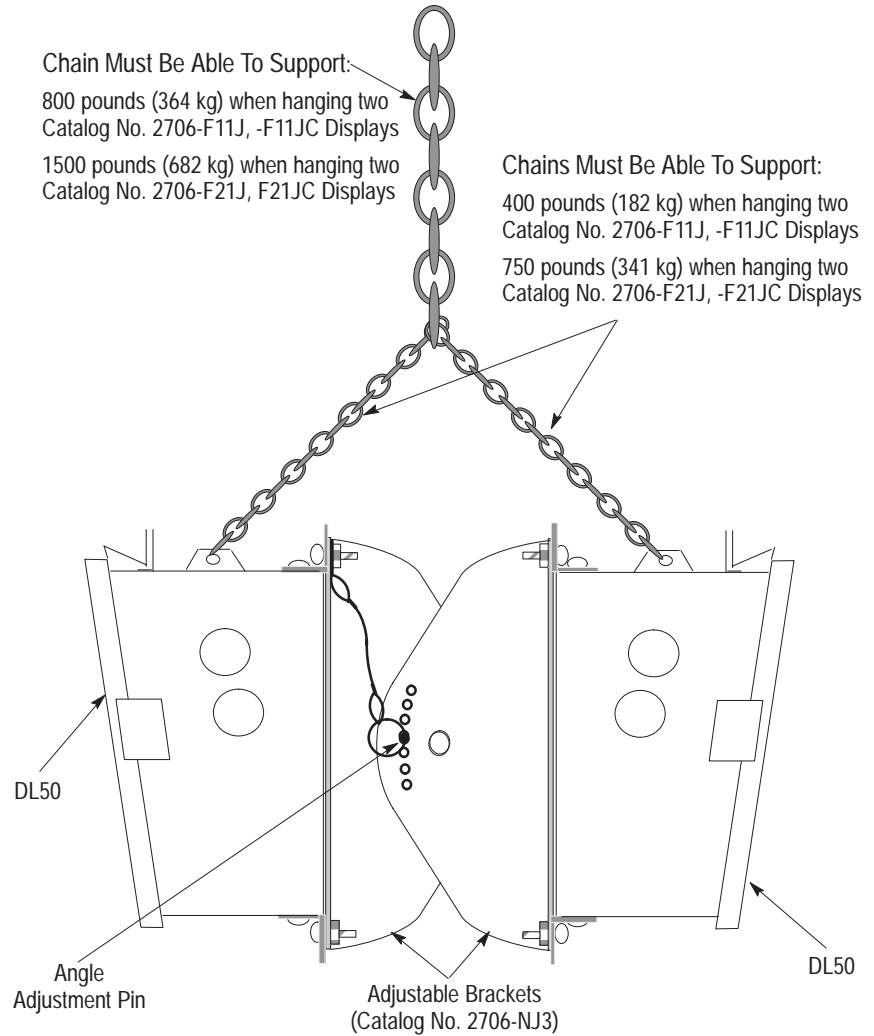
Chain Must Be Able To Support:

800 pounds (364 kg) when hanging two
Catalog No. 2706-F11J, -F11JC Displays

1500 pounds (682 kg) when hanging two
Catalog No. 2706-F21J, F21JC Displays

Chains Must Be Able To Support:

400 pounds (182 kg) when hanging two
Catalog No. 2706-F11J, -F11JC Displays

750 pounds (341 kg) when hanging two
Catalog No. 2706-F21J, -F21JC Displays

DL50

DL50

Angle
Adjustment Pin

Adjustable Brackets
(Catalog No. 2706-NJ3)

Note: Catalog No. 2706-NJ3 contains 2 pairs of brackets. You will need 2 pairs of brackets to mount Catalog No. 2706-F11J, -F11JC and 4 pairs of brackets to mount Catalog No. 2706-F21J, -F21JC.

To adjust the viewing angle:

1) Support DL50 and remove Angle Adjustment Pins (see Figure 4.6).

2) Position DL50 at the proper angle.

3) Align bracket holes and re-insert Angle Adjustment Pins.

Wiring Recommendations

Careful wire routing helps cut down on electrical noise. To reduce electrical noise, the DL50 should be connected to its own branch circuit. (See the next section for power requirements in the European Union or EFTA regions.)The input power source should be protected by a fuse or circuit breaker rated at no more than 15 Amps. Route incoming power to the DL50 by a separate path from the communication cables.

> ⚠ **ATTENTION: Do not run signal wiring and power wiring in the same conduit!**

Where power and communications lines must cross, they should cross at right angles. Communications lines can be installed in the same conduit as low level DC I/O lines (less than 10 Volts).

All communications lines should be shielded. The shield should be connected to ground only at the transmitting device.

European Union Directive Compliance

If this product is installed within the European Union or EFTA regions, the following regulations apply:

EMC Directive

This apparatus is tested to meet Council Directive 89/336/ECElectromagnetic Compatibility (EMC) using the following standards:

- EN 50081-2
  EMC – Generic Emission Standard, Part 2 Industrial Environment
- EN 50082-2
  EMC – Generic Immunity Standard, Part 2, Industrial Environment.

LVD Directive

This apparatus is tested to meet Council Directive 73/23/EEC with amendments, including 93/68/EEC Low Voltage (LVD) using the following standard:

- EN 60950   Safety of Information Technology Equipment.

Intended Use of Product

The products described in this manual are intended for use in an industrial environment as defined in Appendix H.

Grounding Recommendations

Grounding is an important safety measure in electrical installations. Grounding also helps eliminate the effects of noise due to Electromagnetic Interference (EMI).

An authoritative source on grounding requirements is the National Electrical Code published by the National Fire Protection Association of Boston, Massachusetts. Article 250 of the Code describes the types and sizes of wire conductors and safe methods of grounding electrical equipment and components.

> ⚠️ **ATTENTION:** To avoid risk of shock, Earth Ground must be connected to the display at all times.

Connecting Power

Connect power line to the DL50 terminal blocks as shown in Figure 4.7. The DL50 will accept 95-120 or 190-240 Volts AC, 50-60 Hz input power.

Figure 4.7
Electrical Power Connections

L2N L1

L1

L2
E.GND

NO
NC
COM

Processor Board

PE (Protective Earth) ⏚
Connect power line ground to this terminal.

Factory Installed Ground Wire (Green/Yellow)
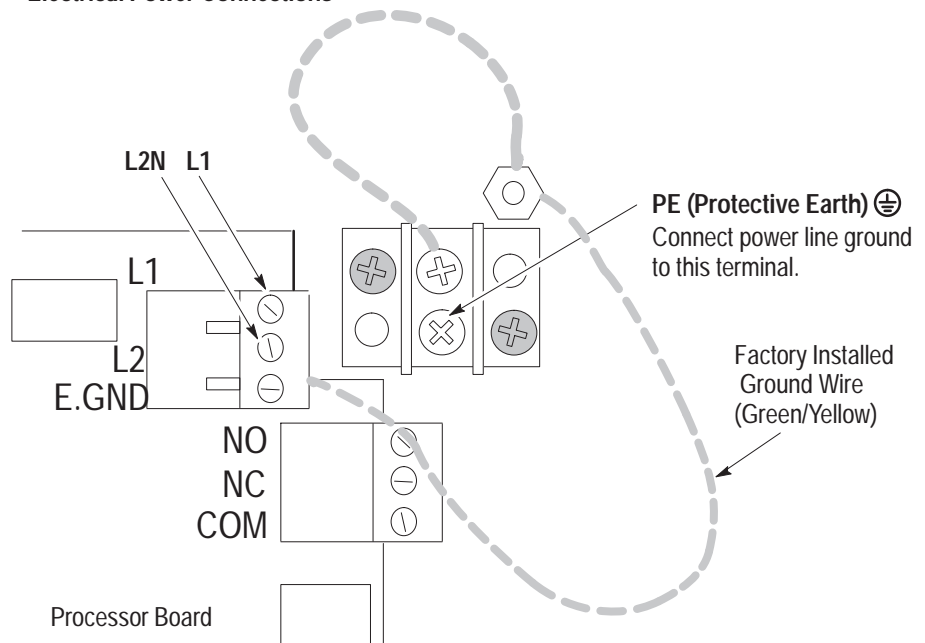
> ⚠️ **ATTENTION:** Do not apply power to the display until all electrical connections, including communications lines, have been connected.

> ⚠️ **ATTENTION:** Terminal 3 (Ground Terminal) must be connected to a reliable low impedance earth ground to protect the display against electrical noise. The ground will also help protect personnel from electrical shock if a voltage is shorted to the enclosure.

1. Connect ground wire to the chassis grounding terminal. Then verify that the factory installed earth ground wire is connected between the chassis PE (Protective Earth) terminal and the earth ground terminal on the power input connector.

   Note: If the power lines enter the left side of the display, route the AC lines through the cable guides on the upper part of the display. Route the communication lines through the cable guides on the bottom half of the display.

2. Connect input power lines, L1 and L2N. **Do not** apply power until all connections have been made

3. Connect communications lines as described in the following sections.

4. Apply power and verify power-up messages as shown in Chapter 3.

Annunciation Relay Connections

Figure 4.8 shows a typical connection between the annunciation relay and an annunciator.

> ⚠ **ATTENTION:** Do not use the relay for control purposes. Use relay for annunciator only. Failure to follow this warning could result in unexpected switching of control circuits.

> ⚠ **ATTENTION:** When power is removed, the annunciator will be energized if the normally closed outputs are used.

Figure 4.8
Annunciation Relay Connections (Normally Open)

DL50
RELAY TERMINALS

NO — 1
NC — 2
COM — 3
RELAY

ALARM

NO = Normally Open
NC = Normally Closed
COM = Common

Relay is rated for:
   3A @ 240V AC resistive load
   3A @ 30V DC resistive load
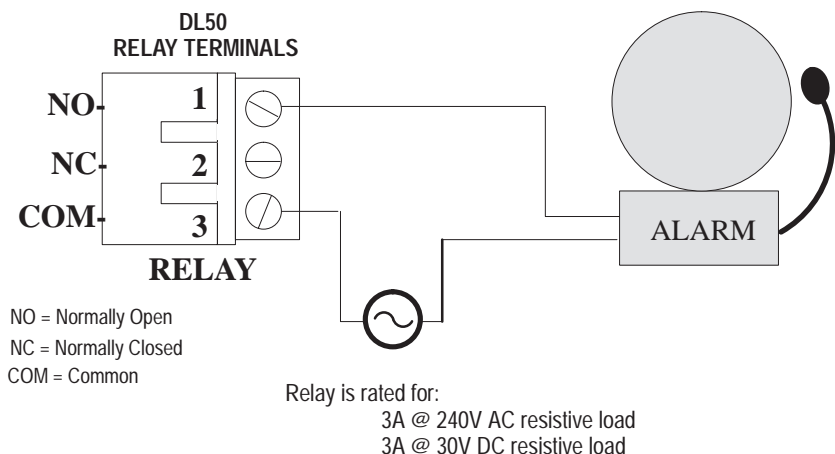
RS-232 Connections

The RS-232 interface allows connection of a single DL50 display, with a maximum recommended cable length of 50 feet.

Figure 4.9 shows the location of the DL50's RS-232 port terminals. The terminals are labeled:

RS-232 Connection Terminals

Terminal Number*	Label	Definition
1	T	Transmit Line
2	R	Receive Line
3	GND	Signal Ground

* Pin #1 is on top.

Figure 4.9
RS-232 Terminal Location

T (Terminal #1)
R (Terminal #2)
G (Terminal #3)
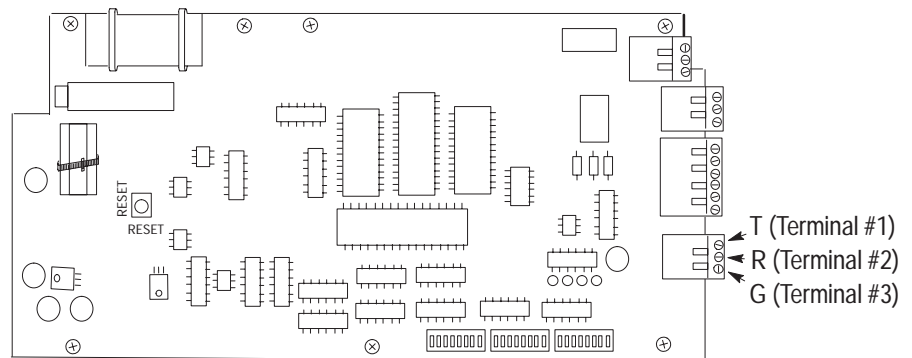
Figure 4.10 shows a typical connection between a host device RS-232 port and the DL50 display. We recommend that you use Belden 9842 cable.

The DL50 display is considered a "DTE" (Data Terminal Equipment) device. The connection diagram assumes that the RS-232 port of the host device is also a "DTE" type, as most are. If instead it is a "DCE" (Data Communications Equipment) type, you should interchange the wires on pins 2 and 3.

We recommend that you connect the shield at the one end only, as shown.

Note: If noise problems occur between a DL20 master display and a DL50 display when RS-232 communications are used, we recommend that you connect the shield of the communication cable to chassis ground at both ends. However, the earth ground for each device must be at the same potential.

Figure 4.10
RS-232 Connections
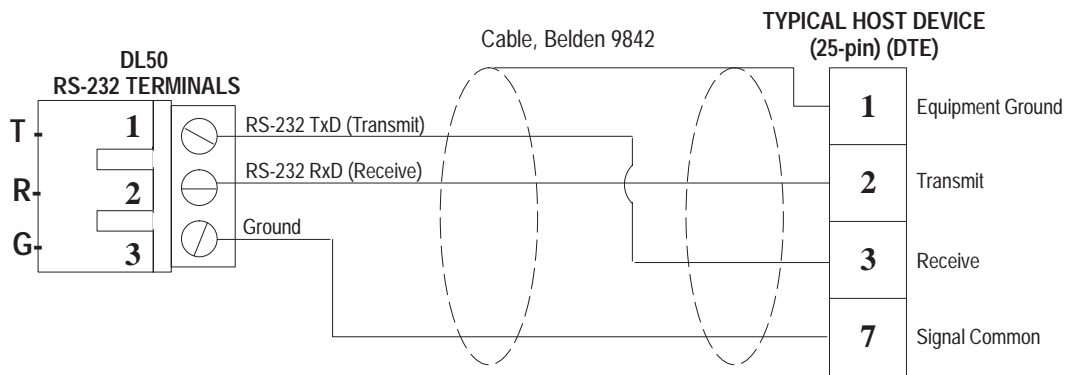
Note: Some devices require that certain hardware hand-shaking lines be asserted.

This may require a jumper between the CTS and RTS terminals. Refer to the applicable product literature.

RS-485 Connections

The RS-485 interface has these advantages over the RS-232:

- Improved noise immunity.
- DL50 displays can be a distance of up to 4000 feet (1200 m) from the host device.
- Up to 32 devices can be connected directly to the RS-485 port of the host controller. Up to 100 DL50 displays can be addressed when line drivers are used.

Figure 4.11 shows the location of the DL50's RS-485 port terminals. The terminals are labeled:

RS-485 Connection Terminals

Label	Function	Definition
1	E. GND	Earth Ground
2	SHLD	Shield
3	COM	Common
4	+	RS-485 + (B)
5	-	RS-485 - (A)
6	TERM	Termination

Figure 4.11
RS-485 Terminal Location
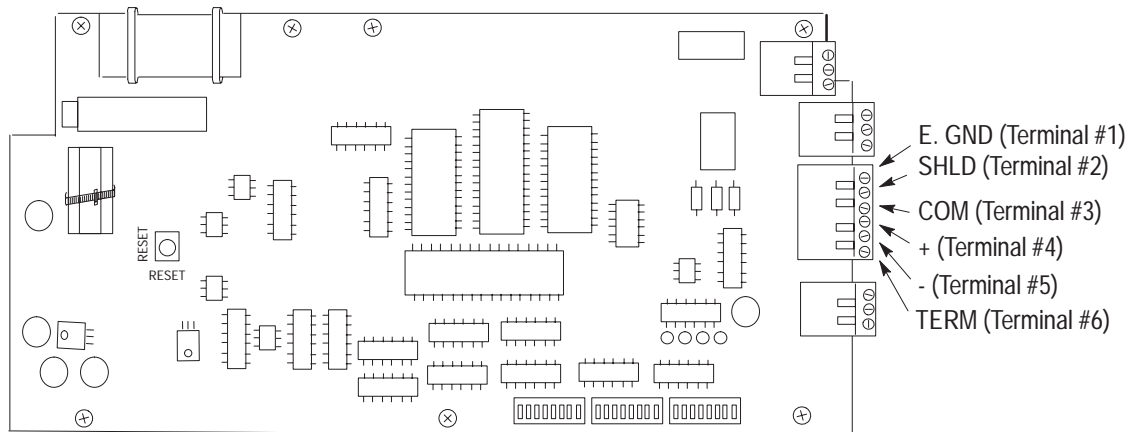
Figure 4.12 shows a typical connection between a host device RS-485 port and DL50 displays. We recommend that you use Belden 9842 cable.

Note that pin or terminal numbers are not shown for the host device. This is because the terminal numbers vary for different products. For actual pin numbers, refer to the appropriate host device product literature.

We recommend that you connect the shield to ground at one end only, as shown.

Figure 4.12
RS-485 Connections

Note: Some devices require that certain hardware handshaking lines be asserted.
Refer to the applicable product literature.

Shield Grounding
Connect shield (terminal #2) to ground (terminal #1) at any one node (only) on RS-485 Network

Network Termination
Terminate the network at the last device. Terminate a DL50 by connecting RS-485 + (terminal #4) to TERM (terminal #6).
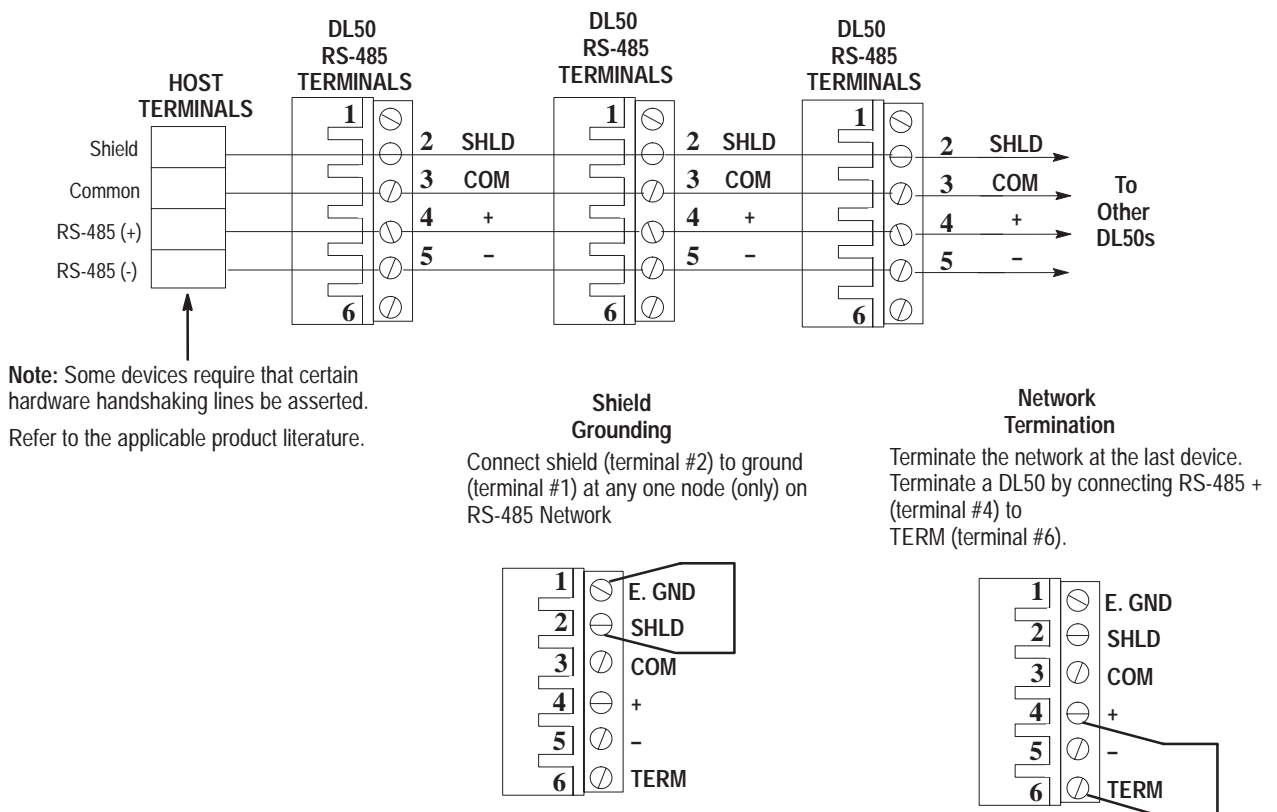
Note: RS-232 devices such as personal computers can communicate through the DL50 RS-485 port using an RS-232 → RS-485 converter such as a Black Box™ LD-485A-MP.
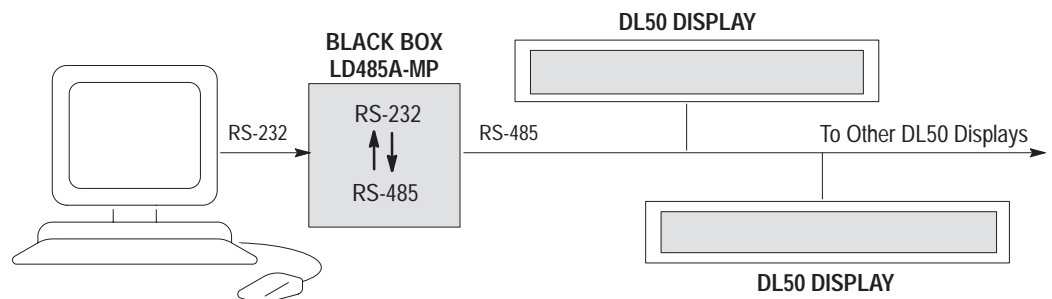
Connection to DL20/DL40 "Master" Displays

As previously described, a DL50 display can be connected to the RS-232 or RS-422 port of a DL20 display or the RS-485 port of a DL40 display (Master). When this type of configuration is used, all messages are stored in the Master DL20/DL40 displays. All the host controller is required to do is trigger a particular message stored in the Master DL20/DL40 display.

Up to 32 DL50 slave displays can be connected (without line drivers) to the RS-485 port of the DL40 or RS-422 port of the DL20. When particular messages are created, they can be assigned an attribute which designates that messages be displayed on a particularly addressed slave DL50 display, all slave DL50 displays, or just the host DL40/DL20 display. Addresses are assigned to Slave DL50 displays by setting DIP Switches as described in Chapter 3 of this manual.

The DL40 (Firmware V. 3.00 or later) supports control of the DL50 relay, and control of the display color in tri-color displays, on a per-message basis. These controllable DL50 features are accessed and configured using the message attribute selections within the DL40 Offline Programmer software (2706-ND1 Series D or later).

Note: Whatever is sent out of the DL20's RS-422 port is also sent out the RS-232 port, and vice versa.

For more information on DL20 displays (Master) refer to DL20 display User's Manual Publication 2706-801.

Figure 4.13 illustrates possible DL20 and DL40 Master/Slave configurations:

Figure 4.13
DL20/DL40 Master/Slave Configurations
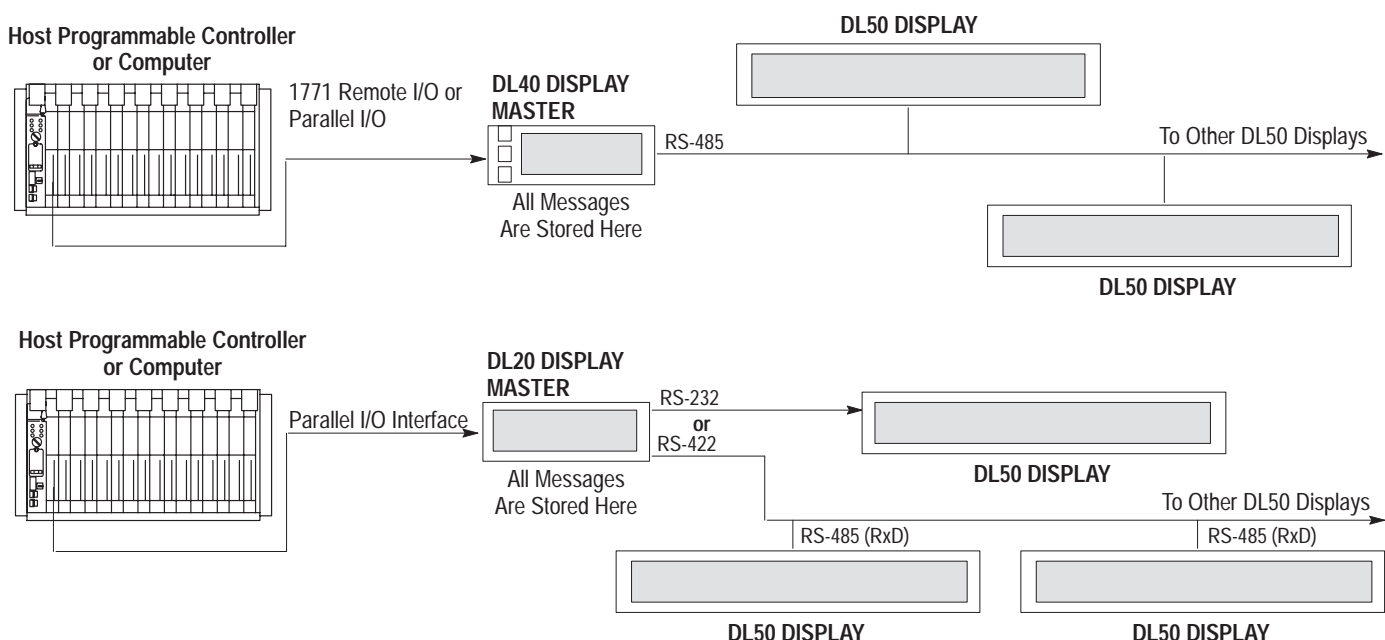
Note: If noise problems occur between a DL20 master display and a slave DL50 display (RS-232), we recommend that you connect the shield of the communication cable to chassis ground at both ends. The earth ground for each device must be the same potential to insure that ground currents do not flow.

Connect the slaves to the master using Belden 9842 cable. Figure 4.14 shows the DL40 to DL50 wiring connections.

Figure 4.14
RS-485 DL40 / RS-422 DL20 Master to DL50 Slave(s) Wiring Connections

* Refer to Figure 4.12 for shield grounding and line termination information.
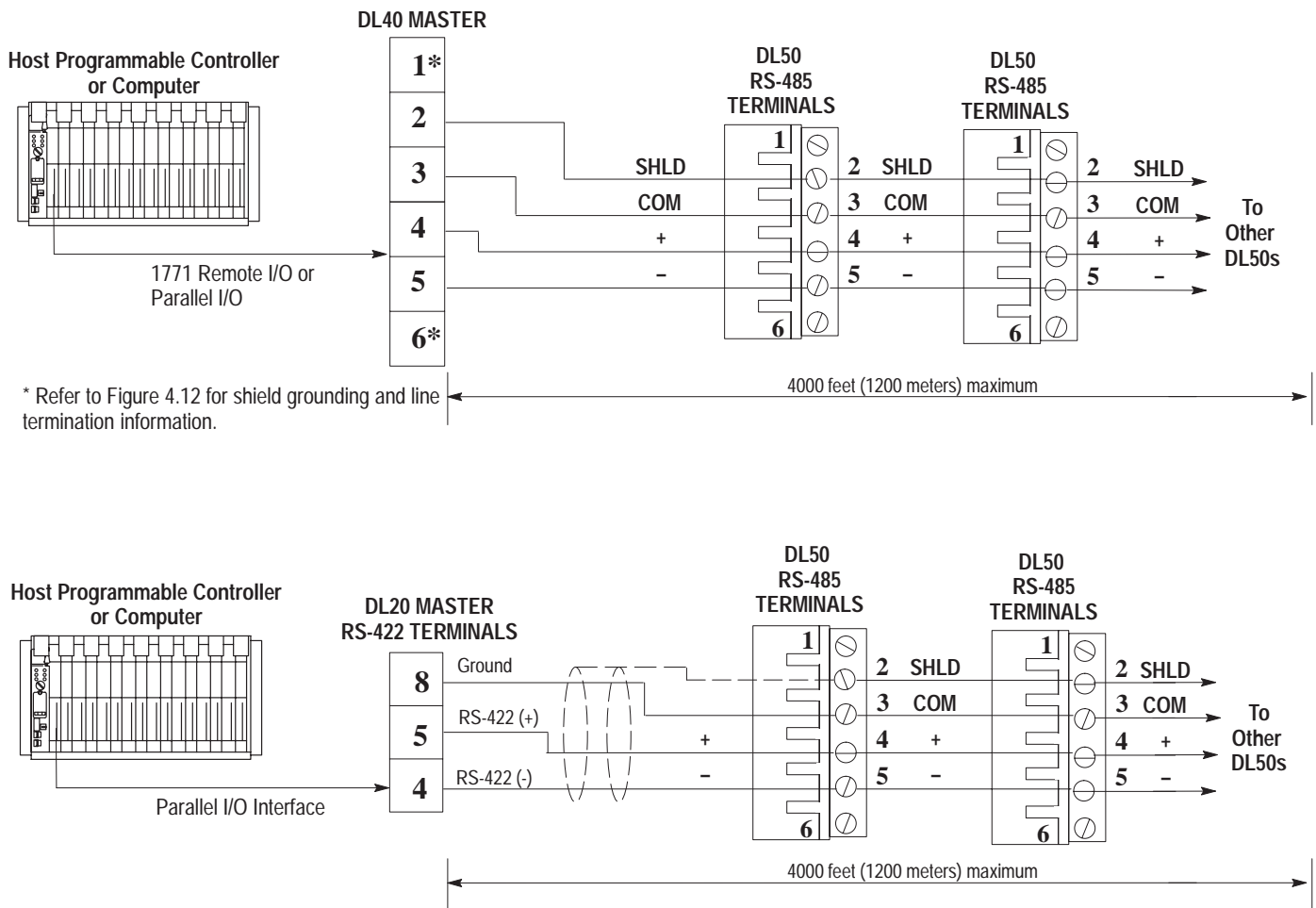
Connection as Slave to DL20 "Master" RS-232 Port

It is also possible to use the RS-232 output of the DL20 to connect to one DL50 slave, however the distance limitation is 50 feet. These connections are shown in Figure 4.15.

Figure 4.15
RS-232 DL20 Master to DL50 Slave Wiring Connections
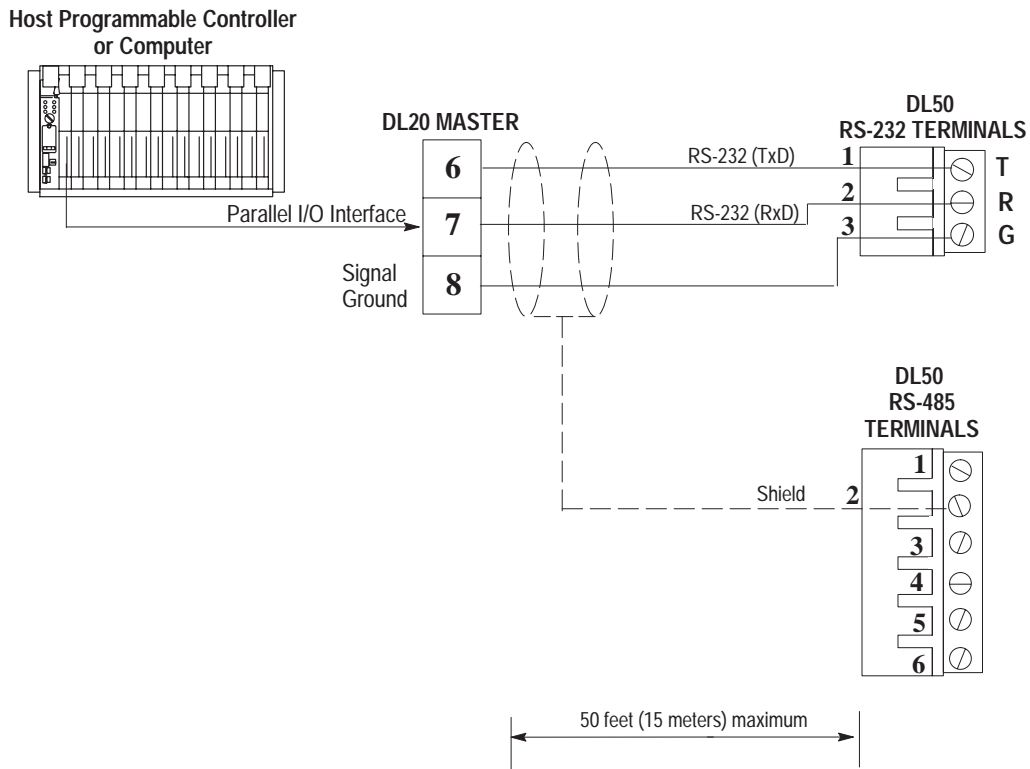
Connection to Personal Computers

The DL50 display may be connected to personal computers through an RS-232 port. Either Simplex or Duplex protocol may be used in applications with a personal computer as host.

- For single-point connections of 50 feet or less, the DL50 RS-232 port may be connected directly to the personal computer RS-232 port. See Figure 4.16.

Figure 4.16
Personal Computer to DL50 RS-232 Port
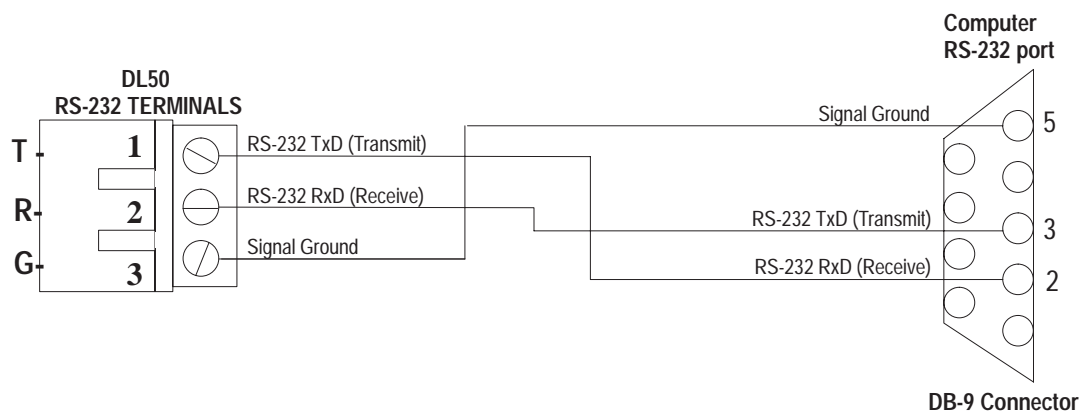
- For installations greater than 50 feet, or for multi-drop networks containing multiple DL50 displays, the personal computer can be connected to a DL50 RS-485 network through a multi-point RS-232 to RS-485 converter. See Figure 4.17.

A multi-point converter is used for:

- single DL50 installations with a cable length over 50 feet, or
- multi-drop network containing multiple DL50 displays.

Any RS-232 host (such as a personal computer) can be connected to a DL50 RS-485 network through a multi-point RS-232 to RS-485 converter such as Black Box Corporation's Model LD485A-MP.

Note: The output of LD485A-MP is a half-duplex RS-485 network that will support up to 32 multi-dropped DL50 displays. Up to 100 DL50 displays can be connected when line drivers are installed.

Figure 4.17
Personal Computer to DL50 RS-485 Port(s)
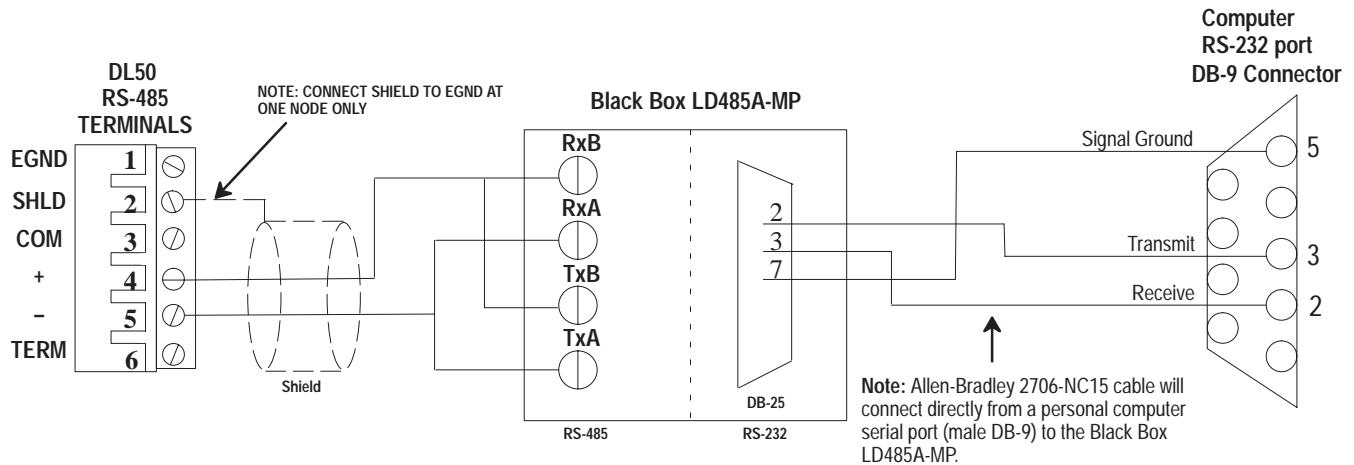
Black Box LD485A-MP Configuration

Configure the Black Box (LD485A-MP) converter as follows:

1. Remove cover and set the converter as a DCE device using the XW1A jumper. This is a 16-pin DIP jumper.

2. Short TxA and RxA on TB1 of the converter.

3. Short TxB and RxB on TB1 of the converter.

4. Set jumper W8 to half-duplex operation.

5. Set jumper W9 for a 50 millisecond RTS/CTS delay time.

6. Set jumper W15 to B-C for data enabled operation.

7. Set jumper W16 to A-B for 5 millisecond turnaround delay.

8. Set jumper W17 to A for 1 millisecond driver delay.

9. Set jumper W18 to A-B for DTR enabled driver.

10. Set switch S2 to the unterminated position.

11. Replace cover.

12. Set Normal/Loopback switch on front panel to Normal.

> ⚠ **ATTENTION:** The two jumpers to short TxA to RxA and TxB to RxB are **essentia**l for converter function. See steps 2 and 3 above, and Figure 4.17.

**Connection to
Allen-Bradley
Programmable Controllers**

Most Allen-Bradley Programmable Logic Controllers (PLCs) provide a
variety of methods to interface RS-232 or RS-485 devices. They include the:

Mini PLC-2

Mini PLC-2/15, -2/05, etc.

PLC-2/20 (1772-LP1, -LP2)

PLC-2/30 (1772-LP3)

PLC-3

PLC-3/10

PLC-5 Family

SLC 500 Family

The most common means of providing serial interfaces for the above
Programmable Controllers include the following optional modules:

BASIC Module- Catalog No. 1771-DB
(All PLC-5 Programmable Controllers)

Peripheral Communications Module- Catalog No. 1771-GA
(PLC-3 Family only)

ASCII I/O Module- Catalog No. 1771-DA
(All PLC-5 Programmable Controllers)

Flexible Interface Module- Catalog No. 2760-RB
(All PLC-5 Programmable Controllers)

SLC 500 BASIC Module- Catalog No. 1746-BAS
(All SLC 500 Small Logic Controllers)

BASIC Module
Catalog No. 1771-DB
Catalog No. 1746-BAS

The Allen-Bradley BASIC Modules (Catalog No. 1771-DB and Catalog No. 1746-BAS) provide a cost-effective and efficient serial interface to Allen-Bradley PLC and SLC controllers. The BASIC Modules store all messages in battery-backed RAM or EPROM. The modules can be programmed to transmit these messages along with status or variable data from the programmable controller.

The BASIC Modules support both RS-232 and RS-422 applications. For more information on the BASIC Modules, refer to the user's manuals. Chapter 6 provides programming examples.

Figure 4.18 shows how to connect the RS-232 port of the DL50 to the BASIC Modules.

Figure 4.18
RS-232 Connection to BASIC Module
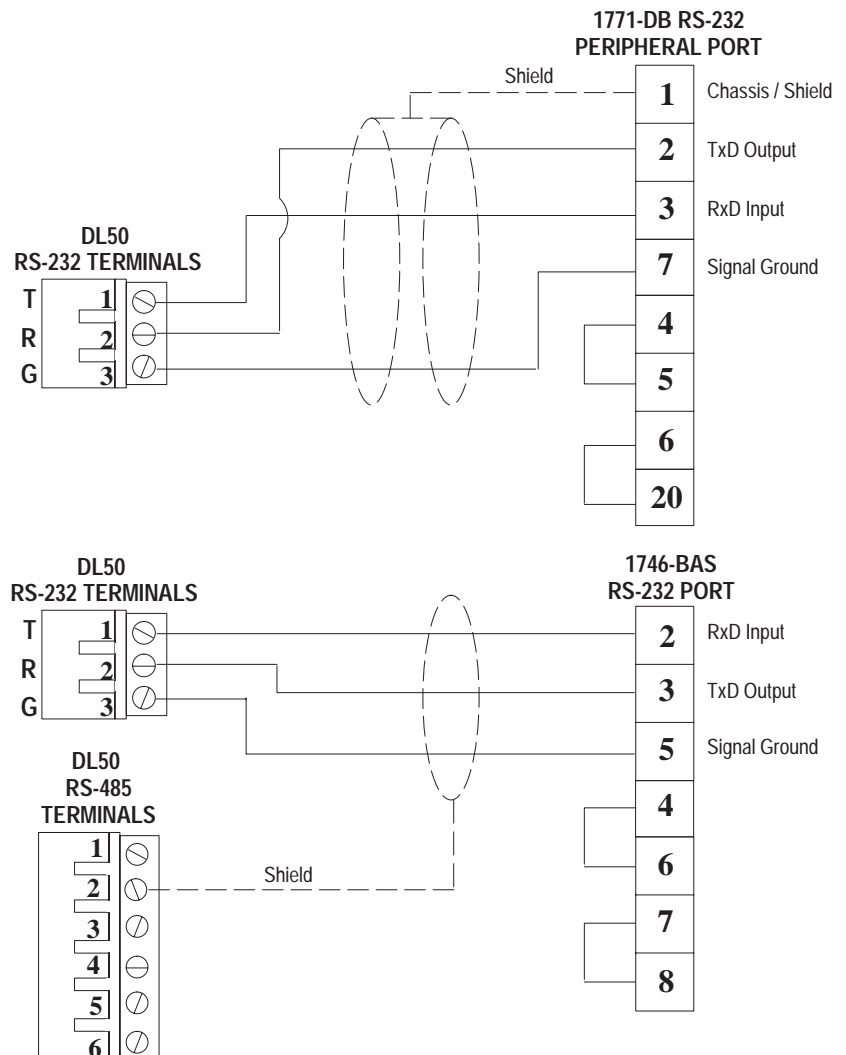
Peripheral Communications Module Catalog No. 1771-GA

The Peripheral Communications Module (Catalog No. 1775-GA) is only applicable to Allen-Bradley PLC-3 Family Programmable Controllers. The module plugs directly into the PLC-3 chassis. It has several serial ports and is capable of performing many unique tasks at one time for a PLC-3 System. The Peripheral Communications Module supports RS-232 serial port specifications.

Figure 4.19 shows how to connect the RS-232 port of the DL50 to a Peripheral Communications Module.

Note: Using an RS-232 ⇋RS-485 converter such as the Black Box ™ LD-485A-MP you can connect the Peripheral Communications Module to the RS-485 port of one or more DL50(s). See figure below.

Figure 4.19
RS-232 Connection to Peripheral Communications Module
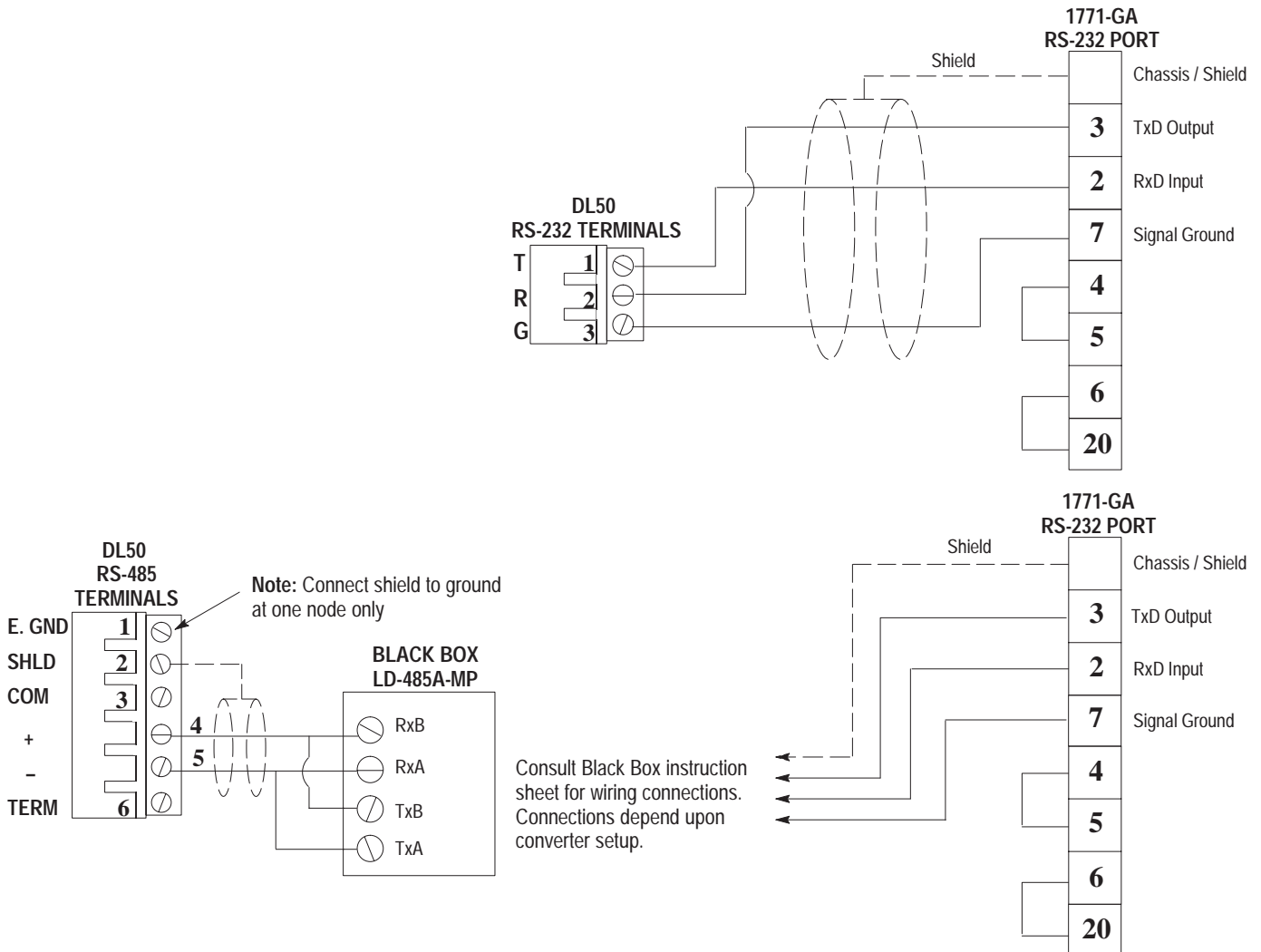
ASCII I/O Module Catalog No. 1771-DA

The ASCII I/O Module (Catalog No. 1771-DA) provides a serial interface for almost all Allen-Bradley programmable controllers. It can be plugged into any slot of a standard 1771 local or remote I/O rack.

The ASCII I/O Module has no memory or programming language. All DL50 display messages would be stored in the programmable controller's memory.

Figure 4.20 shows how to connect the RS-232 port of the DL50 to a ASCII I/O Module.

Note: Using an RS-232 ⇆RS-485 converter such as the Black Box™ LD-485A-MP you can connect the ASCII I/O Module and the RS-485 port of one or more DL50(s). See figure below.

Figure 4.20
RS-232 Connection to an ASCII I/O Module
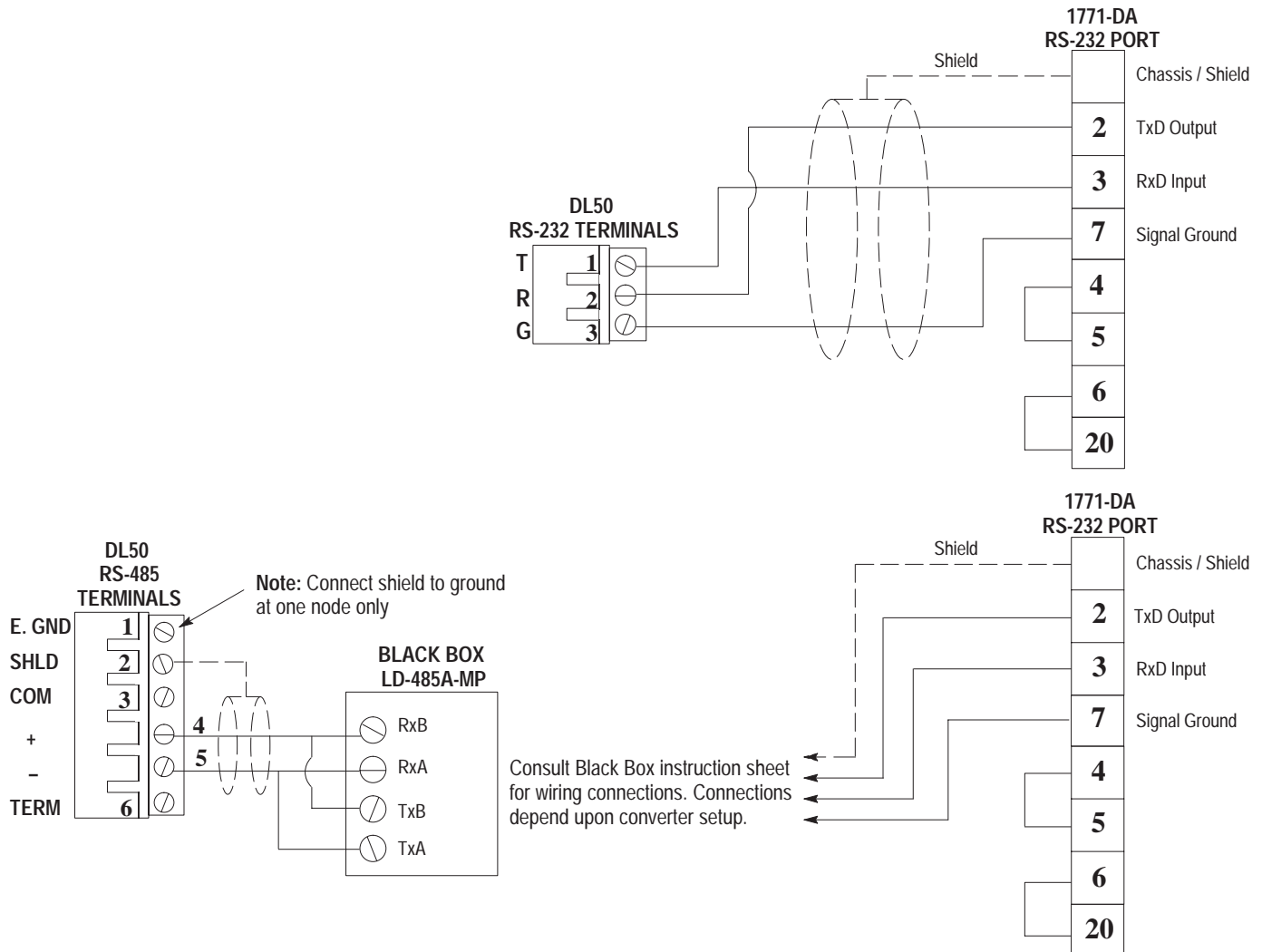
Flexible Interface Module Catalog No. 2760-RB

Use the Flexible Interface Module with either the Catalog No. 2760-SFC1 or 2760-SFC2 cartridge with Dumb Terminal (DT) protocol. Multidrop up to 31 DL50's on each of the three communications ports on the module.

Figure 4.21 shows how to connect the RS-485 port of the DL50 to a Flexible Interface Module RS-422 port.

Figure 4.21
RS-485 Connection to a Flexible Interface Module
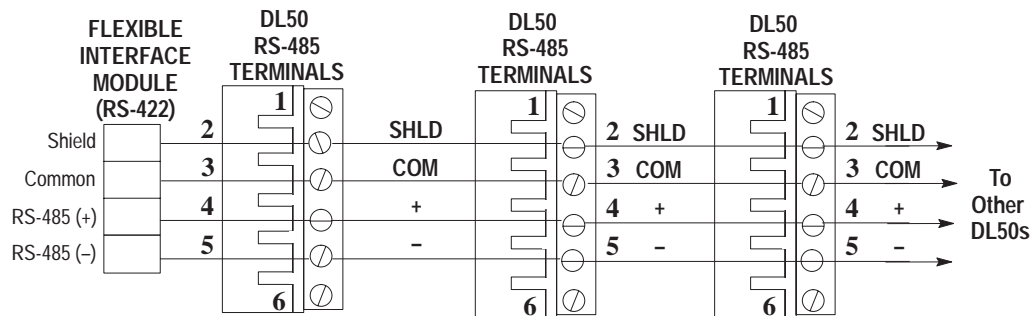
Flexible Interface Module Network Termination
Terminate RS-422 network at Flexible Interface Module. Refer to User Manual.

Shield Grounding
Connect shield (terminal #2) to ground (terminal #1) at any one node (only) on RS-422 Network.

Network Termination
Terminate last DL50 by connecting RS-422 + (terminal #4) to TERM (terminal #6)
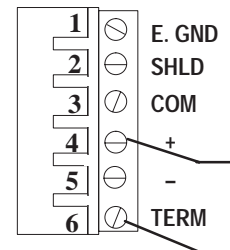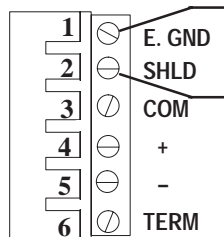
Serial Communications

Chapter Objectives

This chapter describes how to communicate with the DL50 using a simple ASCII string format. The DL50 supports both simplex and duplex communications protocols. Each will be addressed in this chapter.

Protocols

Simplex Communications- In this protocol, the DL50 does not provide any responses to the master device. The DL50 receives message packets from the master device and uses this information to display text. Use this protocol when the commands are sent from Allen-Bradley Dataliner DL20 and DL40 message displays.

Duplex Communications- In this protocol, the DL50 provides a response to each command it receives. The response includes data checking bytes (Checksum) and a handshake byte (ACK/NAK). The DL50 receives message packets from the master device, transmits data checksum/handshake bytes back to the master, and uses the message data to display text.

The Duplex Protocol section starts on page 5-8.

Host Device Compatibility

The DL50 can communicate with a wide range of host devices using either the Simplex or Duplex protocols. These protocols are selected through dipswitch configuration of the DL50 display. Table 5.A lists typical Allen-Bradley products that can drive DL50 displays, together with the protocol(s) they can support.

Table 5.A
Host Device Compatibility with Simplex and Duplex Protocol Formats

Product Family	Host Device	Host COM Port	Simplex	Duplex
Dataliner Displays	Dataliner DL40 Message Displays Dataliner DL20 Message Displays	RS-485 RS-232 / RS-422	YES YES	NO NO
MessageView Displays	MessageView 2706-M1D1, -M1N1, -M1F1	RS-232	YES	NO
PLC 5	PLC 5 Family Programmable Controllers BASIC Module (1771-DB) ASCII I/O Module (1771-DA) Flexible Interface Module (2760-RB)	Channel #0 RS-232 RS-232/RS-485 RS-232 RS–232/RS-422	YES YES YES YES	YES YES YES YES
SLC500	SLC 5/03 Small Logic Controller SLC 5/04 Small Logic Controller BASIC Module (1746-BAS)	Channel #0 RS-232 Channel #0 RS-232 RS-232/RS-485	YES YES YES	YES YES YES

Simplex Protocol

The simplex data packet consists of 6 data fields as shown below:

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6
Optional Control Byte	**ASCII Text or Special Control Characters**	**Optional Display Mode**	**Slave Address**	**Line Number**	**Carriage Return**
1 Byte	0-250 Bytes	1 Byte	1 Byte	1 Byte	1 Byte

Note: Simplex protocol is compatible with Allen-Bradley DL20 and DL40 message displays.

Field 1: Optional Control Byte

This is an optional field which indicates whether the text is to be buffered or displayed when it is received. The following control characters are used:

Table 5.B
Control Byte Characters (Simplex)

Control Character	Decimal Value	Function
Ctrl-A	1	Append the characters to buffer.
Ctrl-B	2	Append characters to buffer then display.
Ctrl-C	3	Clear display line(s).
Ctrl-L	12	Initialize DL50 for Bootstrap.

The ability to append characters to the display buffer (Ctrl-A) and to display the buffer contents (Ctrl-B) allows long message text to be sent using multiple data packets.

The command for initializing the Bootstrap Mode (Ctrl-L) is described in Chapter 7.

If this control byte is not included in the message packet, the DL50 will default to displaying the text. All other values of the control character are ignored.

Field 2: ASCII Text

This field contains the ASCII characters and/or special ASCII control characters (up to 250) that are to be displayed by, or to control, the DL50.

If the Optional Display Mode byte is not sent, and the packet contains more text than can be displayed on one line of the display, the message will be truncated (unless message line number is 30, see Table 3.A).

Simplex Protocol (continued)

Field 3: Optional Display Mode

This optional field indicates how the message text is to be displayed. If this optional byte is not present, the Line Number (field 5) determines the display mode. The following control characters are used:

Table 5.C
Display Mode Control Characters

Control Character	Decimal Value	Display Mode ①
Ctrl-A	1	Hold
Ctrl-B	2	Flash
Ctrl-C	3	Scroll
Ctrl-D	4	Roll Up
Ctrl-E	5	Roll Down
Ctrl-H	8	Roll Right
Ctrl-I	9	Roll Left
Ctrl-K	11	Wipe Up
Ctrl-L	12	Wipe Down
Ctrl-N	14	Wipe Left
Ctrl-O	15	Wipe Right

① Refer to Appendix A for display descriptions.

Simplex Protocol (continued)

Field 3: Optional Display Mode (continued)

Special Control Characters

When operating in the slave mode, the DL50 will recognize the following special control characters:

- **Ctrl F [FLASH]**
  The Ctrl F (decimal 6) control character causes the DL50 to toggle between flashing and non-flashing characters. Text which is between two Ctrl F characters will flash, all other characters will be non-flashing.

  For Example:
  Assume that the character ^ denotes a Ctrl-F. If the following message is sent: *This is a message with ^FLASHING TEXT^ along with non-flashing text.*

  The words FLASHING TEXT will flash while the other words will be non-flashing.

- **Ctrl R [RESET]**
  The Ctrl R (decimal 18) control character causes the DL50 to clear all data in the message buffer, toggle the flashing message attribute to off, and reset the display color to the default specified by the dipswitch settings (see Figure 3.2). This control character does not affect a message being currently displayed.

  Note: We recommend that the host device send a **Ctrl-R** (decimal 18) command to all slave displays when the system is powered up, and also each time before a message packet is sent to a specific slave address. This clears any data that might interfere with the new message.

- **Ctrl X [RED]**
  The Ctrl X (decimal 24) control character changes all subsequent characters to Red until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

- **Ctrl Y [AMBER (YELLOW)]**
  The Ctrl Y (decimal 25) control character changes all subsequent characters to Amber until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

- **Ctrl Z [GREEN]**
  The Ctrl Z (decimal 26) control character changes all subsequent characters to Green until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

Simplex Protocol (continued)

Field 4: Slave Address

The slave address is a single byte field that can be any value from 1- 255, except for 6, 13,16, and 18. When connecting a DL50 to a DL20/DL40 master, the illegal decimal addresses are: 0, 4, 6, 7, 13, 16, 18, 20, 22, 43, 45, 48-57, and 128-255. A display with an address of 127 will accept all message packets regardless of the address on the packet. In addition any message packet with an address of 127 will be received by all displays.

Field 5: Line Number

When the optional bytes (field 1 and 3) are not present, the line number field specifies on which line(s) the message is displayed. The line number function depends upon the size of the display (10 or 20 character display) and the line height (selected by DIP switches). Table 5.D shows the effect of line number selection on Catalog No. 2706-F11J, -F11JC and Table 5.E shows the effect of line number selection on Catalog No. 2706-F21J, -F21JC.

Note: Catalog No. 2706-F11J, -F11JC can display **one line of ten 4.8 inch** characters or **two lines of twenty 2.1 inch** characters. Catalog No. 2706-F21J, -F21JC can display **one line of twenty 4.8 inch** characters or **two lines of forty 2.1 inch** characters.

Table 5.D
Line Number Effect On Catalog No. 2706-F11J, -F11JC

Display Mode	Line Number Field 5 (Decimal)	Text Displayed On Line Number:	Character Size (Inches)
2.1 Inch Text	1	1	2.1
	2	2	2.1
	3	Line Ignored	Not Applicable
	4	Line Ignored	Not Applicable
	30	1 and 2 ①	2.1
4.8 Inch Text	1	1 ②	4.8
	2	Line Ignored	Not Applicable
	3	Line Ignored	Not Applicable
	4	Line Ignored	Not Applicable
	30	1 ②	4.8
Auto-Select	1	1	2.1
	2	2	2.1
	3	1 ②	4.8
	4	Line Ignored	Not Applicable
	30	1 and 2 ①	2.1

① If the line number is 30, this means that the host is requesting the text to be displayed on both lines 1 and 2. The first 20 characters are displayed on line 1 and the second 20 characters on line 2. If more than 40 characters are received, characters 41-80 will be displayed on the second screen, characters 81-120 on the third screen, etc.

② If more than 10 characters are sent, the DL50 will Roll the character text from right to left.

Simplex Protocol (continued)

Table 5.E
Line Number Effect On Catalog No. 2706-F21J, -F21JC

Display Mode	Line Number Field 5 (Decimal)	Text Displayed On Line Number:	Character Size (Inches)
2.1 Inch Text	1 2 3 4 30	1 (1st 20 Characters) 1 (2nd 20 Characters) 2 (1st 20 Characters) 2 (2nd 20 Characters) 1 and 2 [1]	2.1 2.1 2.1 2.1 2.1
4.8 Inch Text	1 2 3 4 30	1 [2] Line Ignored Line Ignored Line Ignored 1 [2]	4.8 Not Applicable Not Applicable Not Applicable 4.8
Auto-Select	1 2 3 4 30	1 2 1 [2] Line Ignored 1 and 2 [1]	2.1 2.1 4.8 (20 Characters) Not Applicable 2.1

[1] If the line number is 30, this means that the host is requesting the text to be displayed on both lines 1 and 2. The first 40 characters are displayed on line 1 and the second 40 characters on line 2. If more than 40 characters are received, characters 81-160 will be displayed on the second screen, characters 161-240 on the third screen, etc.

[2] If more than 20 characters are sent, the DL50 will display the message in successive 20-character sections.

A line number of 48 will energize the annunciation relay. A line number of 49 will de-energize the annunciation relay.

> **ATTENTION:**
>
> Use relay for annunciator only. Do not use relay contacts for purposes of control. Failure to follow this warning may result in unexpected equipment operation.

Field 6: Carriage Return

The Carriage Return (decimal 13) indicates the end of a message packet.

Simplex Protocol (continued)

Clearing Lines of Text

There are two methods of clearing text on the display:

- You can either send a message packet with a control byte (field 1) that has a Ctrl-C (decimal 3) value, or
- You can send a message packet with the following format:

Field 1	Field 2	Field 3
Slave Address	Line Number	Carriage Return
1 Byte	1 Byte	1 Byte

The line number in the message packet specifies which line(s) to clear:

ASCII Character	Decimal Value	Function
Ctrl-A	1	Clear line 1.
Ctrl-B	2	Clear line 2.
2	50	Clear all lines.

Performance

The DL50 display requires a time delay between successive packets sent from the host (master) to the DL50 display. This delay is referred to as the "inter-packet delay". It is required so the DL50 can process the received data properly before the next packet is received.

These delays need to be programmed into the host system only if messages will be sent in rapid succession to the same display. The time delay interval required is a function of the display type, character size, baud rate, and packet length. Table 5.F lists the required delay times for DL50 displays operating in Simplex Protocol mode, using the worst case scenario.

Table 5.F
Simplex Protocol Inter-Packet Delay Requirements
19200 Baud with Large Characters (worst case)

Display Type	Packet Length	Delay (milliseconds)
2706-F11J	250 characters	300 mS
2706-F11JC	250 characters	350 mS
2706-F21J	250 characters	300 mS
2706-F21JC	250 characters	350 mS

Note: Typical inter-packet delay requirements for most applications range from 80 to 250 milliseconds.

Duplex Protocol

Duplex Communications- In this Protocol, the DL50 provides a response to each command it receives. The response includes data checking bytes (Checksum) and a handshake byte (ACK/NAK). The DL50 receives message packets from the master device, transmits data checksum/handshake bytes back to the master, and uses the message data to display text.

> **Note:** Use Simplex Protocol when the commands are sent from Allen-Bradley Dataliner DL20 and DL40 message displays, or from other master devices that do not support duplex communication. The Simplex Protocol section starts on page 5-2.

The Duplex data packet consists of 7 data fields as shown below:

Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7
Control Byte	**ASCII Text or Special Control Characters**	**Slave Address**	**Line Number**	**Carriage Return**	**Message Attributes**	**Checksum (Dipswitch Enabled)**
1 Byte	1-250 Bytes	1 Byte	1 Byte	1 Byte	3 Bytes	3 Bytes

Field 1: Control Byte

This field indicates whether the text is to be buffered or displayed when it is received. The following control characters are used:

Table 5.G
Control Characters in Duplex Protocol

Control Character	Decimal Value	Function
Ctrl-A	1	Append the characters to buffer. Field 6 is not sent.
Ctrl-B	2	Append characters to buffer then display.
Ctrl-C	3	Clear display line(s). Field 2 is not sent.
Ctrl-D	4	Abandon running message. Reset buffer.
Ctrl-L	12	Initialize DL50 for Bootstrap.

Note: The Control byte is not optional as in the Simplex protocol.

If the control byte is Ctrl-A (decimal 1), the Message Attributes (field 6) is not sent because this packet does not cause the DL50 to display text. When Ctrl-B (decimal 2) is sent with a message attributes field, the message is sent to the message buffer and then displayed. Text which was previously sent to the buffer using Ctrl-A message packets is displayed with the message attributes contained in the Ctrl-B message packet.

A control byte containing Ctrl-D (decimal 4) provides a means of interrupting the DL50 display. This provides the host with the ability to display a messages with a higher priority than the message currently being displayed.

Duplex Protocol (continued)

A control byte containing Ctrl-L (decimal 12) indicates that the DL50 is being initialized for the bootstrap mode. In this mode the DL50 will be idle, waiting for the host to transmit a firmware update (refer to Chapter 7).

Field 2: ASCII Text or Special Control Characters

This field contains the ASCII characters (up to 250) that are to be displayed by the DL50 or sent to the message buffer. The special control characters are described on page 5-11.

Field 3: Slave Address

The slave address is a single byte field that can be any value from 1 to 255, except for addresses 6, 13, 16, and 18.

A display with an address of 255 will accept all message packets regardless of the address. In addition, any message packet with an address of 255 will be received by all displays.

   Note: Displays and messages with an address of 255 will not have a response packet. This is to prevent multiple devices from trying to transmit simultaneously on a half-duplex RS-485 network.

Field 4: Line Number

The line number performs one of two functions.

- Indicates where text is displayed.
- Indicates which lines to clear. Refer to the following table:

Line Number Field 4 (Decimal)	Function
1	Clear line 1 or display text on line 1.
2	Clear line 2 or display text on line 2.
3	Reserved for future use.
4	Reserved for future use.
50	Clear all lines.

Note: The line number and other attributes as defined in the Message Attributes byte (field 6) determine how the message is displayed.

Field 5: Carriage Return

This is a Ctrl M (decimal 13) character.

Duplex Protocol (continued)

Field 6: Message Attributes

This three byte field specifies how a message is displayed. The three bytes specify:

Byte 1	Byte 2	Byte 3
Display Mode Display Speed	**Text Height Relay Control**	**Reserved**

Display Mode / Speed The first byte of the Message Attributes field specifies display mode / display speed. The first five bits indicate display mode and the last three bits indicate the display speed.

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

↑ Always Set to 1   ↑ **Display Speed** ↑ Set Bits 5 and 6 using Table 5.D   **Display Mode** Set Bits 0 through 4 using Table 5.H ↑

Table 5.H
Bits 0 through 4 of the Message Attribute 1st Byte

Function①	Bits 4 ← 0	Decimal Value②
Hold	0 0 0 0 0	0
Roll Up	0 0 0 0 1	1
Roll Down	0 0 0 1 0	2
Roll Left	0 0 0 1 1	3
Roll Right	0 0 1 0 0	4
Roll In	0 0 1 0 1	5
Roll Out	0 0 1 1 0	6
Rotate	0 0 1 1 1	7
Wipe Up	0 1 0 0 0	8
Wipe Down	0 1 0 0 1	9
Wipe Left	0 1 0 1 0	10
Wipe Right	0 1 0 1 1	11
Wipe In	0 1 1 0 0	12
Wipe Out	0 1 1 0 1	13
Twinkle	0 1 1 1 0	14
Sparkle	0 1 1 1 1	15
Snow	1 0 0 0 0	16
Interlock	1 0 0 0 1	17
Switch	1 0 0 1 0	18
Slide Across	1 0 0 1 1	19
Spray On	1 0 1 0 0	20
Starburst On	1 0 1 0 1	21
Scroll	1 0 1 1 0	22
Reserved	1 0 1 1 1 → 1 1 1 1	23 → 31

① **Refer to Appendix A for descriptions of these attributes.**
② **Add decimal values for all bits within a byte to determine value of the entire byte.**

Duplex Protocol (continued)

Field 6: Message Attributes (continued)

Special Control Characters

When operating in the slave mode, the DL50 will recognize the following special control characters:

- **Ctrl F [FLASH]**
  The Ctrl F (decimal 6) control character causes the DL50 to toggle between flashing and non-flashing characters. Text which is between two Ctrl F characters will flash, all other characters will be non-flashing.

  For Example:
  Assume that the character ^ denotes a Ctrl-F. If the following message is sent: *This is a message with ^FLASHING TEXT^ along with non-flashing text.*

  The words FLASHING TEXT will flash while the other words will be non-flashing.

- **Ctrl R [RESET]**
  The Ctrl R (decimal 18) control character causes the DL50 to clear all data in the message buffer, toggle the flashing message attribute to off, and reset the display color to the default specified by the dipswitch settings (see Figure 3.2). This control character does not affect a message being currently displayed.

  Note: We recommend that the host device send a **Ctrl-R** (decimal 18) command to all slave displays when the system is powered up, and also each time before a message packet is sent to a specific slave address. This clears any data that might interfere with the new message.

- **Ctrl X [RED]**
  The Ctrl X (decimal 24) control character changes all subsequent characters to Red until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

- **Ctrl Y [AMBER (YELLOW)]**
  The Ctrl Y (decimal 25) control character changes all subsequent characters to Amber until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

- **Ctrl Z [GREEN]**
  The Ctrl Z (decimal 26) control character changes all subsequent characters to Green until another special control character is received or the end of the message occurs. After the end of the message, the default color is re-established. (Tri-color displays only.)

Duplex Protocol (continued)

Field 6: Message Attributes (continued)

Table 5.I
Bits 5 through 7 of the Message Attribute 1st Byte

Function	Bits 7 ← 5 ①	Decimal Value ②
Fastest Display	1 0 0	128
Fast Display	1 0 1	160
Slow Display	1 1 0	192
Slowest Display	1 1 1	224

① Bit 7 is always set to 1.

② Add decimal values for all bits within a byte to determine value of the entire byte.

Text Height / Relay Control- The second byte of the Message Attributes field specifies the text height and relay operation. The first three bits are reserved for future use. The third and fourth bits specify the text height. The sixth bit is reserved, the seventh bit controls the operation of the relay, and the eighth bit is always set to one.
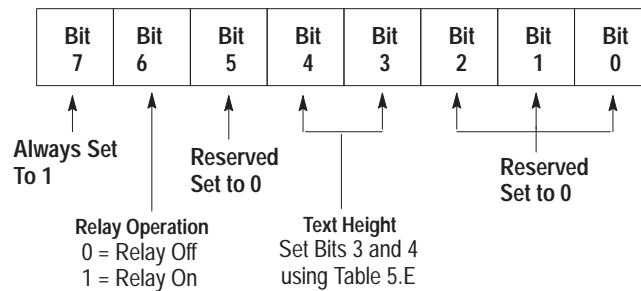
Table 5.J
Bits 3 and 4 of the Message Attribute 2nd Byte

Text Height	Bits 4 ← 3	Decimal Value ①
2.1 Inch (53.3mm) Text	0 0	0
4.8 Inch (12 1.9 mm) Text	0 1	8
Reserved	1 0	16
Reserved	1 1	24

① Add decimal values for all bits within a byte to determine value of the entire byte.

Note: Bit 6 of message attribute 2nd byte:

Relay On = decimal value of 64
Relay Off = decimal value of 0

Bit 7 of message attribute 2nd byte always = decimal value of 128

Duplex Protocol (continued)

Field 6: Message Attributes (continued)

Third Byte Message Attributes- The third byte of the Message Attributes field is reserved for future enhancements. Always set the eighth bit to 1 so that the field is not misinterpreted as a control character:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Always Set To 1   Reserved
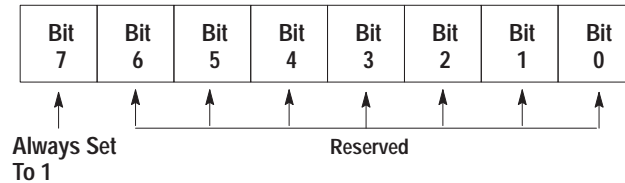
Field 7: Checksum

This is a three byte field that contains:

Byte 1	Byte 2	Byte 3
Checksum Dummy Byte	**Checksum MSB**	**Checksum LSB**
1 Byte	1 Byte	1 Byte

If either the Checksum Most Significant Byte (MSB) or Checksum Least Significant Byte (LSB) contain a value equivalent to a CR (decimal 13), the content of the dummy byte is adjusted to alter the value of the Checksum bytes. Refer to Appendix F for a description of how the checksum bytes are calculated.

Important: To disable the checksum, set the DL50 DIP switch S2 position 8 to Off (refer to Figure 3.2). With the checksum disabled, your host duplex messages must still contain 3 bytes in Field 7, but the checksum value is ignored by the DL50.

Duplex Protocol (continued)

Response From the DL50

To every command the DL50 successfully receives, the DL50 will provide a response. The response packet has the following format:

Field 1	Field 2	Field 3
ACK or NAK	**Status Byte**	**Checksum**
1 Byte	1 Byte	3 Bytes

1. If the DL50 Display successfully received the message packet, and is ready to process it, the DL50 sends an acknowledge response (**ACK** 6 decimal). In this case, the contents of the status byte are irrelevant.

2. If the DL50 successfully received the message packet but is not able to display it, a negative acknowledge response (**NAK** 21 decimal) is sent. This indicates one of the following:

- A Display FAULT has been detected, or
- Display is in the BUSY state.

   A NAK will be accompanied by a status byte with the bits set as defined here:

Bit Number	Meaning
0	0 = No Fault; 1 = Fault Detected
1	0 = Normal; 1 = Display is Busy
2	Unused
3	Unused
4	Unused
5	Unused
6	Unused
7	Always 1

3. If no response is sent from the DL50, it indicates one of the following:

- The message was not received
- CHECKSUM error was detected
- DL50 address is set to 255
- Message address is 255.

Both ACK and NAK responses are also accompanied by a three byte Checksum. The first byte (dummy byte) is normally 0 and is only used when either or both checksum bytes contain a value equivalent to a Carriage Return. Refer to Appendix F for a description of how the checksum bytes are calculated.

Note: If a DL50 has an address of 255, or if a DL50 receives a message with an address of 255, it does not send a response. This is to prevent multiple devices from trying to transmit simultaneously on the half-duplex RS-485 network.

Slave Mode Operation / Examples

Chapter Objectives

This chapter describes how to operate the DL50 in the slave mode. The slave mode is the normal operating mode of the DL50. In order to show the operation of the DL50, this chapter contains example messages and host programs.

Slave Mode Operation

To operate the DL50 in the slave mode, perform the following steps:

1. Install the DL50 as described in Chapter 4.

2. Configure the DL50 using the configuration DIP switches as shown in Figure 3.2. You can configure the DL50 using the DIP switches before or after installation. Make sure you press the reset button (or cycle power) if power is applied before you configure the DL50. This will load the DIP switch settings into the DL50's memory. Refer to Figure 2.2 for the location of the reset button.

3. Depending upon the protocol selected using the DIP switches (Simplex or Duplex), send message packets which are in the format described in Chapter 5.

4. If you are using Duplex Protocol, the host device will receive an ACK (decimal 6) or NAK (decimal 21) response from the DL50. Refer to description of DL50 response format in NO TAG. The host should re-transmit the message if a NAK is received.

Example Messages

The following are example message packets that could be transmitted to a DL50. The function(s) of each command is provided.

Example 1 (Simplex Protocol)

Command Function: Display message shown below on all DL50 message displays with an address of 42.

```
┌─────────────────────────────┐
│                             │
│        PRESSURE LOW         │
│                             │
└─────────────────────────────┘
```

The command specifies a Roll up display mode.

The host would need to send the following data (Simplex Protocol):

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
P **(Decimal 77)**	**R** **(Decimal 82)**	**E** **(Decimal 69)**	**S** **(Decimal 83)**	**S** **(Decimal 83)**	**U** **(Decimal 85)**
1 of 12 bytes	2 of 12 bytes	3 of 12 bytes	4 of 12 bytes	5 of 12 bytes	6 of 12 bytes

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
R **(Decimal 82)**	**E** **(Decimal 69)**	**SPACE** **(Decimal 32)**	**L** **(Decimal 76)**	**O** **(Decimal 79)**	**W** **(Decimal 87)**
7 of 12 bytes	8 of 12 bytes	9 of 12 bytes	10 of 12 bytes	11 of 12 bytes	12 of 12 bytes

Roll Up Message	Slave Address 42	Line #1	End Message
Field 3 Display Mode	Field 4 Slave Address	Field 5 Line Number	Field 6 Carriage Return
Ctrl-D **(Decimal 4)**	**42** **Decimal**	**1** **Decimal**	**CR** **(Decimal 13)**
1 of 3 bytes	2 of 3 bytes	3 of 3 bytes	1 byte

A simple BASIC program for a host PC to send the message would be:

100: Print #1, "PRESSURE LOW" + CHR$(4) + CHR$(42) + CHR$(1) + CHR$(13)

Example 2 (Duplex Protocol)

Command Function: Display message shown below on all DL50 message displays.

```
┌─────────────────────────────┐
│ ┌─────────────────────────┐ │
│ │                         │ │
│ │       Motor ON          │ │
│ │                         │ │
│ └─────────────────────────┘ │
└─────────────────────────────┘
```

The command specifies message attributes of roll in display mode, fast display speed, 4.8 inch text, and annunciation relay on.

Address 255 specifies that the message is displayed on all DL50s.

The host would need to send the following data (Duplex Protocol):

Append & Display Message | | | Message Text | | |

Field 1 Control Byte	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
Ctrl-B **(Decimal 2)**	**M** **(Decimal 77)**	**o** **(Decimal 111)**	**t** **(Decimal 116)**	**o** **(Decimal 111)**	**r** **(Decimal 114)**
1 byte	1 of 8 bytes	2 of 8 bytes	3 of 8 bytes	4 of 8 bytes	5 of 8 bytes

			Message Text		
Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 3 Slave Address	Field 4 Line Number	Field 5 Carriage Return
SPACE **(Decimal 32)**	**O** **(Decimal 79)**	**N** **(Decimal 78)**	**255** **Decimal**	**1** **Decimal**	**CR** **(Decimal 13)**
6 of 8 bytes	7 of 8 bytes	8 of 8 bytes	1 byte	1 byte	1 byte

Fast Display, Roll in	Relay On 4.5 Inch text	Always Set to 128		Checksum Bytes	
Field 6 Message Attributes	Field 6 Message Attributes	Field 6 Message Attributes	Field 7 Checksum	Field 7 Checksum	Field 7 Checksum
165 **Decimal**	**200** **Decimal**	**128** **Decimal**	**0** **Decimal**	**05** **Decimal**	**202** **Decimal**
1 of 3 bytes	2 of 3 bytes	3 of 3 bytes	1 of 3 bytes	2 of 3 bytes	3 of 3 bytes

A simple BASIC program for a host PC to send the message would be:

```
100:  Print #1, CHR$(2) + "Motor ON" + CHR$(255) + CHR$(1) + CHR$(13) + CHR$(165) +
      HR$(200) + CHR$(128) + CHR$(0) + CHR$(05) + CHR$(202)
```

Note: Refer to Appendix F for checksum calculations.

Example 3 (Relay On)

Command Function: Energize annunciation relay on DL50 with an address of 150.

The host would need to send the following data (Simplex Protocol):

Address	Relay On	End Message
Field 4 Slave Address	Field 5 Line Number	Field 6 Carriage Return
150 **Decimal**	**48** **Decimal**	**CR** **(Decimal 13)**
1 byte	1 byte	1 byte

A simple BASIC program for a host PC to send the message would be:

100: Print #1, CHR$(150) + CHR$(48) + CHR$(13)

Example 4 (Relay Off)

Command Function: De-energize annunciation relay on DL50 with an address of 150.

The host would need to send the following data (Simplex Protocol):

Address	Relay Off	End Message
Field 4 Slave Address	Field 5 Line Number	Field 6 Carriage Return
150 **Decimal**	**49** **Decimal**	**CR** **(Decimal 13)**
1 byte	1 byte	1 byte

A simple BASIC program for a host PC to send the message would be:

100: Print #1, CHR$(150) + CHR$(49) + CHR$(13)

Example 5 (Send 2-Line Message)

Command Function: Display message as shown below on lines 1 and 2 of all
DL50s using the line number field value of 30.

.

```
Sequence Error:
ROBOT NOT POSITIONED
```

The command is written for a Catalog No. 2706-F11J or -F11JC display.
Address 127 specifies that the message is displayed on all DL50s. The word
"NOT" in the message will flash. The host would need to send the following
data (Simplex Protocol):

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
S (Decimal 83)	**e** (Decimal 101)	**q** (Decimal 113)	**u** (Decimal 117)	**e** (Decimal 101)	**n** (Decimal 110)	**c** (Decimal 99)	**e** (Decimal 101)	**SPACE** (Decimal 32)
1 of 42 bytes	2 of 42 bytes	3 of 42 bytes	4 of 42 bytes	5 of 42 bytes	6 of 42 bytes	7 of 42 bytes	8 of 42 bytes	9 of 42 bytes

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
E (Decimal 69)	**r** (Decimal 114)	**r** (Decimal 114)	**o** (Decimal 111)	**r** (Decimal 114)	**:** (Decimal 58)	**SPACE** (Decimal 32)	**SPACE** (Decimal 32)	**SPACE** (Decimal 32)
10 of 42 bytes	11 of 42 bytes	12 of 42 bytes	13 of 42 bytes	14 of 42 bytes	15 of 42 bytes	16 of 42 bytes	17 of 42 bytes	18 of 42 bytes

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
SPACE (Decimal 32)	**SPACE** (Decimal 32)	**R** (Decimal 82)	**O** (Decimal 79)	**B** (Decimal 66)	**O** (Decimal 79)	**T** (Decimal 84)	**SPACE** (Decimal 32)	**Flash On** (Decimal 6)
19 of 42 bytes	20 of 42 bytes	21 of 42 bytes	22 of 42 bytes	23 of 42 bytes	24 of 42 bytes	25 of 42 bytes	26 of 42 bytes	27 of 42 bytes

Message Text

Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text
N (Decimal 78)	**O** (Decimal 79)	**T** (Decimal 84)	**Flash Off** (Decimal 6)	**SPACE** (Decimal 32)	**P** (Decimal 80)	**O** (Decimal 79)	**S** (Decimal 83)	**I** (Decimal 73)
28 of 42 bytes	29 of 42 bytes	30 of 42 bytes	31 of 42 bytes	32 of 42 bytes	33 of 42 bytes	34 of 42 bytes	35 of 42 bytes	36 of 42 bytes

Message Text						Simplex All Slaves	Line Number 30	
Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 2 ASCII Text	Field 4 Slave Address	Field 5 Line Number	Field 6 Carriage Return
T (Decimal 84)	**I** (Decimal 73)	**O** (Decimal 79)	**N** (Decimal 78)	**E** (Decimal 69)	**D** (Decimal 68)	**127** **Decimal**	**30** **Decimal**	**CR** (Decimal 13)
37 of 42 bytes	38 of 42 bytes	39 of 42 bytes	40 of 42 bytes	41 of 42 bytes	42 of 42 bytes	1 byte	1 byte	1 byte

A simple BASIC program for a host PC to send the message would be:

```
100: L1$ = "Sequence Error: (5 Spaces)"
110: L2$ = "ROBOT " + CHR$(6) + "NOT" + CHR$(6) + "POSITIONED"
120: Print #1, L1$ + L2$ + CHR$(127) + CHR$(30) + CHR$(13)
```

Programming Examples

The following are examples showing how some of the most common hosts would be programmed to send messages to a slave DL50.

Using the DL50 to Display Messages from a DL20

Chapter 4 illustrates the connections between the DL50 and a DL20 Series Dataliner.

Note: You must set the DL50 for Simplex protocol when communicating with a DL20.

The position and size of the characters displayed on the DL50 is determined by:

- Number of lines available on the master DL20
- Message attributes

When programming DL20 messages for a DL50, refer to the following charts and suggestions.

Catalog No. 2706-F11J, -F11JC

	2.1 Inch (53.3 mm) Characters 2 Lines Available	4.8 Inch (121.9 mm) Characters 1 Line Available	Auto Select One or Two Lines Available
DL20 Display Type 1, 2, or 4 Line ①	2 Line	1 Line ②	4 Line ②

Catalog No. 2706-F21J, -F21JC

	2.1 Inch (53.3 mm) Characters 2 Lines Available	4.8 Inch (121.9 mm) Characters 1 Line Available	Auto Select One or Two Lines Available
DL20 Display Type 1, 2, or 4 Line ①	4 Line	1 Line	4 Line

① Number of DL20 lines required to use all of the characters on each line of the DL50.

② The DL50 will Roll the 20 characters from right to left, 10 (4.8 inch) characters at a time.

Table 6.A
Application Hints for using a DL20 as host

Displaying 2.1 Inch (53.3 mm) Characters

DL20 Message Type	How Message Appears On DL50	DL50/DL20 Application Notes
"Line 1 Only"or "Line 2 Only" message $\leq$ 20 characters on the DL20	Message appears as a Line 1 or Line 2 message on the DL50 with up to 20 characters.①	DL50: 2.1 Inch characters or auto-select. DL20: Line used attribute.
"Line 1 Only"or "Line 2 Only" message > 20 characters on the DL20	Message appears as a Line 1 or Line 2 message on the DL50 in segments of up to 20 characters each.①	DL50: 2.1 Inch characters or auto-select DL20: Line used attribute.
"All Lines" message on a 4 line DL20.	Do not send message to a DL50 in Auto-Select mode.	DL50: 2.1 Inch characters. DL20: Line used attribute.
Scrolling message on a DL20.	Also scrolls on a DL50, but the scroll rate is slower than the DL20 wait time (in .1 seconds).	DL50: Scroll message. DL20: Scroll message and wait time attributes.
Flashing message on a DL20.	Also flashes on a DL50. A scrolling message is not displayed as flashing	DL50: Flash messages. DL20: Flash attribute and scroll message attribute.

① Uses the 20 characters on the left half of Catalog No. 2706-F21J, -F21JC.

Displaying 4.8 Inch (121.9 mm) Characters

DL20 Message Type	How Message Appears On DL50	DL50/DL20 Application Notes
"Line 1 Only" message $\leq$ 20 characters on the DL20.	Message appears on DL50 with up to 20 characters.②	DL50: 4.8 Inch characters. DL20: Line used attribute, wait time attribute.
"Line 1 Only" message > 20 characters on the DL20.	Message appears as a Line 1 or Line 2 message on the DL50 in segments of up to 20 characters each.② For Catalog No. 2706-F11J, wait time = 4 is recommended.	DL50: 4.8 Inch characters, auto-select mode. DL20: Line used attribute, wait time attribute.
"All Lines" message on a 4 line DL20.	Do not send message to a DL50 in Auto-Select or large text mode.	2.1 inch characters only, see above.
"All Lines" message on a 2 line DL20.	Do not send message to a DL50 in large text mode.	
Scrolling message on a DL20.	Catalog No. 2706-F21J: Also scrolls, but the scroll rate is slower than the DL20 wait time (in .1 seconds). Catalog No. 2706-F11J: Do not use the DL20 scroll mode attribute.②	DL50: Scroll message. DL20: Scroll message and wait time attributes.
Flashing message on a DL20.	Also flashes on a DL50. A message with the scroll attribute set will not be displayed as flashing.	DL50: Flash messages. DL20: Flash attribute and scroll message attribute.

② Catalog No. 2706-F11J, -F11JC scrolls 20 character segments from right to left, 10 characters at a time.

Using the DL50 to Display Messages from a DL40

The DL50 can receive message data from a Bulletin 2706 DL40 Series Dataliner. Chapter 4 illustrates the connections.

Note: You must set the DL50 for Simplex protocol when communicating with a DL40.

The position and size of the characters displayed on the DL50 is determined by:

- Number of lines available on the master DL40
- Message attributes

When programming DL40 messages for a DL50, refer to the following charts and suggestions.

Catalog No. 2706-F11J, -F11JC

	2.1 Inch Characters 2 Lines Available	4.8 Inch Characters 1 Line Available	Auto Select One or Two Lines Available
DL40 Display Type 2 or 4 Line①	2 Line	2 Line②	4 Line②

Catalog No. 2706-F21J, -F21JC

	2.1 Inch Characters 2 Lines Available	4.8 Inch Characters 1 Line Available	Auto Select One or Two Lines Available
DL40 Display Type 2 or 4 Line①	4 Line	2 Line②	4 Line②

① Number of DL40 lines required to use all of the characters on each line of the DL50.

② The DL50 will scroll the 20 characters from right to left, 10 (4.8 inch) characters at a time, unless the DL40 slave message-length attribute is set to 10 characters.

Table 6.B
DL40 Application Hints for using a DL40 as host

Displaying 2.1 Inch (53.3 mm) Characters

DL40 Message Type	How Message Appears On DL50	DL50/DL40 Application Notes
"Line 1 Only"or "Line 2 Only" message $\leq$ 20 characters on the DL40	Message appears as a Line 1 or Line 2 message on the DL50 with up to 20 characters.①	DL50: 2.1 Inch characters or Auto-Select. DL40: Line Used Attribute.
"Line 1 Only"or "Line 2 Only" message > 20 characters on the DL40	Appears as a Line 1 or Line 2 message on the DL50 in segments of up to 20 characters each.①	DL50: 2.1 Inch characters or Auto-Select. DL40: Line Used Attribute.
"All Lines" message on the DL40.	Do not send message to a DL50 in Auto-Select mode.	DL50: 2.1 Inch characters DL40: 2 or 4 line displays.
Scrolling message on a DL40.	Also scrolls on a DL50, but the scroll rate is slower than the DL40 wait time (in 0.1 seconds).	DL50: Scroll message. DL40: Scroll message and wait time attributes.
DL40 message contains characters that blink.	The same characters will blink on a DL50. It is possible to scroll a message with blinking characters.	DL50: Blinking characters. DL40: Blinking (<CTRL>B) characters in message and scrolling messages.
Energize slave (DL50) relay.	DL50 relay is energized until another message is received with the slave relay attribute set to off.	DL 50: Turn on relay. DL40: Energize slave relay attribute.
Control DL50 Tri-Color Display Colors	Each message can be Red, Green or Amber.	DL40: Set slave Message Color attribute.. DL50: Displays red, green, or amber text.

①Uses the 20 characters on the left half of Catalog No. 2706-F21J, -F21JC.

Displaying 4.8 Inch (121.9 mm) Characters

DL40 Message Type	How Message Appears On DL50	DL50/DL40 Application Notes
"Line 1 Only" message $\leq$ 20 characters on the DL40.	Message appears on DL50 with up to 20 characters.②	DL50: 4.8 Inch characters. DL40: Line Used Attribute, Wait Time Attribute
"Line 1 Only" message > 20 characters on the DL40.	Appears as a Line 1 or Line 2 message on the DL50 in segments of up to 20 characters each.② For Catalog No. 2706-F11J, wait time = 4 is recommended.	DL50: 4.8 Inch characters. DL40: Line Used Attribute, Wait Time Attribute
"All Lines" message on a 2 or 4 line DL40.	Do not send message to a DL50 in Auto-Select mode.	DL50: 2.1 inch characters DL40: 2 or 4 line displays
Scrolling message on a DL40.	Catalog No. 2706-F21J: Also scrolls, but the scroll rate is slower than the DL40 wait time (in .1 seconds). Catalog No. 2706-F11J: Do not use the DL40 scroll mode attribute.②	DL50: Scroll message DL40: Scroll message and wait time attributes.
DL40 message contains characters that blink.	The same characters will blink on a DL50.	DL50: Flash messages DL40: "Flash" attribute and scroll message attribute.
Energize slave (DL50) relay.	DL50 relay is energized until another message is received with the slave relay attribute set to off.	DL 50: Turn on relay. DL40: Energize slave relay attribute.
Control DL50 Tri-Color Display Colors	Each message can be Red, Green or Amber.	DL40: Set slave Message Color attribute. DL50: Displays red, green, or amber text.

② Catalog No. 2706-F11J, -F11JC scrolls 20 character segments from right to left, 10 characters at a time.

Updating Embedded Variables from a DL20 or DL40

Use the following guidelines when updating embedded variable data in DL50 messages from a DL20 or DL40 Dataliner.

- For a DL20, update variables using a sequencer to strobe the high and low bytes of each variable as well as the message number (as described in DL20 User Manual). A baud rate of 9600 is recommended.

- For a DL40, a baud rate of 9600 is recommended. You may update variable data sent to the DL40 as frequently as the PLC scan permits, but you **must** have the DL40's message wait time set for more than 1 second. With a 1 second wait time, you may set the DL40 auto repeat attribute to YES.

Note: DO NOT set the DL40 wait time to 0 and the auto repeat attribute to YES for any messages sent to the DL50 by either the DL20 or DL40.

IMPORTANT:
If you are using a DL20 or DL40 to send messages to a DL50 at a baud rate of 19.2K, we suggest that the updates of embedded variable data be sent in intervals longer than the typical program scan times. You can accomplish this by using the logic program (next page) in a PLC-5:

Figure 6.1
PLC-5 Embedded Variable Wait Time Adjustment

Rung 2:0

```
  T4:0                                           +TON
──┤ ├──────────────────────────────────────┐   TIMER ON DELAY              ─( EN )─
   DN                                        │  Timer            T4:0
                                             │  Time base        0.01        ─( DN )─
                                             │  Preset  See table below
                                             │  Accum               3
```

Rung 2:1

```
  T4:1                                           +TON
──┤ ├──────────────────────────────────────┐   TIMER ON DELAY              ─( EN )─
   DN                                        │  Timer            T4:1
                                             │  Time base        0.01        ─( DN )─
                                             │  Preset           1000
                                             │  Accum             256
```

Rung 2:2

```
  I:000                                          +MOV
──┤ ├──────────────────────────────┬────────┐   MOVE
   00                               │        │  Source           1000
                                    │        │
                                    │        │  Dest            0:010
                                    │        │                   1000
                                    │
                                T4:0│            +MOV
                                 ──┤ ├──────────┐ MOVE
                                   DN           │ Source        T4:1.ACC
                                                │                   256
                                                │ Dest           0:011
                                                │                   253
```

Rung 2:3

```
  I:000                                          +MOV
──┤ ├──────────────────────────────────────┐   MOVE
   00                                        │  Source              0
                                             │
                                             │  Dest            0:010
                                             │                   1000
```

Rung 2:4

```
──────────────────────────[ END OF FILE ]──────────────────────
```
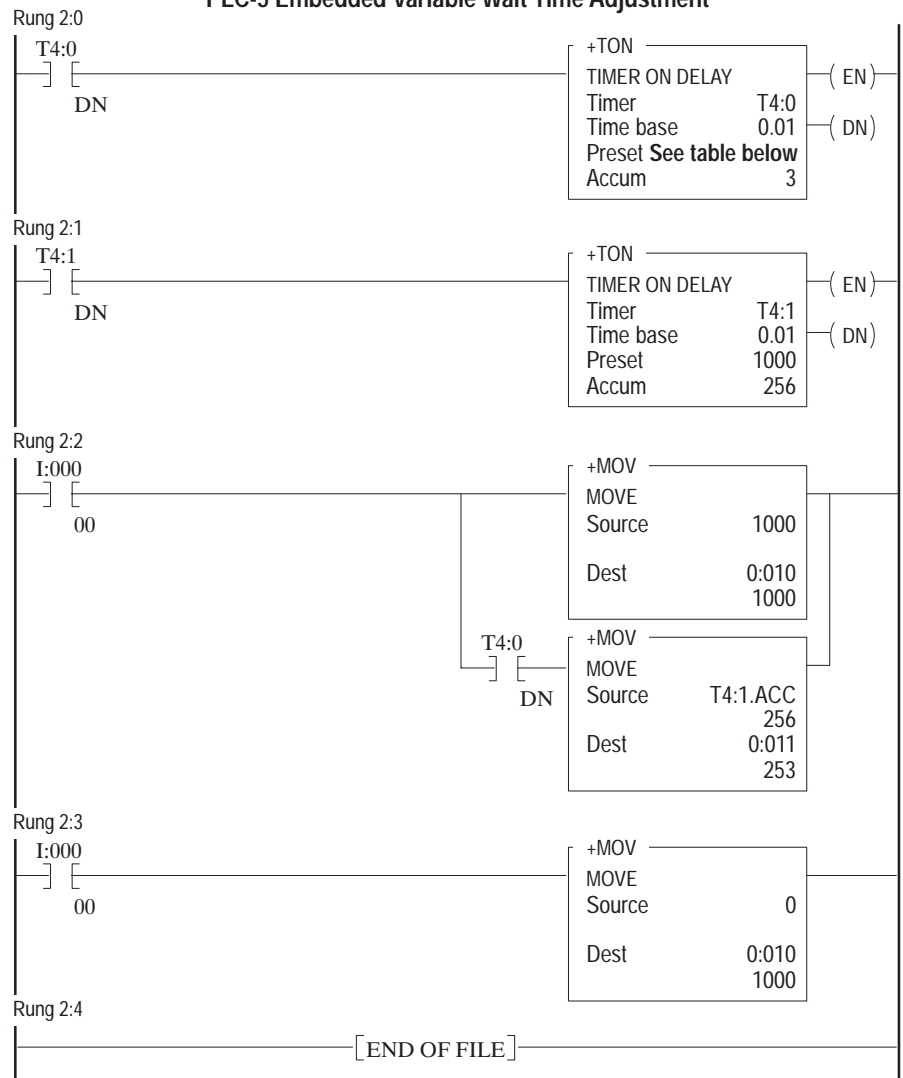
Counter Preset Value Table

Catalog No. / Character Height	Preset Value for TON T4:0	Wait Time of DL40 Auto Repeat Message
Catalog No. 2706-F11J, -F11JC 4.8 Inch (121.9 mm) Text	400 Allows 20 characters to scroll	4 Seconds
Catalog No. 270-F11J, -F11JC ① 2.1 Inch (53.3 mm) Text	7	1 Second
Catalog No. 2706-F21J, -F21JC ② 4.8 Inch (121.9 mm) Text	9	1 Second
Catalog No. 2706-F21J, -F21JC 2.1 Inch (53.3 mm) Text	17	1 Second

① Baud Rate > 9600

② Baud Rate ≥ 9600

DL50 BASIC Alarm Programming Example

This example is for Catalog No. 2706-F11J, -F11JC. Use it as a guide in creating your own alarm programs. The program determines which alarm(s) are current and the priority in which they are displayed. The program is compatible with Microsoft QuickBasic and IBM GW BASIC / BASIC A.

Here is a quick summary of the program:

Lines 5 to 10 initialize the computer communications port for the DL50.
Lines 100 and 120 send the alarm message to the DL50.
Lines 1005 to 2000 define the messages.
Lines 4000 to 6000 determine current alarms and priority.
Lines 9000 to 9200 provide a menu of the available test messages.

Program:

```
5 REM                LINE 10 PREPARES SERIAL PORT 'COM1' TO SEND MESSAGES TO THE DL50

6 REM                WITH BAUD RATE = 9600

10 OPEN "com1:9600,n,8,1,cs,ds,cd"FOR RANDOM AS #1

20 REM               THE USER INSERTS
30                   OTHER 'INITIALIZATION' CODE HERE
35                   THE PROGRAM DOES A 'GOSUB' TO LINES 4000-6000 TO EVALUATE IF ANY
36                   ALARMS ARE CURRENT AND WHICH WOULD GET PRIORITY TO BE DISPLAYED.
40 GOSUB 4000

97 REM               LINE 100 DETERMINES WHICH OTHER 'GOSUB' LINE WILL DEFINE WHAT NEEDS
98 REM               TO BE SENT TO THE DL50
99 REM   ALARM=          1    2    3    4    5    6    7    8
100 ON ALARM       GOSUB 1005, 1010, 1015, 1020, 1025, 1030, 1035, 2000
120 PRINT #1, M$ ; CHR$ (ADDRESS) ; CHR$(LN) ; CHR$(13)
130 GOTO 35

998 REM              LINES 1005-2000 DEFINE THE MESSAGES TO BE SENT TO THE DL50
999 REM              SPACING, LINE CHOICE (AND SOMETIMES CHARACTER HEIGHT), ADDRESSING
1000                 AND BLINKING CHARACTERS ARE ALL DETERMINED HERE
1001 REM
1002 REM             M$, THE ADDRESS, AND LINE NUMBER ARE SENT TO THE DL50 AFTER
1003 REM             THE "RETURN"
1004 REM

1005 LN=1: ADDRESS = 1: M$ = "TEST ALARM #1"
1006 RETURN
1010 LN=2: ADDRESS = 1: M$ = "TEST ALARM #2"
1011 RETURN
1015 LN=3: ADDRESS = 1: M$ = "TEST ALARM #3"
1016 RETURN
1020 LN=3O: ADDRESS = 1: M$ = " THIS IS A TWO-LINE TEST ALARM #4 "
1021 RETURN
```

(Program continued on next page)

```
1025 LN=48: ADDRESS = 1: M$ = " ": REM   THIS TURNS ON THE DL50's RELAY
1026 RETURN
1030 LN=49: ADDRESS = 127: M$ = " ": REM   THIS TURNS OFF THE DL50's RELAY
1031 RETURN
1035 LN=50: ADDRESS = 127: M$ = " ": REM  THIS CLEARS THe DL50 DISPLAY
1036 RETURN
2000 RETURN
4000 REM            LINE 4000-6000 DETERMINE IF ANY ALARMS ARE CURRENT AND WHICH
4001 REM            ONE HAS PRIORITY
4002 REM
4030 INPUT "Alarm No."; ALARM: REM   ###THIS IS FOR PROGRAM TEST ONLY###
4040 IF ALARM=0 THEN END: REM   ###THIS LINE IS FOR PROGRAM TEST ONLY###
4050 REM            THE USER PLACES LINES OF CODE FOR ALARM HANDLING HERE
6000 RETURN
9000 REM            DISPLAY THE MENU OF TEST MESSAGES
9001 REM            ###THESE LINES FOR PROGRAM TEST ONLY###
9005 PRINT "ALARM #      Sent to Line #      Result at Dl50 (in Auto-Select Mode)
9006 PRINT "_____      _____      _____"
9110 PRINT "    1              1          '      TEST ALARM # 1          ' "
9115 PRINT "    2              2          '      TEST ALARM #2           ' "
9120 PRINT "    3              3          '      ALARM #3      '  (Large Characters) "
9125 PRINT "    4             30          '      THIS IS A TWO-LINE ' (Lines 1 & 2) "
9130 PRINT "                                     TEST ALARM #4    ' "
9135 PRINT "    5             48          * THIS TURNS ON THE DL50) RELAY * "
9140 PRINT "    6             49          * THIS TURNS OFF THE DL50) RELAY * "
9145 PRINT "    7             30          * THIS CLEARS THE DL50) DISPLAY  * "
9150 PRINT "    8         **  UNUSED **         ' "
9155 PRINT "    9    ** REPEATS THIS MENU AGAIN ** "
9160 PRINT "    0       ** QUITS THE PROGRAM ** "
9165 PRINT "
9200 RETURN
```

Using the DL50 ALARM BASIC Program

After entering the program, the program will prompt to enter an alarm number. Press any key 0 through 7 and then the Return key. Refer to program lines 9000 through 9160 for a description of each alarm function. Press 0 and Return to exit the program.

Note: You can also use this program in a PLC/SLC BASIC Module with the changes described on the following page.

1771–DB BASIC Module Simplex Example

The following is an example of print statement using a BASIC Module (Catalog No. 1771-DB) as a host. The example assumes that the DL50 slave has an address of 1.

100: PRINT #"VALVE NUMBER 1 OPEN",CHR(1),CHR(2),CHR(13)

Where: (1) specifies slave address 1

      (2) specifies line 2 of the display

      (13) is equivalent to a Carriage Return (CR)

After receiving this message, the DL50 will display:

```
┌──────────────────────────────┐
│                              │
│     VALVE NUMBER 1 OPEN      │
│                              │
└──────────────────────────────┘
```

on the second line of the display. When using the BASIC module, you must use the print CHR (decimal equivalent character) function.

Note: The alarm program for BASIC on page 6-12 may also be used on the BASIC modules (Catalog No. 1771-DB or 1746-BAS) with the following changes and additions:

```
1 STRING 200,40
10 CALL 119 : REM SETS PERIPHERAL PORT TO DEFAULTS
99 REM  N=      0   1   2   3   4   5   6   7   8
100 ON N GOSUB 2000, 1005, 1010, 1015, 1020, 1025, 1030, 1035, 2000
110 IF N=9 GOTO 35
120 PRINT # $(1), CHR(A), CHR (LN ), CHR (13)
4030 INPUT "Alarm No." N: REM   ###THIS IS FOR PROGRAM TEST ONLY###
4040 IF N=0 THEN END: REM   ###THIS LINE IS FOR PROGRAM TEST ONLY###
```

On Lines 1005 t0 1035 change:
      ADDRESS to A
      M$ to $(1)

Flexible Interface Module Example

In this example, a PLC-5/15 is used to send a message through a Flexible
Interface Module (Catalog No. 2760-RB) using RS-422 communications.
The RS-422 communications port is compatible with the DL50 RS-485 port.
Figure 6.2 illustrates the setup. The Simulator Module (Catalog No.
1771-SM) provides the external inputs, in your application this may be any
of a variety of I/O modules.

Figure 6.2
Flexible Interface Module Example

RS-485 Protocol Cartridge
(Catalog No. 2760-SFC2)

Flexible Interface Module
(Catalog No. 2760-RB)

Simulator Module
(Catalog No. 1771-SM)

R B M o d u l e t o D L 5 0

PLC-5/15
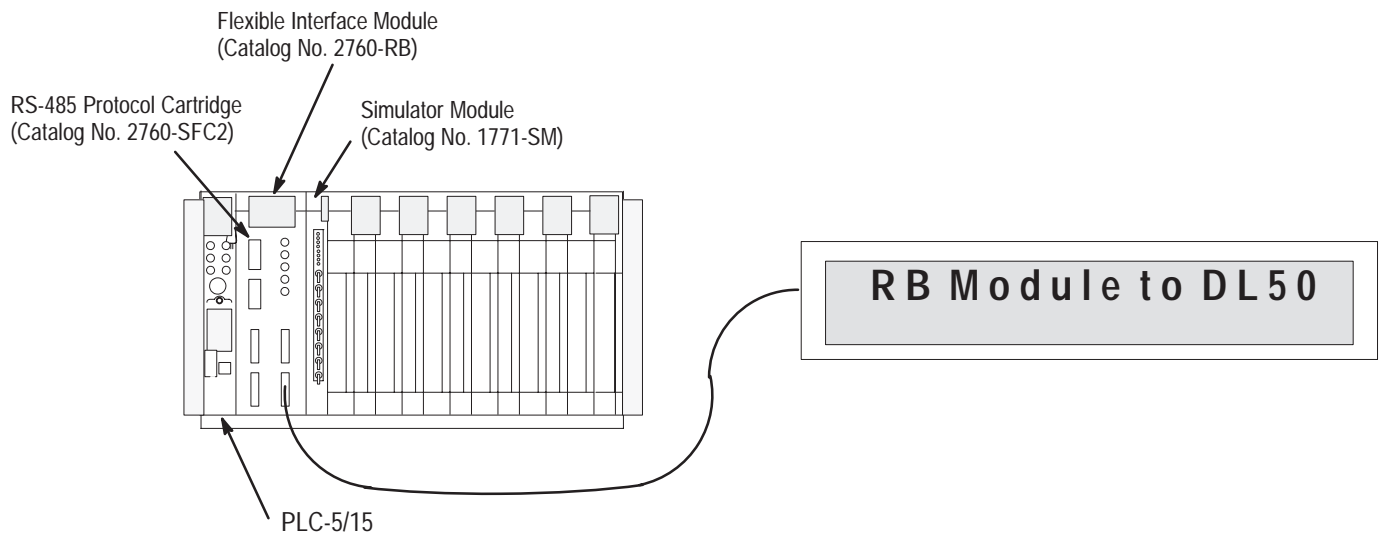
Flexible Interface Module Configuration:
For this example, the Flexible Interface Module can use port 1, 2, or 3.

The selected port should be set as follows:

MODEM CONTROL (ENABLE/DISABLE) = DISABLE.
9600 BITS PER SECOND (YES/NO) = YES.
8 BITS NO PARITY (YES/NO) = YES.
XON/XOFF (ENABLE/DISABLE) = DISABLE.
RS422 (YES/NO) = YES.
RECEIVE MATRIXING (ENABLE/DISABLE) = DISABLE.
BYTE SWAPPING (ENABLE/DISABLE) = ENABLE.
BINARY DATA NO CONVERSIONS (YES/NO) = YES.
HDR/TLR ON OUTPUT (ENABLE/DISABLE) = ENABLE.
HEADER BYTE LENGTH (DEC 0 . . . 4) = 0.
HEADER DATA [0] (HEX 0 . . .ff) = 0.
HEADER DATA [1] (HEX 0 . . .ff) = 0.
HEADER DATA [2] (HEX 0 . . .ff) = 0.
HEADER DATA [3] (HEX 0 . . .ff) = 0.
TRAILER BYTE LENGTH (DEC 0 . . .4) = 1.
TRAILER DATA [0] (HEX 0 . . .ff) = 0.
TRAILER DATA [1] (HEX 0 . . .ff) = d.
TRAILER DATA [2] (HEX 0 . . .ff) = 0.
TRAILER DATA [3] (HEX 0 . . .ff) = 0
MAX DATA BYTE LENGTH (DEC 0 . . . 124) = 0.
MIN DATA BYTE LENGTH (DEC 0 . . . 124) = 0

The program consists of two rungs:

- Rung 0 initiates the block transfer of data to the Flexible Interface Module. N7:00 is the data file with the DL50 message. In this example, I:2/0 is the input which triggers the message.

- Rung 1 reads command responses from the Flexible Interface Module. You can delete this rung if the Flexible Interface Module is configured with handshake data disabled and the DL50 is set for Simplex Protocol.

Figure 6.3
Ladder Diagram: Flexible Interface Module Example
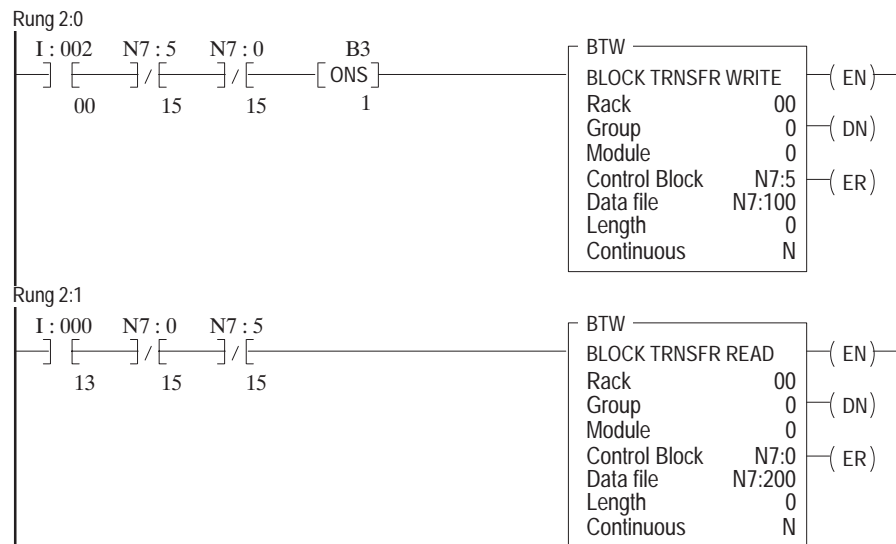
This is what the data files look like:

Address	0	1	2	3	4	5	6	7	8	9
N7:100	\00\26	\05\01	_R	B_	Mo	du	le	_t	o_	DL
N7:110	50	_ _	\05\01							

Byte Count
(Including Words
N7:100 → N7:112) = 26

Source (5) = Backplane

Destination (01) = Port 1

DL50 Address Byte = 5

DL50 Line No. = 1

Note: _ = Space
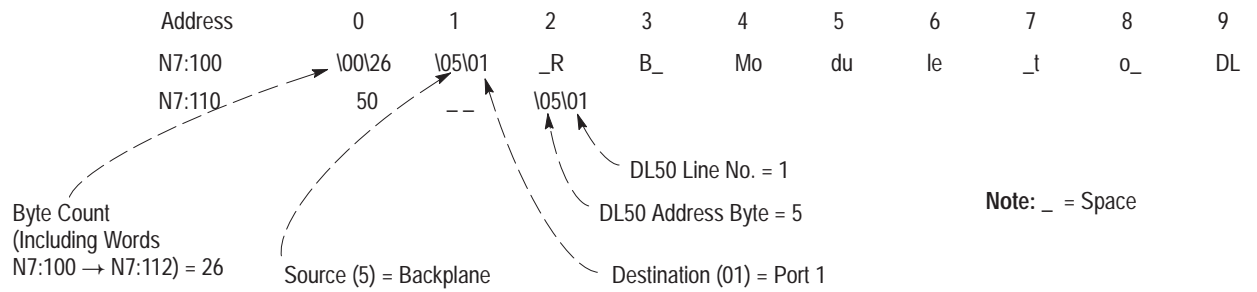
Note: If byte swapping is enabled, all data should end on a word boundary (must have even number byte count)

PLC-5 Channel 0 Simplex Example

This example demonstrates how to use the RS232 Channel 0 of supporting members of the Allen-Bradley PLC-5 family to trigger a Dataliner DL50 display. In the example, a counter is used to simulate changing variable data, which could be a motor speed or a temperature. This will demonstrate how variable data may be incorporated into messages.

The program below will display the message "Temp ##" in green (red on F11J or F21J), where ## represents the sample variable. The text size will depend on the character size setting on the DL50 display.

```
Temp ##
```

Channel 0 Configuration

The first step is to configure the PLC channel 0 port to communicate with a DL50 slave. Table 6.C shows the user mode configuration of the PLC channel 0. Note that the baud rate should match that being used by the DL50.

Table 6.C
Configuring the Channel 0 Port

```
              Channel 0                     USER

              Channel 1A                    DH+
              Channel 1B               SCANNER MODE
              Channel 2A               ADAPTER MODE
              Channel 2B               SCANNER MODE

              Channel 3A                    N/A
```

```
                      User Mode
                Channel 0 Configuration
Diag.file:           N11    XON/XOFF:            DISABLED

Remote mode change: DISABLED System mode char.:        S
Mode Attention Char.:\0x1b   User mode char.:          U

Baud rate:           9600    Parity:               NONE
Stop bits:              1    Bits per character:      8
Control line:   NO HANDSHAKING

Echo/delete mode:     CRT    RTS send delay (20 ms):   0
                             RTS off delay (20 ms):    0
Termination 1:       \0xd    Append 1:              \0xd
Termination 2:       \0x0    Append 2:                 0
```

PLC String Variables

For this example, processor memory file #12 is set up as a string file which contains the parts needed to form a message packet for a DL50 in Simplex mode. Table 6.D has the variables for any Simplex mode communication, and Table 6.E shows the strings for this example.

Table 6.D
Variables for Simplex Protocol and Their Functions

Memory Location	Symbol	Description
ST12:0	MSG_SEND	The message which is built by the PLC and is actually sent out to the DL50 through CH0
ST12:1	VARIABLE	The converted integer sample variable being appended to the message
ST12:2	PRE_TEXT	The simplex protocol control byte (Field 1) and color code (F11JC and F21JC only)
ST12:3	TEXT	The message text
ST12:4	F3_F4_F5	Fields 3, 4, and 5 of the simplex protocol Field 3 determines the display mode Field 4 determines the slave address Field 5 determines the line number These fields are followed by a \0D to produce a carriage return

The contents of these strings must be assigned using the off-line programming software (6200). Control code values are entered into the strings by using a forward slash followed by two hexadecimal digits. (See Appendix B, which has hexadecimal values for all ASCII and extended ASCII characters.)

Table 6.E
Strings Representing Control Code Values for This Example

```
Address          LEN          STRING TEXT

ST12:0           15           \19Temp 36\03\7F\01\0D

ST12:1           2            36

ST12:2           2            \02\19

ST12:3           5            Temp

ST12:4           4            \01\7F\01\0D
```

Note: Messages and attributes are changed by changing the strings or by having the PLC append different pre-determined string numbers to the MSG_SEND string.

Ladder Logic

The ladder logic builds a string from all the parts and sends it out to the
DL50 via channel 0. Messages sent to the DL50 by the PLC must observe
the required inter-message delays described in Table 5.F.

Note: Use a timer to avoid sending continuous messages.

Figure 6.4
Ladder Diagram: Channel 0 Simplex Example

```
Rung 2:0
A free running timer used to trigger a variable counter and create a delay for
message timing.
|   T4:0                                              +TON---------------+    |
+--]/[-------------------------------------------------+TIMER ON DELAY   +-(EN)-+
|     DN                                              |Timer          T4:0|    |
|                                                     |Time base      0.01+-(DN) |
|                                                     |Preset          100|    |
|                                                     |Accum            28|    |
|                                                     +-----------------+    |
Rung 2:1
A counter is used to simulate a changing variable value.
|   T4:0                                              +CTU---------------+    |
+--] [-------------------------------------------------+COUNT UP         +-(CU)-+
|     DN                                              |Counter        C5:0|    |
|                                                     |Preset           99+-(DN) |
|                                                     |Accum            36|    |
|                                                     +-----------------+    |
Rung 2:2
Creation of output string for DL50.  Message sending is initiated by discrete
input I:001/00 and controlled by the delay timer.
First the variable is converted from an integer to an ASCII string. (AIC)
Next the output string is assembled from the separate parts. (ACN)
Finally the output string is sent out to the DL50 through CH0. (AWT)
| I:001  T4:0                                    +AIC-------------------------+  |
+--] [---] [--------------------------------++INTEGER TO STRING CONVERSION++-+
|    00    DN                                    ||Source           C5:0.ACC|| |
|                                                ||                       36|| |
|                                                ||Destination       VARIABLE|| |
|                                                |+-------------------------+| |
|                                                |   +ACN-------------------+| |
|                                                +-----+STRING CONCATENATE    ++ |
|                                                |    |Source A       PRE_TEXT|| |
|                                                |    |Source B           TEXT|| |
|                                                |    |Destination    MSG_SEND|| |
|                                                |    +----------------------+| |
|                                                |   +ACN-------------------+| |
|                                                +-----+STRING CONCATENATE    ++ |
|                                                |    |Source A       MSG_SEND|| |
|                                                |    |Source B       VARIABLE|| |
|                                                |    |Destination    MSG_SEND|| |
|                                                |    +----------------------+| |
|                                                |   +ACN-------------------+| |
|                                                +-----+STRING CONCATENATE    ++ |
|                                                |    |Source A       MSG_SEND|| |
|                                                |    |Source B       F3_F4_F5|| |
|                                                |    |Destination    MSG_SEND|| |
|                                                |    +----------------------+| |
```

```
|                                             |+AWT--------------------+      | |
|                                             ++ASCII WRITE           +-(EN)+ |
|                                              |Channel              0|      |
|                                              |Source       MSG_SEND+-(DN)   |
|                                              |Control           R6:0|       |
|                                              |String length        0+-(ER)  |
|                                              |Characters sent     15|       |
|                                              +----------------------+       |
|
Rung 2:3
The counter is reset when it is done.
|   C5:0                                                                C5:0 |
+--] [----------------------------------------------------------------(RES)-+
|     DN                                                                     |
Rung 2:4
|                                                                           |
+------------------------------[END OF FILE]--------------------------------+
|                                                                           |
```

PLC-5 Channel 0 Duplex Example

The following example demonstrates how to use the RS232 Channel 0 of supporting members of the Allen-Bradley PLC-5 family to trigger a DL50 Dataliner display, running in Duplex mode with checksum disabled. In this example a counter is used to simulate changing variable data, which could be a motor speed or a temperature. This will demonstrate how variable data can be incorporated into messages.

The program below will display the message "Speed ##" in 4.8-inch amber characters (red on F11J or F21J) in hold mode where ## represents the sample variable.

<div style="border:1px solid black; text-align:center; font-size:2em;">

Speed

</div>

Channel 0 Configuration

The first step is to configure the PLC channel 0 port to communicate with a DL50 slave. Table 6.F shows the user mode configuration of the PLC. Note that the baud rate should match that being used by the DL50.

Table 6.F
Configuring the Channel 0 Port

```
                 Channel 0              USER

                 Channel 1A             DH+
                 Channel 1B             UNUSED
                 Channel 2A             UNUSED
                 Channel 2B             UNUSED

                 Channel 3A             N/A


                        User Mode
                  Channel 0 Configuration
Diag.file:            N11    XON/XOFF:              DISABLED

Remote mode change: DISABLED  System mode char.:          S
Mode Attention Char.:\0x1b    User mode char.:            U

Baud rate:            9600   Parity:                    NONE
Stop bits:               1   Bits per character:           8
Control line:    NO HANDSHAKING

Echo/delete mode:      CRT    RTS send delay (20 ms):     0
                             RTS off delay (20 ms):      0
Termination 1:         \0xd   Append 1:                 \0xd
Termination 2:         \0x0   Append 2:                 \0x0
```

PLC String Variables

For this example, processor memory file #12 is set up as a string file which contains the parts needed to form a message packet for a DL50 in Duplex mode. Table 6.G has the variables for any Duplex mode communication, and Table 6.H shows the strings for this example.

Table 6.G
Variables for Duplex Protocol and Their Functions

Memory Location	Symbol	Description
ST12:0	MSG_SEND	The message which is built by the PLC and is actually sent out to the DL50 through CH0
ST12:1	VARIABLE	The converted integer sample variable being appended to the message
ST12:2	PRE_TEXT	The duplex protocol control byte (Field 1) and color code (F11JC and F21JC only)
ST12:3	TEXT	The message text
ST12:4	F3_F4_F5	Fields 3, 4, and 5 of the duplex protocol Field 3 determines the slave address Field 4 determines the line number Field 5 is \OD to produce a carriage return
ST12:5	F6_B123	The three bytes of field 6 of the duplex protocol. This dield controls the display mode, speed, and relay for each message. Use the Duplex Field 6 Worksheet to determine hex values for desired display operation.
ST12:6	CHECKSUM	Dummy checksum bytes appended to the end of the message. Their actual value is not important, since the checksum checking must be disabled on the DL50. (**Note:** These bytes MUST NOT equal 13 or 18 decimal.)

The contents of these strings must be assigned using the PLC off-line programming software (6200). Control code values are entered into the strings by using a forward slash followed by two hexadecimal digits. See Appendix B, which has hexadecimal values for all ASCII and extended ASCII characters.

Table 6.H
Strings Representing Control Code Values for This Example

Address	LEN	STRING TEXT
ST12:0	19	\02\19Speed 25\FF\01\0D\80\88\80\00\00\00
ST12:1	2	25
ST12:2	2	\02\19
ST12:3	6	Speed
ST12:4	3	\FF\01\0D
ST12:5	3	\80\88\80
ST12:6	3	\00\00\00

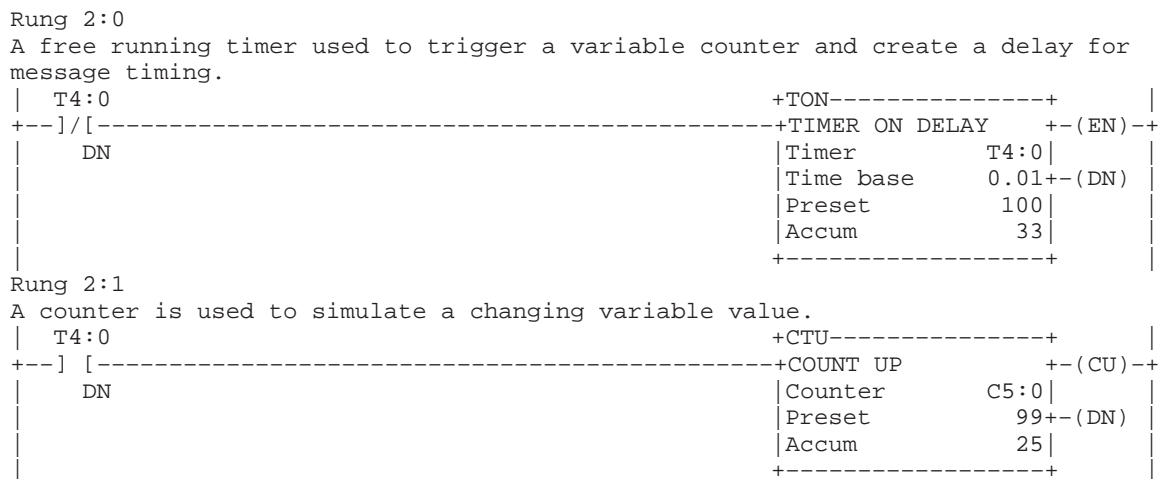Messages and attributes are changed by changing the strings or by having the PLC append different pre-determined string numbers to the MSG_SEND string. The hex values for Field 6 can be calculated using the worksheet found in Appendix G.

Ladder Logic

The ladder logic builds a string from all the parts and sends it out to the DL50 via channel 0. Messages sent to the DL50 by the PLC must observe the required inter-message delays described in Table 5.F.

Note: Use a timer to avoid sending continuous messages.

Table 6.I
Ladder Diagram: Channel 0 Duplex Example

```
Rung 2:0
A free running timer used to trigger a variable counter and create a delay for
message timing.
|   T4:0                                               +TON---------------+     |
+--]/[-------------------------------------------------+TIMER ON DELAY   +-(EN)-+
|     DN                                               |Timer        T4:0|     |
|                                                      |Time base    0.01+-(DN) |
|                                                      |Preset        100|     |
|                                                      |Accum          33|     |
|                                                      +-----------------+     |
Rung 2:1
A counter is used to simulate a changing variable value.
|   T4:0                                               +CTU--------------+     |
+--] [-------------------------------------------------+COUNT UP        +-(CU)-+
|     DN                                               |Counter      C5:0|     |
|                                                      |Preset         99+-(DN) |
|                                                      |Accum          25|     |
|                                                      +-----------------+     |
```

```
Rung 2:2
Creation of output string for DL50.  Message sending is initiated by discrete
input I:001/00 and controlled by the delay timer.
First the variable is converted from an integer to an ASCII string. (AIC)
Next the output string is assembled from the separate parts. (ACN)
Finally the output string is sent out to the DL50 through CH0. (AWT)
| I:001  T4:0                                          +AIC------------------------+  |
+--] [---] [------------------------------------------++INTEGER TO STRING CONVERSION++-+
|    00     DN                                         ||Source              C5:0.ACC||  |
|                                                      ||                         25 ||  |
|                                                      ||Destination         VARIABLE||  |
|                                                      |+----------------------------+|  |
|                                                      |      +ACN-------------------+|  |
|                                              +-----+STRING CONCATENATE     ++  |
|                                              |      |Source A        PRE_TEXT||  |
|                                              |      |Source B            TEXT||  |
|                                              |      |Destination     MSG_SEND||  |
|                                              |      +----------------------+|  |
|                                              |      +ACN-------------------+|  |
|                                              +-----+STRING CONCATENATE     ++  |
|                                              |      |Source A        MSG_SEND||  |
|                                              |      |Source B        VARIABLE||  |
|                                              |      |Destination     MSG_SEND||  |
|                                              |      +----------------------+|  |
|                                              |      +ACN-------------------+|  |
|                                              +-----+STRING CONCATENATE     ++  |
|                                              |      |Source A        MSG_SEND||  |
|                                              |      |Source B        F3_F4_F5||  |
|                                              |      |Destination     MSG_SEND||  |
|                                              |      +----------------------+|  |
|                                              |      +ACN-------------------+|  |
|                                              +-----+STRING CONCATENATE     ++  |
|                                              |      |Source A        MSG_SEND||  |
|                                              |      |Source B         F6_B123||  |
|                                              |      |Destination     MSG_SEND||  |
|                                              |      +----------------------+|  |
|                                              |      +ACN-------------------+|  |
|                                              +-----+STRING CONCATENATE     ++  |
|                                              |      |Source A        MSG_SEND||  |
|                                              |      |Source B        CHECKSUM||  |
|                                              |      |Destination     MSG_SEND||  |
|                                              |      +----------------------+|  |
|                                              |+AWT-------------------+     |  |
|                                              ++ASCII WRITE           +-(EN)+  |
|                                              |Channel              0|     |  |
|                                              |Source        MSG_SEND+-(DN)  |
|                                              |Control           R6:0|     |  |
|                                              |String length        0+-(ER)  |
|                                              |Characters sent     19|     |  |
|                                              +----------------------+     |  |
Rung 2:3
The counter is reset when it is done.
|  C5:0                                                              C5:0 |
+--] [---------------------------------------------------------------------(RES)-+
|    DN                                                                   |
Rung 2:4
|                                                                        |
+-----------------------------[END OF FILE]------------------------------+
|                                                                        |
```

1746-BAS Duplex Example

The following example demonstrates how a 1746-BAS SLC Basic Module can be used to trigger messages on a DL50 display running in Duplex mode. This example prompts the user to enter a message along with its display attributes. The basic program calculates the control bytes, calculates the checksum of the packet, and sends the final packet out to the DL50 through its PRT2 serial port.

Port Setup

The MODE statement in line 10 sets the Basic Module's port 2 to 9600 baud. If the DL50 is not set at 9600 baud, this statement must be changed to match the DL50 baud rate.

This Basic program can use either RS232 or RS485 communications. The Basic Module's port type can be configured using the jumpers on the 1746-BAS module. Refer to the Basic Module Design and Integration Manual (Pub. #1746-ND005) for more information on the port configuration.

Program Variables

Table 6.J lists the variables which control the messages being sent to the DL50 by the Basic Module. These can be changed to obtain the desired message attributes.

First the message text is stored in string (0) and the attribute strings are set to the desired values. Next the subroutine starting on line 5000 is called. This subroutine calculates the control bytes and the checksum, then sends the message out in the proper duplex packet form.

Table 6.J
Duplex.BAS Variables List

$(0) TEXT String Location of Message Text		

CTBT Control Byte		
	VALUE	FUNCTION
	1	Append to buffer
	2	Append to buffer and display
	3	Clear line(s). Send no F2.
	4	Abandon running message and reset buffer
	12	Initialize for bootstrap

DSPEED Display Speed		
	VALUE	FUNCTION
	0	Fastest
	1	Fast
	2	Slow
	3	Slowest

HEIGHT Character Height		
	VALUE	FUNCTION
	0	2.1 inch
	1	4.8 inch

LINO Line Number		
	VALUE	FUNCTION
	1	Line 1
	2	Line 2
	3, 4	Reserved
	30	Clear all lines

MDE Display Mode		
	0-22	Decimal

RELAY Relay Status		
	VALUE	FUNCTION
	0	Off
	1	On

CLR Color Code		
	VALUE	COLOR
	0	Red
	1	Amber
	2	Green

DL50 Response Variables

If the message is sent to a slave address other than 255, the DL50 will send back a reply packet. The subroutine which starts on line 5900 stores these reply bytes into the integer array RESP() and prints them to the console device.

Figure 6.5
Basic Program: To Trigger Messages on a DL50 Display

```
1               REM DL50 DUPLEX FOR 1746-BAS
10              MODE(PRT2,9600,N,8,,,)
15              STRING 3000,254
20              CTBT = 2                      :REM DEFAULT CONTROL BYTE
25              SLADD = 255   :REM DEFAULT SLAVE ADDRESS
30              TD = 10                       :REM DEFAULT TIME DELAY
35              LINO = 1                      :REM DEFAULT LINE NUMBER
40              DSPEED = 0                    :REM DEFAULT DISPLAY SPEED
45              MDE = 0                       :REM DEFAULT DISPLAY MODE
50              RELAY = 0                     :REM DEFAULT RELAY MODE
55              HEIGHT = 0                    :REM DEFAULT CHARACTER HEIGHT
60              CLR = 0                       :REM DEFAULT COLOR CODE
65              TMOUT = 100   :REM DEFAULT TIMEOUT
70              RTMOUT = 100  :REM RESPONSE TIMEOUT
100             REM *************START USER PROGRAM
110             INPUT "ENTER MESSAGE TEXT"$(0)
120             INPUT "ENTER DISPLAY MODE"MDE
130             INPUT "ENTER RELAY STATUS"RELAY
140             INPUT "ENTER LINE NUMBER"LINO
150             INPUT "ENTER HEIGHT CODE"HEIGHT
160             INPUT "ENTER COLOR CODE"CLR
170             INPUT "ENTER DISP SPEED"DSPEED
180             GOSUB 5000    :REM SEND MESSAGE
190             GOTO 110
200             END
4999            REM *************END USER PROGRAM
5000            REM CREATE AND SEND OUTPUT ROUTINE
5010            GOSUB 5100                    :REM ASSIGN FIELD 6 BYTE 1
5020            GOSUB 5200                    :REM ASSIGN FIELD 6 BYTE 2
5030            GOSUB 5300                    :REM ASSIGN FIELD 6 BYTE 3
5040            GOSUB 5400                    :REM CALCULATE CHECKSUM
5050            GOSUB 5700                    :REM SEND OUTPUT
5060            GOSUB 5900                    :REM GET DL50 RESPONSE
5070            RETURN
5080            END
5100            REM ASSIGN FIELD 6 BYTE 1
5110            SPV=2**5*DSPEED
5120            MV=MDE
5130            F6=128+SPV+MV
5140            RETURN
5150            END
5200            REM ASSIGN FIELD 6 BYTE 2
5210            RLV = 2**6*RELAY
5220            HTV = 2**3*HEIGHT
5230            F62=128+RLV+HTV
5240            RETURN
5250            END
```

(More on next page)

```
5300           REM ASSIGN FIELD 6 BYTE 3
5310           F63=129
5320           RETURN
5330           END
5400           REM CHECKSUM CALCULATION
5410           TCSUM=0:CHD=0:CSUM=0
5420           PUSH 0                        :REM GET LENGTH $(0)
5430           CALL 68
5440           POP SL
5450           BAD=0
5460           IF SL=0 THEN GOTO 5500
5470           FOR POSIT = 1 TO SL STEP 1
5480                      TCSUM=TCSUM+ASC($(0),POSIT)
5490           NEXT POSIT
5500           CSUM=CTBT+CLR+24+TCSUM+SLADD+LINO
5510           CSUM=CSUM+13+F6+F62+F63
5520           CHH=INT(CSUM/256)
5530           CHL=CSUM-(256*CHH)
5540           IF CHL=13 .OR. CHL=18 THEN CHD=1:BAD=1
5550           IF CHH=13 .OR. CHH=18 THEN CHD=CHD+127:BAD=1
5560           IF BAD=1 THEN GOTO 5420
5570           RETURN
5580           END
5700           REM SEND OUTPUT SUBROUTINE
5710           PRINT# CHR(CTBT),CHR(CLR+24),$(0),
5720           PRINT# CHR(SLADD),CHR(LINO),CHR(13),
5730           PRINT# CHR(F6),CHR(F62),CHR(F63),
5740           PRINT# CHR(CHD),CHR(CHH),CHR(CHL),
5750           DLY=TMOUT:GOSUB 5800          :REM TIME DELAY
5760           RETURN
5770           END
5800           REM TIME DELAY SUBROUTINE
5805           FOR I = 1 TO DLY
5810           NEXT I
5820           RETURN
5830           END
5900           REM GET DL50 RESPONSE
5910           REM WAIT FOR DL50 RESPONSE
5920           IF SLADD=255 THEN RETURN
5930           J = 0
5940           PUSH1:CALL 36:          REM GET INPUT BUFFER LENGTH
5950           POP BL
5960           J = J + 1
5970           IF J > RTMOUT THEN GOTO 6030
5980           IF BL < 5 THEN GOTO 5940 ELSE 5990
5990           FOR I = 1 TO BL STEP 1
6000           RESP(I) = GET#
6010                      PRINT RESP(I)
6020           NEXT I
6030           PUSH 1                        :REM CLEAR INPUT BUFFER
6040           CALL 37
6050           RETURN
6060           END
```

Bootstrap Mode

Chapter Objectives

This chapter describes how to operate the DL50 in the bootstrap mode. The bootstrap mode allows the DL50 to receive firmware revisions.

Bootstrap Mode

The bootstrap mode is entered by sending a Ctrl-L (Decimal 12) control byte as described in Table 5.B (Simplex Protocol) or Table 5.G (Duplex Protocol). Use the bootstrap mode to update or correct any anomalies in the DL50 firmware.

The following is required to update the DL50 firmware:

• A personal computer with DOS 3.0 or greater and an RS-232 port.
• A firmware update kit from Allen-Bradley (Catalog No. 2706–NR4) which will contain a diskette and an instruction sheet.
• The addresses of all slave devices on the RS-485 network (if used).
• If there are devices on a network that have the same slave address, you will need the serial numbers of the devices.
• If the firmware updates are done through the RS-485 port, you will need an RS-485 to RS-232 converter.

If the DL50s on the link are driven by another master (such as a DL20, DL40, or other computer), then the master must be disabled before the firmware update can occur.

How to Tell if Firmware Is Corrupted

Upon power up, the DL50 performs a self test as described in Chapter 3. If the DL50 fails the Firmware Checksum test, the DL50 will alternately display the following two messages:

```
BAD CODE CHECKSUM
Waiting for host . . .
```

```
Slave Addr:  AAA
Sub-Addr:  SSSSSSSSS
```

Where: AAA = three digit slave address
             SSSSSSSSS = DL50 Serial Number

At this point, the DL50 will remain idle waiting for the host to send a bootstrap command.

Note: If operated under normal operating conditions, it is unlikely that the DL50 firmware will be corrupted.

Updating Firmware

The instruction sheet accompanying the firmware diskette provides complete instructions on updating the DL50 firmware. The firmware diskette is an easy-to-use menu driven package. You do not require any previous programming experience to update the firmware.

Troubleshooting and Maintenance

Chapter Objectives

This chapter describes how to identify the most common problems that may occur when operating DL50 displays. This chapter describes how to use the diagnostics mode and circuit board LEDs as an aid in troubleshooting.

This chapter also provides instructions on cleaning the display window.

Troubleshooting Chart

Table 8.A
Troubleshooting

Problem	Probable Cause(s)	Corrective Action(s)
DL50 does not power-up.	1. Power source not providing power. 2. Power source is not correctly attached to DL50. 3. Blown fuse. 4. Defective power supply (refer to Using LED Indicators and Diagnostic Mode).	1. Verify presence of 100-240 VAC, 50-60 Hz. 2. Verify power connections as shown in Chapter 4. 3. Replace fuse. 4. Replace power supply as described in this chapter.
DL50 does not display messages properly or no messages are displayed.	1. Communications lines are not properly connected. 2. DL50 is not properly configured. 3. DL50 was not restarted after configuration changes. 4. Incorrect protocol used. 5. Improper message format. 6. Faulty processor board, display board, or power supply. 7. Incorrect jumper setting. 8. No Ctrl–R command sent.	1. Verify communication line connections as shown in Chapter 4. 2. Verify the DIP switch settings as described in Chapter 3. 3. Cycle power to the DL50 or press the Restart switch. 4. Verify that your protocol matches the DIP switch setting. 5. Make sure your messages are properly formatted as described in Chapter 5. Use sample messages provided in Chapter 6 as a means of testing the display. 6. Check status of circuit board LEDs as described in next section of this chapter. 7. Set J-1 on processor board to the position indicated in the diagram on the inside back cover of the manual. 8. In duplex mode, send Ctrl-R before each new data packet.
Display characters are not proper size.	1. Line number is set incorrectly. 2. Improper DIP switch setting for character height.	1. Verify that correct line number is provided, refer to Chapter 5. 2. Verify character size DIP switch setting, refer to Chapter 3.

Troubleshooting
(Continued)

Table 8.A
Troubleshooting (cont'd)

Problem	Probable Cause(s)	Corrective Action(s)
Displayed messages are not full brightness.	1. DL50 has entered reduced brightness mode. Refer to Chapter 2 for a description of this mode. 2. Dirty display window.	1. Check that the ambient temperature is within specification provided in Chapter 10. Lower ambient temperature if possible. 2. Clean window as described in this chapter.
Messages **"BAD CODE CHECKSUM Waiting for host"** and**"Slave Addr: XXX"** are displayed alternately.	1. Corrupted firmware. 2. Dipswitch S3-8 set incorrectly.	1. Use bootstrap mode and firmware diskette to re-install firmware. Refer to Chapter 7 for instructions. 2. Set dipswitch S3-8 to OFF position.
Sections of messages are not displayed.	1. Loose connections. 2. Faulty display board.	1. Use the wiring diagrams in Appendix F to check for loose connections. 2. Use the display test to check the operation of the LEDs. Have qualified service personnel replace faulty display boards. Refer to Table 8.B.
Large text message on a Catalog No. 2706-F11J, -F11JC DL50 from a DL20 / DL40 master is incomplete.	1. Wait time on master is insufficient for a complete scroll. 2. Scroll attribute of DL20/DL40 is set to YES.	1. Set master wait time for at least 4 seconds. 2. Turn off scroll attribute.
No message or long delay before large text message from a DL20 / DL40 master is displayed on a Catalog No. 2706-F11J, -F11JC DL50.	1. Scroll attribute of DL20/DL40 is set to YES.	1. Turn off scroll attribute.

Using LED Indicators and Diagnostic Mode

To aid in troubleshooting, LED indicators are provided on the Power Supply Board and Processor Board (refer to Figure 8.1). Use the diagnostics mode to further isolate problems.

Figure 8.1
Fault Isolation LEDs

AC Power LED
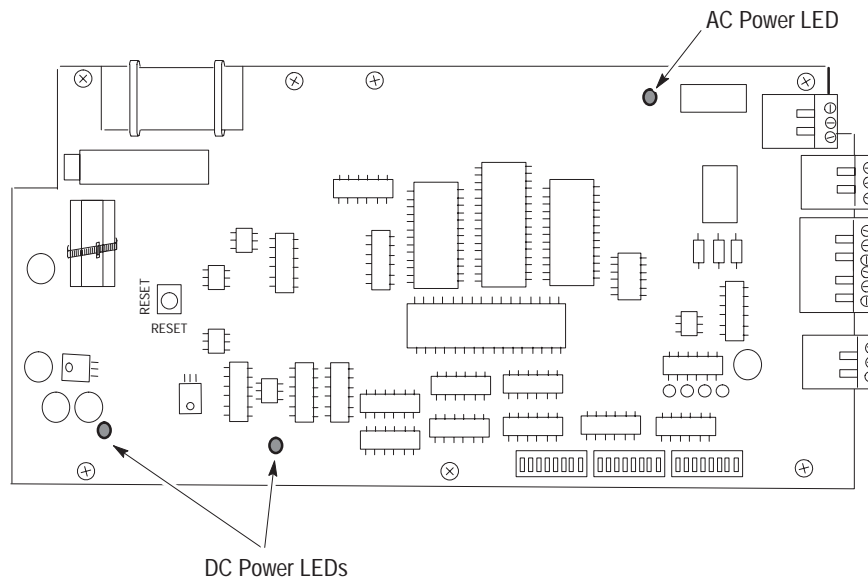
DC Power LEDs

The Processor Board has two LEDs indicating that the proper DC power is applied to the board. The Processor Board also has an LED indicating that AC power is applied. Use these LEDs in conjunction with the diagnostic mode to isolate faulty components.

The general guidelines for using the LEDs to isolate faults are:

1. If the DL50 appears to have a fault or if the STATUS LED on the front panel is flashing, the DL50 should be opened for diagnostics.

⚠️ **ATTENTION:**
Disconnect power before servicing. Failure to follow this warning could result in electrical shock.

Loosen the screws securing the front cover latches of the DL50. There are 6 door latches on the small display (Catalog No. 2706-F11J, -F11JC) and 10 latches on the large display (Catalog No. 2706-F21J, -F21JC).

Note: Loosen, do not remove, screws to turn latches.

⚠️ **ATTENTION:**
The next step allows the front cover to open downward. Make sure there is adequate clearance. Failure to provide proper clearance may cause damage to the display.

Carefully turn the latches away from the door. After all of the latches have been turned, the front cover can be lowered.

2. Set the Mode Select DIP switches to select Diagnostics (refer to Figure 3.2, DIP switch S2-7 ON). Press the RESET button or cycle the power. Observe the front panel display.

    In the diagnostics mode, the DL50 will run the following tests:

    μP Confidence Test

    RAM Test

    ROM Test

    Processor Board Power

    Serial Test

    Display Test

The DL50 will continuously repeat the diagnostic tests until a different operating mode is selected (DIP switches) and the RESET button is pressed or power is cycled.

As each test is being made, the DL50 displays the name of the test. After each test the DL50 displays the results. The results are also sent out to the RS-232 port.

µP Confidence Test
This test checks the ability to read/write to the processor's internal registers. If this test fails, the processor board needs replacement. Refer to Replacement Parts List, Table 8.B.

RAM Test
This test writes to RAM and verifies the write. If this test fails, the processor board needs replacement. Refer to Replacement Parts List, Table 8.B.

ROM Test
Performs a checksum and compares the checksum against the stored checksum. If this test fails, use the bootstrap mode to reload firmware.

Processor Board Power Test
Verifies that the proper voltages are present at the processor board. Refer to next section for instructions on how to use the diagnostic LEDs to verify correct voltages at the processor board.

Serial Test
In this test the DL50 prompts the user to enter text from a terminal. Any text received within 10 seconds is displayed on the DL50. After 10 seconds, the test is terminated. If this test fails, check communications connections.

Display Test
This test displays test patterns. Use this test to isolate faulty display boards. Faulty red display boards can be replaced, refer to Replacement Parts List, see Table 8.B. Faulty tricolor displays must be returned to the factory for repair.

3. Observe the diagnostic LEDs (Figure 8.1). If both the AC and DC indicators are on, then the display should be cycling through diagnostic tests. During the display test, the DL50 will display patterns of scrolling both horizontally and vertically. Inspect each display board for faulty LEDs (continuously in an ON or OFF state).

   • If faulty LEDs are detected, the display board needs to be replaced. Refer to Replacement Parts List in this chapter.

   • If nothing is displayed, then either the connection from the processor board to the display board is faulty or the processor board is faulty. Check connections. Check the output of the processor board by connecting a dumb terminal to the RS-232 port. If no text is displayed on the dumb terminal screen, the processor board needs to be replaced. Refer to Replacement Parts List, Table 8.B.

4. If the AC LED is On and the DC LED(s) are Off, check the AC power fuse. (See Figure 8.2 for the location of this fuse.) If the fuse is ok and there is power at the AC input of the power supply, then either the LED on the processor board or the power supply is faulty. Use a voltmeter to verify the presence of +5V DC on the output of the power supply(s). If +5V DC is not present, the power supply is faulty. If +5V DC is present, the processor board is faulty. Refer to Replacement Parts List, Table 8.B.

5. If the AC LED is Off, there is either an incorrect supply voltage or a defective power supply. Measure the voltage at the AC input terminal. If the proper AC voltage is present and the fuse is good (see Figure 8.2 for the location of this fuse), the power supply is defective. Refer to Replacement Parts List, Table 8.B.

Fuse Replacement

Figure 8.2 shows the location of the power input fuse.

Figure 8.2
Power Input Fuse Location
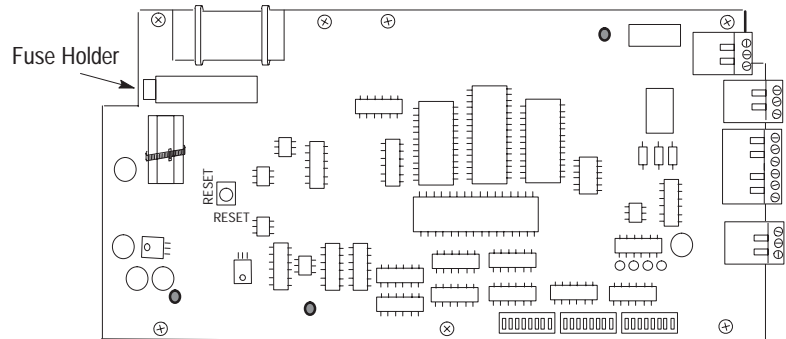
1. Disconnect power from the DL50.

! **ATTENTION:**
Disconnect power before servicing. Failure to follow this warning could result in electrical shock.

2. Loosen the screws securing the front cover latches of the DL50. There are 6 door latches on the small displays (Catalog No. 2706-F11J, -F11JC) and 10 latches on the large display (Catalog No. 2706-F21J, -F21JC).

Note: Do not completely remove the screws securing the latches. Loosening the screws allows the latches around the door to move freely but still keep the door secured

! **ATTENTION:**
The next step allows the front cover to open downward. Make sure there is adequate clearance. Failure to provide proper clearance may cause damage to the display.

3. Carefully turn the latches away from the door. After all of the latches have been turned, the front cover can be lowered.

4. If possible, determine why the fuse has blown. Do not replace the fuse until the fault for the fuse blowing has been corrected.

5. Use a slotted screwdriver to remove end cap on the fuse holder. Remove and install new fuse. The replacement fuse should be one of the following types:

>   European: 2.5A Type GMA
>   U.S.A: 2.5A Type AGC

6. Carefully lift the front cover up to its closed position and use one of the door latches to lock the cover in place. Tighten the screw securing the latch.

7. Apply power and verify the initial power-up display as described in Chapter 3.

8. Lock the rest of the door latches and tighten all of the screws.

Replacement Parts List

Table 8.B lists the replacement parts that are available for the DL50.

Table 8.B
Replacement Parts List

Replacement Part	Catalog Number
Power Supply	W7712881002
Controller (Processor) Board	W7712881103
Display Board, Red	W7712881201
Power Input Fuse	U.S.A: 2.5A Type AGC European: 2.5A Type GMA

Only qualified service personnel should service the DL50. Replacement parts can be ordered through your local Allen-Bradley distributor.

Maintenance

General Cleaning
Clean the display window as follows:

⚠ **CAUTION:**

Clean the display window as specified. Use of abrasive cleansers or solvents may damage the window. Do not scrub or use brushes.

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1. Disconnect power from the display at the power source.

2. Using a clean sponge or a soft cloth, clean the window with a mild soap or detergent.

2. Dry the window with a chamois or moist cellulose sponge to prevent water spots.

Removing Paint and Grease
Fresh paint splashes and grease can easily be removed before drying by rubbing lightly with isopropyl alcohol. Afterward, a warm final wash should be made using a mild soap or detergent solution and ending with a thorough rinsing with clean water.

Removing Hairline Scratches
Scratches and minor abrasions can be removed or minimized by using a mild automobile polish. We recommend that you first test the product on a small area.

Specifications

Specifications

Display Characters

Character Height	2.1 inch (53.3 mm) 4.8 inch (121.9 mm)
Character Set	Standard and Extended ASCII
Characters Per Line Catalog No. 2706-F21J, -F21JC Catalog No. 2706-F11J, -F11JC	Forty 2.1 inch characters, or Twenty 4.8 inch characters Twenty 2.1 inch characters, or Ten 4.8 inch characters
Display Type Catalog No. 2706-F11J, -F21J Catalog No. 2706-F11JC, -F21JC	Super-Brite Red LED Dome Matrix Tri-Color LED Matrix
Display Color Catalog No. 2706-F11J, -F21J Catalog No. 2706-F11JC, -F21JC	Red Red, Green, Amber
Approximate Viewing Distance 2.1 inch characters 4.8 inch characters	100 feet (30.5 meters) 240 feet (73.2 meters)

Electrical

Input Voltage	95-120 or 190-240 Volts AC (auto-ranging), 50-60 Hz
Input Power Catalog No. 2706-F11J Catalog No. 2706-F11JC Catalog No. 2706-F21J Catalog No. 1706-F21JC	105 VA 120 VA 190 VA 200 VA
Fuse Type U.S.A European	2.5 Ampere, Type AGC 2.5 Ampere, Type GMA
Annunciation Relay AC Resistive Load DC Resistive Load	3 Amperes at 240V AC 3 Amperes at 30 V DC
Communication Interface Direct Connection-Single Point Network Connection-Multi-Drop	EIA-/TIA-232-E (RS-232) EIA-485 (RS-485)

Communications

Protocols Simplex: Duplex:	Simple serial ASCII protocol Serial ASCII protocol with ACK/NAK response packet and optional checksum feature
Baud Rate	300, 1200, 9600, 19200
Data Format	8 data bits, no parity, one stop bit
Electrical Interface	RS-232 single point, RS-485 multi-drop

Environmental

Temperature Range	
Operating ①	0° to +60°C (+32° to +140°F)
Storage	-40° to +85°C (-40° to +185°F)
Humidity	5% to 95% non-condensing
Shock	Operating 15 G, Non-operating 30 G pulses
Vibration	Operating 1.0 G, Non-operating 2.5 G sinusoidal

Operating temperature range is based upon the absence of moisture and liquids.

Mechanical

Enclosure Type	UL listed for NEMA Type 12 & 13
	Designed but not UL listed for NEMA Type 4 (indoor use only).
Weight - Approximate	
Catalog No. 2706-F11J, -F11JC	40 lbs. (18 kg)
Catalog No. 2706-F21, -F21JC	75 lbs. (34 kg)

Certifications

UL Listing		
	ⓊⓁ LISTED	UL Listed
	c ⓊⓁ LISTED	UL Listed to Canadian safety standards
European Union Directive CE		Electromagnetic Compatibility Directive (89/336/EEC)
		EN 50081-2 Generic Emission Standard - Industrial Environment
		EN 50082-2 Generic Immunity Standard - Industrial Environment
		Low Voltage Directive (73/23/EEC) EN60950 - Safety of Information Technology Equipment

Display Descriptions

Display Descriptions

When selecting the message attributes, use the following descriptions:

Display Mode	Function	Simplex	Duplex
Hold	Holds the message for several seconds.	Yes	Yes
Flash	Creates a flashing message, or (Ctrl-F) selects certain characters or words to flash while others remain stable.	Yes	Yes
Roll Up	Rolls the previous message up off the display while rolling the new message up onto the display.	Yes	Yes
Roll Down	Rolls the previous message down off the display while rolling the new message down onto the display.	Yes	Yes
Roll Left	Rolls the previous message off the display to the left while rolling the new message onto the display from the right.	Yes	Yes
Roll Right	Rolls the previous message off the display to the right while rolling the new message onto the display from the left.	Yes	Yes
Roll In	Rolls the previous message off the display from the ends to the center, while rolling the new message onto the display from the ends.	No	Yes
Roll Out	Rolls the previous message off the display from the center to the ends, while rolling the new message onto the display from the center.	No	Yes
Rotate	Scrolls the message from right to left horizontally across the display. The Flash message attribute is ignored for rotated messages on tri-color displays.	No	Yes
Wipe Down	Wipes a new message down over the current message.	Yes	Yes
Wipe Up	Wipes a new message up over the current message.	Yes	Yes
Wipe Left	Wipes, from the left, a new message over the current message.	Yes	Yes
Wipe Right	Wipes, from the right, a new message over the current message.	Yes	Yes
Wipe In	Wipes a new message over the current message from each end of the display towards the center.	No	Yes
Wipe Out	Wipes a new message over the current message from the center of the display towards the ends.	No	Yes
Twinkle	Creates an oscillating twinkling effect.	No	Yes
Sparkle	Sparkles a new message over the current message.	No	Yes
Snow	Writes a new message over the current message with a snowing effect.	No	Yes
Interlock	Alternates rows of dots and interlocks the message into the center of the display from each side.	No	Yes
Switch	Slides the characters of the message off the display in different directions. The first character slides up, the next down, etc.	No	Yes
Slide Across	Slides the message onto and across the display from right to left, one character at a time.	No	Yes
Spray On	Sprays the message onto and across the display from right to left.	No	Yes
Starburst On	Explodes the message in star-bursts onto the display.	No	Yes
Scroll	Continuously moves the messages to the top of the display.	Yes	Yes
Compress Scroll	Continuously moves and compresses the messages to the top of the display.	No	Yes

Table 5.C shows the codes used to enter these attributes for Simplex Protocol, and Table 5.H shows those for Duplex Protocol. In addition, immediately after each of these tables there is a descriptive list of special control characters which can be used within a message. One of these special characters (Ctrl F) toggles Flash on and off, one (Ctrl R) clears the message buffer, and three of them (Ctrl X,Y and Z), in tricolor displays only, change the color.

ASCII Character Set

Dec.	Oct.	Hex	Char	Control Code	Dec.	Oct.	Hex	Char	Dec.	Oct.	Hex	Char	Dec.	Oct.	Hex	Char
0	000	00	NUL	CTRL @	32	040	20	SP	64	100	40	@	96	140	60	`
1	001	01	SOH	CTRL A	33	041	21	!	65	101	41	A	97	141	61	a
2	002	02	STX	CTRL B	34	042	22	"	66	102	42	B	98	142	62	b
3	003	03	ETX	CTRL C	35	043	23	#	67	103	43	C	99	143	63	c
4	004	04	EOT	CTRL D	36	044	24	$	68	104	44	D	100	144	64	d
5	005	05	ENQ	CTRL E	37	045	25	%	69	105	45	E	101	145	65	e
6	006	06	ACK	CTRL F	38	046	26	&	70	106	46	F	102	146	66	f
7	007	07	BEL	CTRL G	39	047	27	'	71	107	47	G	103	147	67	g
8	010	08	BS	CTRL H	40	050	28	(	72	110	48	H	104	150	68	h
9	011	09	HT	CTRL I	41	051	29	)	73	111	49	I	105	151	69	i
10	012	0A	LF	CTRL J	42	052	2A	*	74	112	4A	J	106	152	6A	j
11	013	0B	VT	CTRL K	43	053	2B	+	75	113	4B	K	107	153	6B	k
12	014	0C	FF	CTRL L	44	054	2C	,	76	114	4C	L	108	154	6C	l
13	015	0D	CR	CTRL M	45	055	2D	-	77	115	4D	M	109	155	6D	m
14	016	0E	SO	CTRL N	46	056	2E	.	78	116	4E	N	110	156	6E	n
15	017	0F	SI	CTRL O	47	057	2F	/	79	117	4F	O	111	157	6F	o
16	020	10	DLE	CTRL P	48	060	30	0	80	120	50	P	112	160	70	p
17	021	11	DC1	CTRL Q	49	061	31	1	81	121	51	Q	113	161	71	q
18	022	12	DC2	CTRL R	50	062	32	2	82	122	52	R	114	162	72	r
19	023	13	DC3	CTRL S	51	063	33	3	83	123	53	S	115	163	73	s
20	024	14	DC4	CTRL T	52	064	34	4	84	124	54	T	116	164	74	t
21	025	15	NAK	CTRL U	53	065	35	5	85	125	55	U	117	165	75	u
22	026	16	SYN	CTRL V	54	066	36	6	86	126	56	V	118	166	76	v
23	027	17	ETB	CTRL W	55	067	37	7	87	127	57	W	119	167	77	w
24	030	18	CAN	CTRL X	56	070	38	8	88	130	58	X	120	170	78	x
25	031	19	EM	CTRL Y	57	071	39	9	89	131	59	Y	121	171	79	y
26	032	1A	SUB	CTRL Z	58	072	3A	:	90	132	5A	Z	122	172	7A	z
27	033	1B	ESC	CTRL [	59	073	3B	;	91	133	5B	[	123	173	7B	{
28	034	1C	FS	CTRL \	60	074	3C	<	92	134	5C	\	124	174	7C		
29	035	1D	GS	CTRL]	61	075	3D	=	93	135	5D	]	125	175	7D	}
30	036	1E	RS	CTRL ^	62	076	3E	>	94	136	5E	^	126	176	7E	~
31	037	1F	US	CTRL _	63	077	3F	?	95	137	5F	_	127	177	7F	■

Extended ASCII Character Set

Dec.	Oct.	Hex	Char	Dec.	Oct.	Hex	Char	Dec.	Oct.	Hex	Char	Dec.	Oct.	Hex	Char
128	200	80	Ç	160	240	A0	á	192	300	C0	└	224	340	E0	α
129	201	81	ü	161	241	A1	í	193	301	C1	┴	225	341	E1	β
130	202	82	é	162	242	A2	ó	194	302	C2	┬	226	342	E2	Γ
131	203	83	â	163	243	A3	ú	195	303	C3	├	227	343	E3	π
132	204	84	ä	164	244	A4	ñ	196	304	C4	─	228	344	E4	Σ
133	205	85	à	165	245	A5	Ñ	197	305	C5	┼	229	345	E5	σ
134	206	86	å	166	246	A6	ª	198	306	C6	╞	230	346	E6	μ
135	207	87	ç	167	247	A7	º	199	307	C7	╟	231	347	E7	τ
136	210	88	ê	168	250	A8	¿	200	310	C8	╚	232	350	E8	Φ
137	211	89	ë	169	251	A9	⌐	201	311	C9	╔	233	351	E9	Θ
138	212	8A	è	170	252	AA	¬	202	312	CA	╩	234	352	EA	Ω
139	213	8B	ï	171	253	AB	1/2	203	313	CB	╦	235	353	EB	δ
140	214	8C	î	172	254	AC	1/4	204	314	CC	╠	236	354	EC	∞
141	215	8D	ì	173	255	AD	¡	205	315	CD	═	237	355	ED	$\varnothing$
142	216	8E	Ä	174	256	AE	<<	206	316	CE	╬	238	356	EE	$\in$
143	217	8F	Å	175	257	AF	>>	207	317	CF	╧	239	357	EF	$\cap$
144	220	90	É	176	260	B0	░	208	320	D0	╨	240	360	F0	$\equiv$
145	221	91	æ	177	261	B1	▒	209	321	D1	╤	241	361	F1	$\pm$
146	222	92	Æ	178	262	B2	▓	210	322	D2	╥	242	362	F2	$\geq$
147	223	93	Ô	179	263	B3	│	211	323	D3	╙	243	363	F3	$\leq$
148	224	94	ö	180	264	B4	┤	212	324	D4	╘	244	364	F4	⌠
149	225	95	ò	181	265	B5	╡	213	325	D5	╒	245	365	F5	⌡
150	226	96	û	182	266	B6	╢	214	326	D6	╓	246	366	F6	$\div$
151	227	97	ù	183	267	B7	╖	215	327	D7	╫	247	367	F7	$\approx$
152	230	98	ÿ	184	270	B8	╕	216	330	D8	╪	248	370	F8	°
153	231	99	Ö	185	271	B9	╣	217	331	D9	┘	249	371	F9	•
154	232	9A	Ü	186	272	BA	║	218	332	DA	┌	250	372	FA	·
155	233	9B	¢	187	273	BB	╗	219	333	DB	█	251	373	FB	$\sqrt{}$
156	234	9C	£	188	274	BC	╝	220	334	DC	▄	252	374	FC	n
157	235	9D	¥	189	275	BD	╜	221	335	DD	▌	253	375	FD	^{2}
158	236	9E	Pt	190	276	BE	╛	222	336	DE	▐	254	376	FE	■
159	237	9F	ƒ	191	277	BF	┐	223	337	DF	▀	255	377	FF	

Dimensions

Catalog No. 2706–F11J, –F11JC Dimensions

Dimensions: inches / (cm)

CASE: 40.10 (101.8)

38.33 (97.4)

19.75 (48.7)

BRACKET: 1.75 (4.4)

CASE: 8.80 (22.3)

10.68 (27.1)

ANGLE BRACKETS

4.86 (12.3)

10.68 (27.1)

3.81 (9.7)
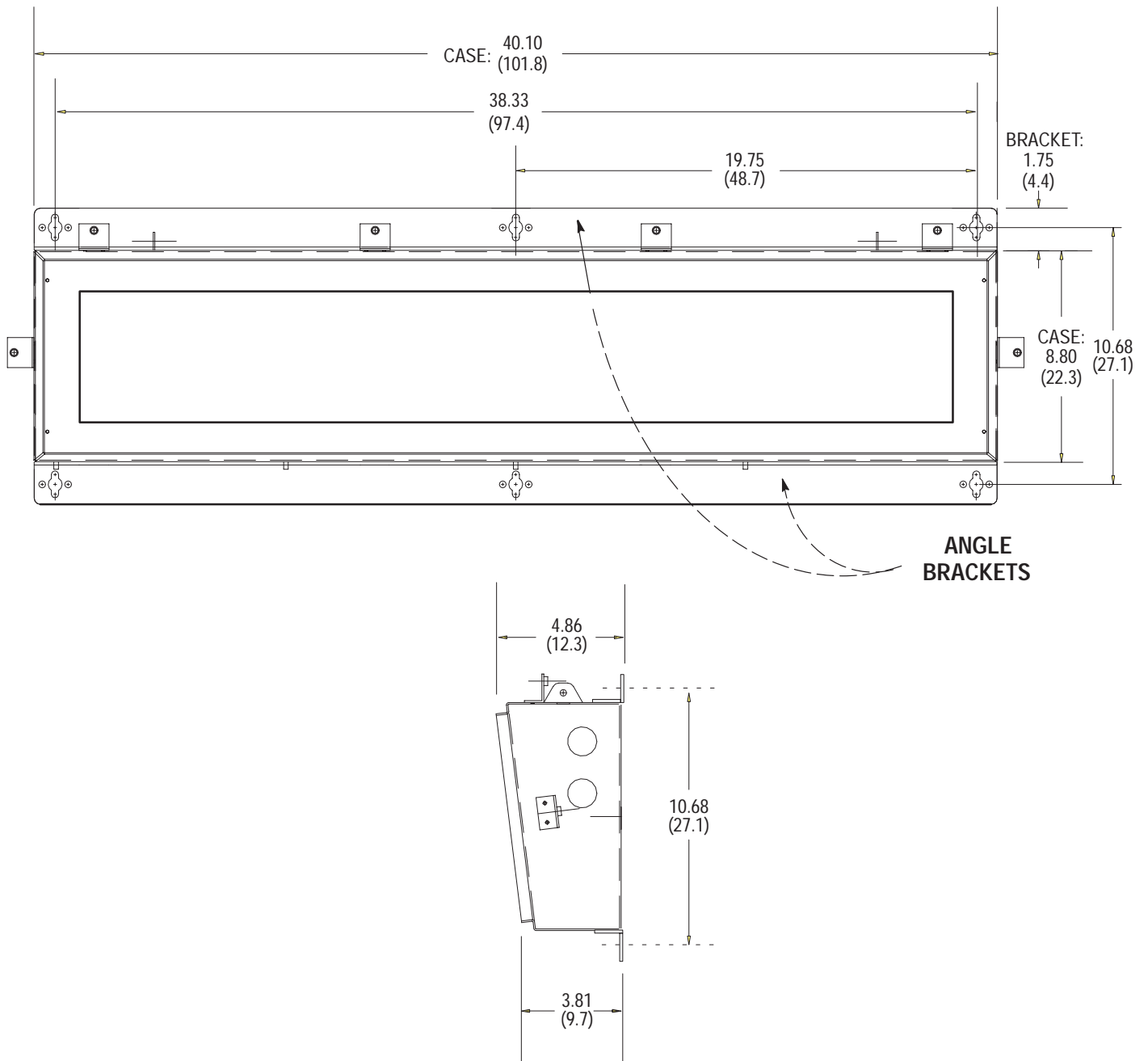
Catalog No. 2706–F21J, –F21JC Dimensions

Dimensions: inches / (cm)

CASE: 76.36 (194.0)

74.89 (188.2)

24.75 (62.9)

A

10.68 (27.1)

ANGLE BRACKETS

A

4.86 (12.3)

SECTION "A-A"

10.68 (27.1)

3.81 (9.7)

C–2
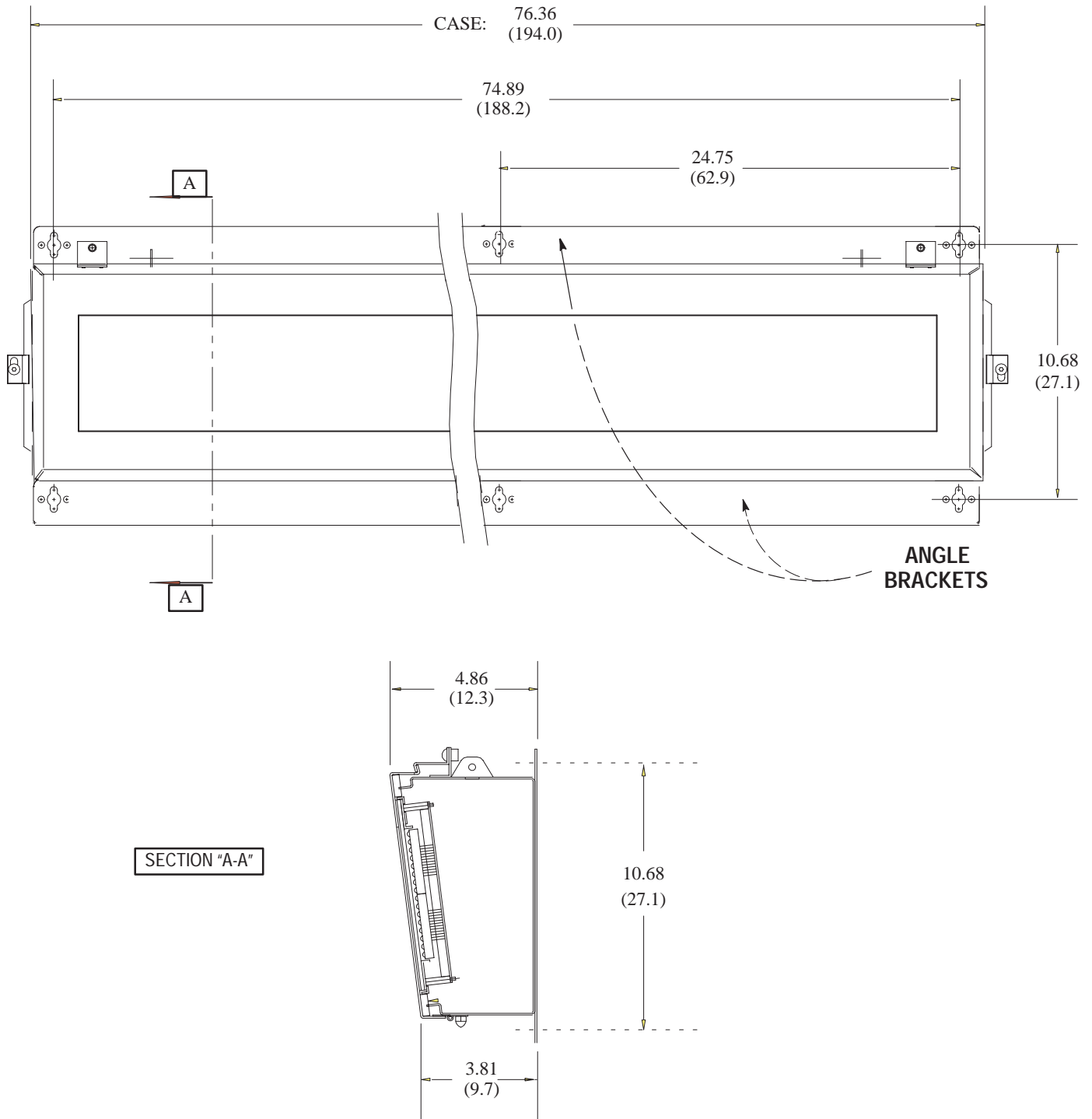
Catalog No. 2706–NJ3 Dimensions

Adjustable Bracket. Dimensions: inches / (cm)

2.52
(6.4)

0.50
(1.3)

0.50
(1.3)

12.30
31.2

10.68
(27.1)

6.15
(15.6)

1.00
(2.5)

4.77
(12.1)

1.87
(4.7)

.81
(2.0)

0.87
(2.2)

10.68
(27.1)

12.30
31.2

6.15
(15.6)
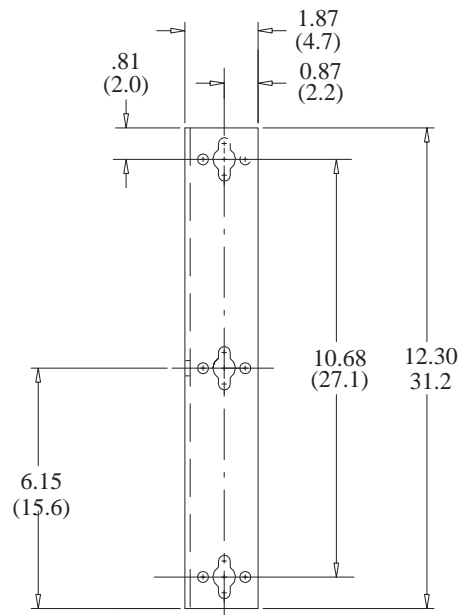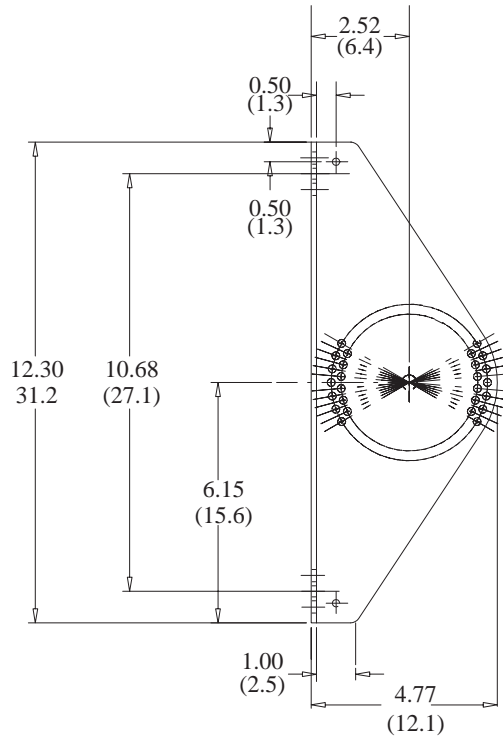
Serial Address Settings

Setting Serial Address

Set DIP switch #1 to the proper serial address using the following tables:

Address	Switch Selections								Address	Switch Selections							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
00	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	32	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
01	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	33	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
02	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	34	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
03	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	35	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
04	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
05	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	37	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
06	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	38	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
07	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	39	OFF	OFF	ON	OFF	OFF	ON	ON	ON
08	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	40	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
09	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	41	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
10	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	42	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
11	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	43	OFF	OFF	ON	OFF	ON	OFF	ON	ON
12	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	44	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
13	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	45	OFF	OFF	ON	OFF	ON	ON	OFF	ON
14	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	46	OFF	OFF	ON	OFF	ON	ON	ON	OFF
15	OFF	OFF	OFF	OFF	ON	ON	ON	ON	47	OFF	OFF	ON	OFF	ON	ON	ON	ON
16	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	48	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
17	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	49	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
18	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	50	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
19	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	51	OFF	OFF	ON	ON	OFF	OFF	ON	ON
20	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	52	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
21	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	53	OFF	OFF	ON	ON	OFF	ON	OFF	ON
22	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	54	OFF	OFF	ON	ON	OFF	ON	ON	OFF
23	OFF	OFF	OFF	ON	OFF	ON	ON	ON	55	OFF	OFF	ON	ON	OFF	ON	ON	ON
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	56	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
25	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	57	OFF	OFF	ON	ON	ON	OFF	OFF	ON
26	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	58	OFF	OFF	ON	ON	ON	OFF	ON	OFF
27	OFF	OFF	OFF	ON	ON	OFF	ON	ON	59	OFF	OFF	ON	ON	ON	OFF	ON	ON
28	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	60	OFF	OFF	ON	ON	ON	ON	OFF	OFF
29	OFF	OFF	OFF	ON	ON	ON	OFF	ON	61	OFF	OFF	ON	ON	ON	ON	OFF	ON
30	OFF	OFF	OFF	ON	ON	ON	ON	OFF	62	OFF	OFF	ON	ON	ON	ON	ON	OFF
31	OFF	OFF	OFF	ON	ON	ON	ON	ON	63	OFF	OFF	ON	ON	ON	ON	ON	ON

Address	Switch Selections								Address	Switch Selections							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
64	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	96	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
65	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON	97	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
66	OFF	OF	OFF	OFF	OFF	OFF	ON	OFF	98	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
67	OFF	ON	OFF	OFF	OFF	OFF	ON	ON	99	OFF	ON	ON	OFF	OFF	OFF	ON	ON
68	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	100	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
69	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	101	OFF	ON	ON	OFF	OFF	ON	OFF	ON
70	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	102	OFF	ON	ON	OFF	OFF	ON	ON	OFF
71	OFF	ON	OFF	OFF	OFF	ON	ON	ON	103	OFF	ON	ON	OFF	OFF	ON	ON	ON
72	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	104	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
73	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	105	OFF	ON	ON	OFF	ON	OFF	OFF	ON
74	OFF	ON	OFF	OFF	ON	OFF	ON	OFF	106	OFF	ON	ON	OFF	ON	OFF	ON	OFF
75	OFF	ON	OFF	OFF	ON	OFF	ON	ON	107	OFF	ON	ON	OFF	ON	OFF	ON	ON
76	OFF	ON	OFF	OFF	ON	ON	OFF	OFF	108	OFF	ON	ON	OFF	ON	ON	OFF	OFF
77	OFF	ON	OFF	OFF	ON	ON	OFF	ON	109	OFF	ON	ON	OFF	ON	ON	OFF	ON
78	OFF	ON	OFF	OFF	ON	ON	ON	OFF	110	OFF	ON	ON	OFF	ON	ON	ON	OFF
79	OFF	ON	OFF	OFF	ON	ON	ON	ON	111	OFF	ON	ON	OFF	ON	ON	ON	ON
80	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	112	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
81	OFF	ON	OFF	ON	OFF	OFF	OFF	ON	113	OFF	ON	ON	ON	OFF	OFF	OFF	ON
82	OFF	ON	OFF	ON	OFF	OFF	ON	OFF	114	OFF	ON	ON	ON	OFF	OFF	ON	OFF
83	OFF	ON	OFF	ON	OFF	OFF	ON	ON	115	OFF	ON	ON	ON	OFF	OFF	ON	ON
84	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	116	OFF	ON	ON	ON	OFF	ON	OFF	OFF
85	OFF	ON	OFF	ON	OFF	ON	OFF	ON	117	OFF	ON	ON	ON	OFF	ON	OFF	ON
86	OFF	ON	OFF	ON	OFF	ON	ON	OFF	118	OFF	ON	ON	ON	OFF	ON	ON	OFF
87	OFF	ON	OFF	ON	OFF	ON	ON	ON	119	OFF	ON	ON	ON	OFF	ON	ON	ON
88	OFF	ON	OFF	ON	ON	OFF	OFF	OFF	120	OFF	ON	ON	ON	ON	OFF	OFF	OFF
89	OFF	ON	OFF	ON	ON	OFF	OFF	ON	121	OFF	ON	ON	ON	ON	OFF	OFF	ON
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF	122	OFF	ON	ON	ON	ON	OFF	ON	OFF
91	OFF	ON	OFF	ON	ON	OFF	ON	ON	123	OFF	ON	ON	ON	ON	OFF	ON	ON
92	OFF	ON	OFF	ON	ON	ON	OFF	OFF	124	OFF	ON	ON	ON	ON	ON	OFF	OFF
93	OFF	ON	OFF	ON	ON	ON	OFF	ON	125	OFF	ON	ON	ON	ON	ON	OFF	ON
94	OFF	ON	OFF	ON	ON	ON	ON	OFF	126	OFF	ON	ON	ON	ON	ON	ON	OFF
95	OFF	ON	OFF	ON	ON	ON	ON	ON	127	OFF	ON	ON	ON	ON	ON	ON	ON

Address			Switch Selections						Address			Switch Selections					
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
128	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	160	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	161	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
130	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	162	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
131	ON	OFF	OFF	OFF	OFF	OFF	ON	ON	163	ON	OFF	ON	OFF	OFF	OFF	ON	ON
132	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	164	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
133	ON	OFF	OFF	OFF	OFF	ON	OFF	ON	165	ON	OFF	ON	OFF	OFF	ON	OFF	ON
134	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	166	ON	OFF	ON	OFF	OFF	ON	ON	OFF
135	ON	OFF	OFF	OFF	OFF	ON	ON	ON	167	ON	OFF	ON	OFF	OFF	ON	ON	ON
136	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	168	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
137	ON	OFF	OFF	OFF	ON	OFF	OFF	ON	169	ON	OFF	ON	OFF	ON	OFF	OFF	ON
138	ON	OFF	OFF	OFF	ON	OFF	ON	OFF	170	ON	OFF	ON	OFF	ON	OFF	ON	OFF
139	ON	OFF	OFF	OFF	ON	OFF	ON	ON	171	ON	OFF	ON	OFF	ON	OFF	ON	ON
140	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	172	ON	OFF	ON	OFF	ON	ON	OFF	OFF
141	ON	OFF	OFF	OFF	ON	ON	OFF	ON	173	ON	OFF	ON	OFF	ON	ON	OFF	ON
142	ON	OFF	OFF	OFF	ON	ON	ON	OFF	174	ON	OFF	ON	OFF	ON	ON	ON	OFF
143	ON	OFF	OFF	OFF	ON	ON	ON	ON	175	ON	OFF	ON	OFF	ON	ON	ON	ON
144	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	176	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
145	ON	OFF	OFF	ON	OFF	OFF	OFF	ON	177	ON	OFF	ON	ON	OFF	OFF	OFF	ON
146	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	178	ON	OFF	ON	ON	OFF	OFF	ON	OFF
147	ON	OFF	OFF	ON	OFF	OFF	ON	ON	179	ON	OFF	ON	ON	OFF	OFF	ON	ON
148	ON	OFF	OFF	ON	OFF	ON	OFF	OFF	180	ON	OFF	ON	ON	OFF	ON	OFF	OFF
149	ON	OFF	OFF	ON	OFF	ON	OFF	ON	181	ON	OFF	ON	ON	OFF	ON	OFF	ON
150	ON	OFF	OFF	ON	OFF	ON	ON	OFF	182	ON	OFF	ON	ON	OFF	ON	ON	OFF
151	ON	OFF	OFF	ON	OFF	ON	ON	ON	183	ON	OFF	ON	ON	OFF	ON	ON	ON
152	ON	OFF	OFF	ON	ON	OFF	OFF	OFF	184	ON	OFF	ON	ON	ON	OFF	OFF	OFF
153	ON	OFF	OFF	ON	ON	OFF	OFF	ON	185	ON	OFF	ON	ON	ON	OFF	OFF	ON
154	ON	OFF	OFF	ON	ON	OFF	ON	OFF	186	ON	OFF	ON	ON	ON	OFF	ON	OFF
155	ON	OFF	OFF	ON	ON	OFF	ON	ON	187	ON	OFF	ON	ON	ON	OFF	ON	ON
156	ON	OFF	OFF	ON	ON	ON	OFF	OFF	188	ON	OFF	ON	ON	ON	ON	OFF	OFF
157	ON	OFF	OFF	ON	ON	ON	OFF	ON	189	ON	OFF	ON	ON	ON	ON	OFF	ON
158	ON	OFF	OFF	ON	ON	ON	ON	OFF	190	ON	OFF	ON	ON	ON	ON	ON	OFF
159	ON	OFF	OFF	ON	ON	ON	ON	ON	191	ON	OFF	ON	ON	ON	ON	ON	ON

Address	Switch Selections								Address	Switch Selections							
	1	2	3	4	5	6	7	8		1	2	3	4	5	6	7	8
192	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	224	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
193	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	225	ON	ON	ON	OFF	OFF	OFF	OFF	ON
194	ON	ON	OFF	OFF	OFF	OFF	ON	OFF	226	ON	ON	ON	OFF	OFF	OFF	ON	OFF
195	ON	ON	OFF	OFF	OFF	OFF	ON	ON	227	ON	ON	ON	OFF	OFF	OFF	ON	ON
196	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	228	ON	ON	ON	OFF	OFF	ON	OFF	OFF
197	ON	ON	OFF	OFF	OFF	ON	OFF	ON	229	ON	ON	ON	OFF	OFF	ON	OFF	ON
198	ON	ON	OFF	OFF	OFF	ON	ON	OFF	230	ON	ON	ON	OFF	OFF	ON	ON	OFF
199	ON	ON	OFF	OFF	OFF	ON	ON	ON	231	ON	ON	ON	OFF	OFF	ON	ON	ON
200	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	232	ON	ON	ON	OFF	ON	OFF	OFF	OFF
201	ON	ON	OFF	OFF	ON	OFF	OFF	ON	233	ON	ON	ON	OFF	ON	OFF	OFF	ON
202	ON	ON	OFF	OFF	ON	OFF	ON	OFF	234	ON	ON	ON	OFF	ON	OFF	ON	OFF
203	ON	ON	OFF	OFF	ON	OFF	ON	ON	235	ON	ON	ON	OFF	ON	OFF	ON	ON
204	ON	ON	OFF	OFF	ON	ON	OFF	OFF	236	ON	ON	ON	OFF	ON	ON	OFF	OFF
205	ON	ON	OFF	OFF	ON	ON	OFF	ON	237	ON	ON	ON	OFF	ON	ON	OFF	ON
206	ON	ON	OFF	OFF	ON	ON	ON	OFF	238	ON	ON	ON	OFF	ON	ON	ON	OFF
207	ON	ON	OFF	OFF	ON	ON	ON	ON	239	ON	ON	ON	OFF	ON	ON	ON	ON
208	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	240	ON	ON	ON	ON	OFF	OFF	OFF	OFF
209	ON	ON	OFF	ON	OFF	OFF	OFF	ON	241	ON	ON	ON	ON	OFF	OFF	OFF	ON
210	ON	ON	OFF	ON	OFF	OFF	ON	OFF	242	ON	ON	ON	ON	OFF	OFF	ON	OFF
211	ON	ON	OFF	ON	OFF	OFF	ON	ON	243	ON	ON	ON	ON	OFF	OFF	ON	ON
212	ON	ON	OFF	ON	OFF	ON	OFF	OFF	244	ON	ON	ON	ON	OFF	ON	OFF	OFF
213	ON	ON	OFF	ON	OFF	ON	OFF	ON	245	ON	ON	ON	ON	OFF	ON	OFF	ON
214	ON	ON	OFF	ON	OFF	ON	ON	OFF	246	ON	ON	ON	ON	OFF	ON	ON	OFF
215	ON	ON	OFF	ON	OFF	ON	ON	ON	247	ON	ON	ON	ON	OFF	ON	ON	ON
216	ON	ON	OFF	ON	ON	OFF	OFF	OFF	248	ON	ON	ON	ON	ON	OFF	OFF	OFF
217	ON	ON	OFF	ON	ON	OFF	OFF	ON	249	ON	ON	ON	ON	ON	OFF	OFF	ON
218	ON	ON	OFF	ON	ON	OFF	ON	OFF	250	ON	ON	ON	ON	ON	OFF	ON	OFF
219	ON	ON	OFF	ON	ON	OFF	ON	ON	251	ON	ON	ON	ON	ON	OFF	ON	ON
220	ON	ON	OFF	ON	ON	ON	OFF	OFF	252	ON	ON	ON	ON	ON	ON	OFF	OFF
221	ON	ON	OFF	ON	ON	ON	OFF	ON	253	ON	ON	ON	ON	ON	ON	OFF	ON
222	ON	ON	OFF	ON	ON	ON	ON	OFF	254	ON	ON	ON	ON	ON	ON	ON	OFF
223	ON	ON	OFF	ON	ON	ON	ON	ON	255	ON	ON	ON	ON	ON	ON	ON	ON

Internal Wiring Diagrams

Catalog No. 2706–F11J, –F11JC Use the following diagram as an aid in troubleshooting.

Catalog No. 2706–F21J, –F21JC Use the following diagram as an aid in troubleshooting.
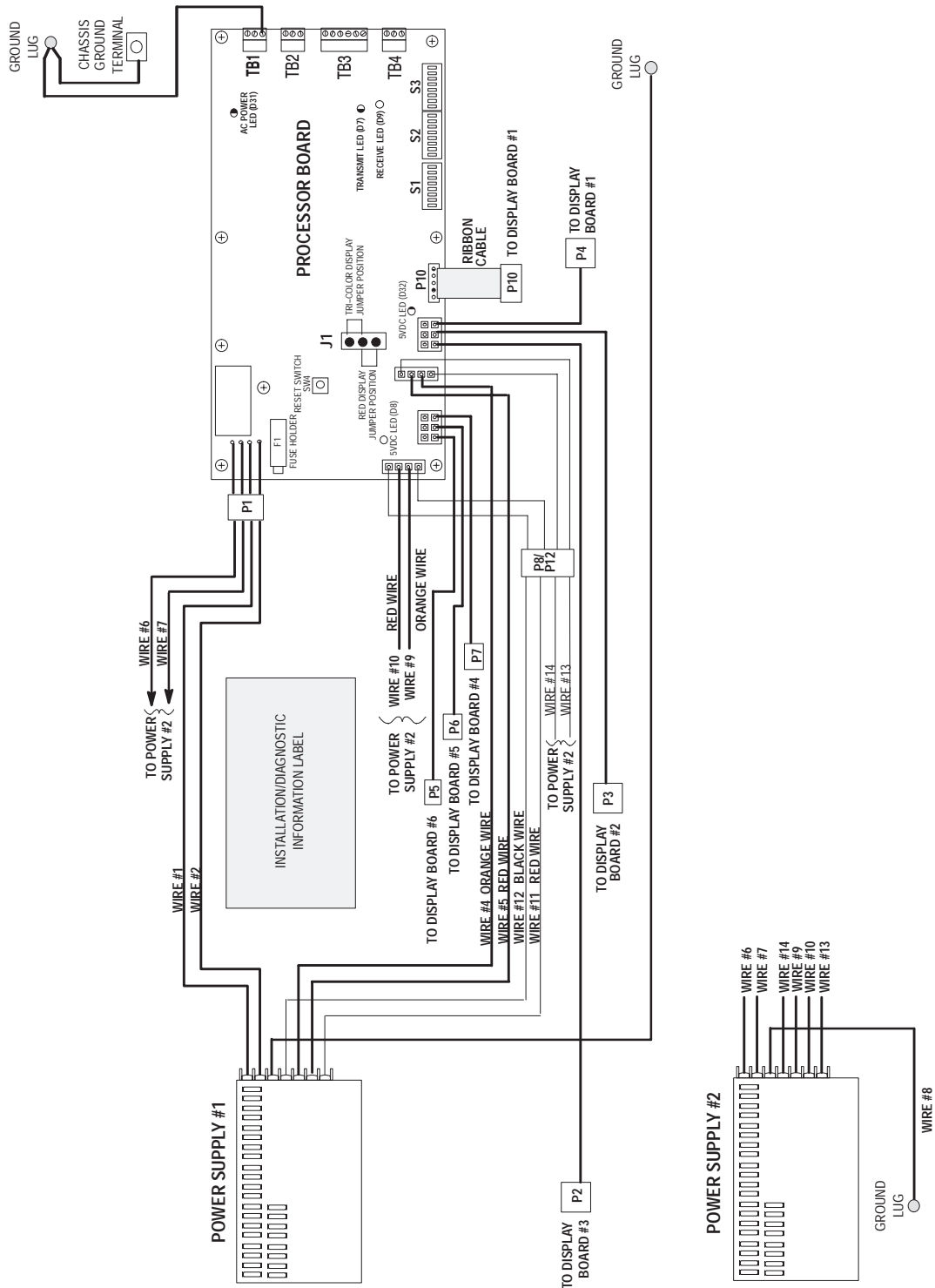
Checksum Calculations

Checksum Description

The checksum bytes verify the transmission of data when the DL50 is in the duplex mode. There are three bytes, the first byte is a dummy byte and the other two are checksum bytes. If either of the two checksum bytes contain a value equivalent to a CR (decimal 13) or DC2 (decimal 18), the content of the dummy byte is adjusted to alter the value of the checksum. The dummy byte is adjusted by:

- Adding a value of 1 if the least significant checksum byte = 13 or 18 (decimal)

- Adding a value of 128 or 255 (decimal) if the most significant byte = 13 or 18 (decimal)

Checksum BASIC Program

This example calculates the checksum bytes for Example #2 (using Duplex Protocol) on page 6.3. Modify this program to calculate checksums for other messages.

```
1   REM         Initialize constants:
2   True=1:False=0
10  REM:        Example program to calculate the checksum for a
11  REM:        message packet to be sent to the DL50
20  REM
30  MSG$=CHR$(2)+"Motor ON"
31  REM         <ctrl>B + Message_String
32  REM         The address=255, Line No.=1, Message Attributes = 165,200,128
33  REM         The dummy byte initially = 0
34  REM
35  DUMMY = 0
36  TMP1$=MSG$+CHR$(255)+CHR$(1)+CHR$(13)+CHR$(165)+CHR$(200)+CHR$(128)+CHR$(DUMMY)
38  REM
39  REM         Get the length of the message packet string, TMP1$
40  L=LEN(TMP1$)
50  REM         Start with 0, and add the ASCII value of each character in the string
55  BCNT=0
60  FOR P=1 to L
70  BCNT=BCNT+ASC(MID$(TMP1$, P, 1))
75  NEXT P
80  REM         Separate out the most and least significant bytes
85  MSB%=(BCNT-(BCNT MOD 256))/256
90  LSB%=BCNT AND 255
92  REM         Look for bad checksum bytes (values 13 or 18)
93  BAD=FALSE
95  IF (LSB%=13) OR (LSB%=18) THEN DUMMY = (DUMMY+1) MOD 255:BAD=TRUE
96  IF (MSB%=13) OR (MSB$=18) THEN DUMMY = (DUMMY + 127) MOD 256:BAD=TRUE
99  REM         lines 99 and 100 for program test only
100 PRINT "MSB=";MSB%,"LSB=";LSB%,"dummy=";DUMMY
101 IF BAD GOTO 36
199 REM         lines 199 and 200 for program test only
200 PRINT "Two Byte Checksum=";BCNT
```

Checksum Program for SLC BASIC Module

The following subroutine calculates the checksum of a message for a 1746-BAS SLC BASIC module. The message text is stored in string $(0) and the duplex control fields are in the variables F1, F3, F4, F6, F62, and F63.

```
5400          REM ** CHECKSUM CALCULATION FOR 1746-BAS
5401          REM ** WHERE MESSAGE TEXT IS IN STRING $(0)
5402          REM ** AND F1, F3, F4, F6, F62, AND F63
5403          REM ** ARE THE DUPLEX FIELD VALUES
5410          TCSUM=0:CHD=0:CSUM=0
5420          PUSH 0                      :REM GET LENGTH $(0)
5430          CALL 68
5440          POP SL
5450          BAD=0
5460          IF SL=0 THEN GOTO 5500
5470          FOR POSIT = 1 TO SL STEP 1
5480                  TCSUM=TCSUM+ASC($(0),POSIT)
5490          NEXT POSIT
5500          CSUM=F1+TCSUM+F3+F4
5510          CSUM=CSUM+13+F6+F62+F63
5520          CHH=INT(CSUM/256)
5530          CHL=CSUM-(256*CHH)
5540          IF CHL=13 .OR. CHL=18 THEN CHD=1:BAD=1
5550          IF CHH=13 .OR. CHH=18 THEN CHD=CHD+127:BAD=1
5560          IF BAD=1 THEN GOTO 5420
5570          RETURN
5580          END
```

CHARACTER ATTRIBUTE WORKSHEET

DUPLEX FIELD 6 CALCULATION

Enter the values corresponding to the desired attributes on the spaces to the right.
Add the decimal values as indicated and then convert to hexadecimal using the hexadecimal chart in Appendix B.
The hexadecimal values represent the control value digits entered into the PLC.

DESCRIPTION	OPTION	VALUE		
BYTE 1: Display Mode and Display Speed				
			_____	A
A) DISPLAY MODE		0 TO 22		
			_____	B
B) DISPLAY SPEED	Fastest	128		
	Fast	160		
	Slow	192		
	Slowest	224	Field 6 Byte 1 (Decimal): _____	C: A + B
			Field 6 Byte 1 (Hex):	D: Hex(C)

DESCRIPTION	OPTION	VALUE		
BYTE 2: Text Height and Relay Status				
			_____	E
E) CHARACTER HEIGHT	2.1"	0		
	4.8"	8	_____	F
F) RELAY STATUS	ON	192		
	OFF	128		
			Field 6 Byte 2 (Decimal): _____	G: E + F
			Field 6 Byte 2 (Hex):	H :Hex(G)

BYTE 3: Reserved for Future Enhancements

Field 6 Byte 3 (Hex):   80

(Always)

European Union Directive Compliance

Overview

If this product or package is marked with the **CE** mark, the product is certified for European Union Directive Compliance. This appendix contains the following sections.

- European Union Directive Compliance
- Intended Use of the Product
- Product Bulletin Catalog Numbers
- Installation Requirements

EU Directive Compliance

$ C \epsilon $

If the Dataliner DL50 Message Display is installed within the European Economic Area (EEA), the following regulations apply.

EMC Directive

This apparatus is tested to meet Council Directive 89/336/ECElectromagnetic Compatibility (EMC) using the following standards:

- EN 50081-2
  EMC – Generic Emission Standard, Part 2 Industrial Environment
- EN 50082-2
  EMC – Generic Immunity Standard, Part 2, Industrial Environment.

LVD Directive

This apparatus is tested to meet Council Directive 73/23/EEC with amendments, including 93/68/EEC Low Voltage (LVD) using the following standard:

- EN 60950   Safety of Information Technology Equipment.

Applicable Equipment

The EN 60950 European Norme standard scope is defined as follows:

This standard is applicable to information technology equipment, including electrical business equipment, and associated equipment with a rated voltage not exceeding 600V.

This standard specifies requirements to insure the safety of the operator and layman who may come in contact with the unit, and where specifically stated for, service personnel.

This standard is intended to insure the safety of installed equipment, whether it consists of a system of interconnected units, or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

Examples of equipment which is within the scope of this standard include: visual display units, data terminal equipment, and data and text processing equipment.

Equipment complying with the relevant requirements of this standard is considered suitable for use with process control equipment, automatic test equipment, and similar systems requiring information processing facilities.

The products described in this manual are intended for use in an industrial environment.

Intended Use of the Product

According to the EMC standards, the factor which determines whether an apparatus is deemed to be "Industrial" or "Residential, Commercial, and Light Industrial" is given in Clause 1 of EN 50081–2 as follows:

Apparatus covered by this standard is not intended for connection to a public mains network, but is intended to be connected to a power network supplied from a high– or medium–voltage transformer dedicated for the supply of an installation feeding a manufacturing or similar plant.

This product is intended for the use solely in an industrial environment as defined above. When installed in Europe, any other application is in contravention of European Union Directives, and a breach of those laws.

Catalog Number Listings

The following table indicates which Dataliner DL50 products comply with the EMC and LVD European Union directives.

Dataliner	Catalog Number	Series	Revision
DL50	2706-F11J	C	A
	2706-F21J	C	A
	2706-F21JC	C	A
	2706-F11JC	C	A

All Dataliner DL50 products of above listed Series/Revision letters and later comply with the required EU directives.

Installation Requirements

Dataliner DL50 installation requirements are specified in Chapter 4.

A

ACK
An abbreviated term for Positive Acknowledgement. A control code that indicates that the previous transmission block was received correctly.

address
A character or a group of characters that identifies a particular part of memory, or some source or destination for a data message. Also, refers to a device or an item of data by its address.

ampere
A unit of current flow.

ASCII
The character set and code described in American National Standard Code for Information Interchange, ANSI X3.4-1977. Each ASCII character is encoded with 8-bits including parity check.

B

baud
A rate at which a transmission occurs, where one baud equals one bit per second.

binary
A base two numbering system.

bit
The smallest unit of information in the binary numbering system. A bit is represented by the digits 0 and 1.

buffer
A temporary storage area for messages or other data.

byte
A unit of data that contains 8 bits.

C

checksum
A means of verifying the validity of transmitted data.

controller, programmable
Refer to programmable controller.

D

default value
A value that is provided for the user by the DL50. It can be set by the user by means of DIP switches.

digit
A single numeric character.

DIP switch
An acronym for Dual In-line Package switch. A DIP switch is a circuit board mounted switch comprised of one or more individual selector switches.

DTE
An acronym for Data Terminal Equipment. A DTE receives and processes transmitted data. The DL50 is considered a DTE device as are most terminals.

E

electrical noise
Electromagnetic interference. Any electromagnetic disturbance that interrupts, obstructs, or otherwise impairs the performance of electronic equipment.

EEPROM
An acronym for Electrically Erasable Programmable Read Only Memory. An EEPROM is a device to store data, often firmware, which is read but not written to. It can be erased electrically and then reprogrammed when the firmware is updated.

F

firmware
A set of software commands that define the parameters of a system: the foundation on which application programs are built. Normally stored in an EEPROM.

H

hexadecimal
A base 16 numbering system.

M

master/slave
A communication link containing a master device which controls slave devices. A master station can initiate communication; a slave device can only respond to commands.

multidrop
A term used to describe multiple devices linked by a communications network.

N

NAK
An abbreviated term for Negative Acknowledgement. A control code that indicates the previous transmission block was not correctly received.

NEMA
An acronym for National Electrical Manufacturers Association.

P

parity bit
A parity bit is added to a binary array to make the sum of all the bits always odd or even, a fundamental transmission check.

port
An electrical connector through which communication signals are transferred between external devices and internal components.

programmable controller
A solid state device that controls industrial operations. The programmable controller contains instructions which specify how output devices operate in response to input signals.

prompt
A word or symbol that is displayed to inform the user that a response is required.

protocol
A set of conventions governing the format and timing of data between communication devices.

R

RAM
An acronym for Random Access Memory. The data it contains can be read and written to very quickly.

restart
Turning power to the display off, then on; it is followed automatically by a check of all parts of the system. The RESTART button does this automatically.

RS-232
An EIA standard that specifies electrical, mechanical, and functional characteristics for serial binary communications circuits in a point-to-point link (two devices only).

RS-422
An EIA standard that specifies electrical characteristics of balanced-voltage digital interface circuits in a point-to-point link (two devices only).

RS-485
An EIA standard that specifies electrical characteristics of balanced-voltage digital interface circuits in a multi-point link.

S

self-test
A description of hardware and firmware that monitors or tests its own operation and indicates any faults it can detect.

W

word
A unit of data that contains two bytes (16 bits)

W

INSTALLATION / DIAGNOSTICS INFORMATION

AC INPUT

VOLTAGE: 95-120 / 190-240V AC
FREQUENCY: 50-60 Hz

TB1

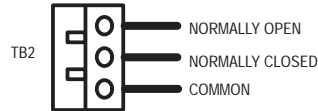L1 (HOT)
L2 (NEUTRAL)
E. GND
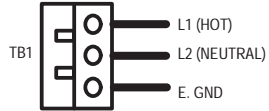
FUSE INFORMATION   European: 2.5 A TYPE GMA
U.S.A.: 2.5 A TYPE AGC

WARNING: HIGH VOLTAGE
USE CAUTION

RELAY

RATING: 3A @ 240 VAC RESISTIVE LOAD
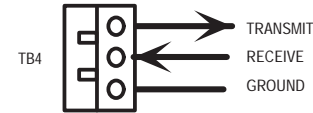3A @ 30 VDC RESISTIVE LOAD

TB2

NORMALLY OPEN
NORMALLY CLOSED
COMMON

WARNING: USE RELAY FOR ANUNCIATOR ONLY.

WARNING: WHEN POWER IS REMOVED, THE ANUNCIATOR WILL BE ENERGIZED IF NORMALLY CLOSED OUTPUT IS USED.

RS-485 PORT

TB3

EARTH GROUND
SHIELD
COMMON
+
–
TERMINATION

RS-232 PORT

TB4

TRANSMIT
RECEIVE
GROUND
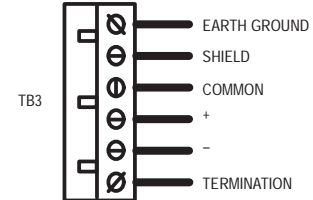
CONFIGURATION DIPSWITCH DEFINITIONS

S1

1	2	3	4	5	6	7	8

MSB   SLAVE ADDRESS   LSB

S2

1	2	3	4	5	6	7	8

PROTO. CHAR. HT. BAUD RATE OP. MODE CKSUM

S3

1	2	3	4	5	6	7	8

DISPLAY TYPE DEFAULT COLOR NOT USED OFF

SLAVE ADDRESS   S1

POSITION	WEIGHT
1	= 128
2	= 64
3	= 32
4	= 16
5	= 8
6	= 4
7	= 2
8	= 1

PROTOCOL   S2

1	
OFF	= SIMPLEX
ON	= DUPLEX

CHARACTER HEIGHT   S2

2	3	
OFF	OFF	= 2"
OFF	ON	= 4.5"
ON	OFF	= AUTO
ON	ON	= RESERVED

BAUD RATE   S2

4	5	
OFF	OFF	= 300
OFF	ON	= 1200
ON	OFF	= 9600
ON	ON	= 19200

OPERATING MODE   S2

6	7	
OFF	OFF	= SLAVE
OFF	ON	= TEST
ON	OFF	= RESERVED
ON	ON	= RESERVED

DISPLAY TYPE   S3

1	2	
OFF	OFF	= 2706–F11J
OFF	ON	= 2706–F21J
ON	OFF	= 2706–F11JC
ON	ON	= 2706–F21JC

DEFAULT COLOR   S3

3	4	
OFF	OFF	= RED
OFF	ON	= GREEN
ON	OFF	= AMBER
ON	ON	= RED

DUPLEX CKSUM   S2

8	
OFF	= DISABLED
ON	= ENABLED

NOTE: EARTH GROUND SHOULD BE CONNECTED TO CHASSIS FIRST BEFORE GOING TO TB1.

AC POWER LED (D31)
AC POWER TERMINAL BLOCK   TB1
F1
FUSE   HOLDER
RESET SWITCH (SW4)
RED DISPLAY JUMPER POSITION
TRI–COLOR DISPLAY JUMPER POSITION
RELAY TERMINAL BLOCK   TB2
RS–485 TERMINAL BLOCK   TB3
RS–232 TERMINAL BLOCK   TB4
5VDC LED (D8)
5VDC LED (D32)
TxD LED (D7)
RxD LED (D9)
P10
S1   S2   S3
CONTROLLER BOARD
CONFIGURATION DIP SWITCHES
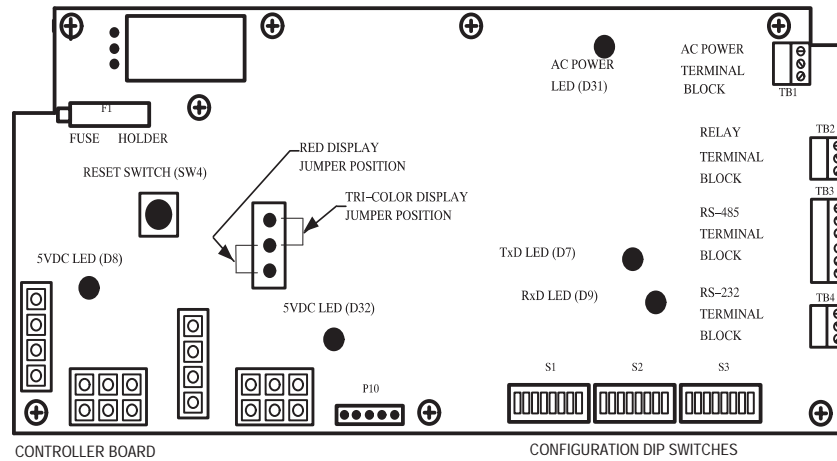
WARNING: TO AVOID RISK OF SHOCK, DISCONNECT TB1 AND TB2 BEFORE ATTEMPTING TO SERVICE THE DISPLAY.

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