

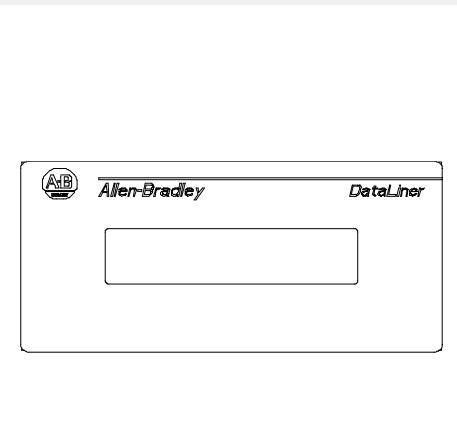


Allen-Bradley

Dataliner DL5 Slave Displays

(Cat. No. 2706-D11JS, -D21JS)

User Manual



Allen-Bradley HMI's

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards.

The illustrations, charts, sample programs and layout examples shown in this guide are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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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

Attention statements help you to:

- identify a hazard
- avoid a hazard
- recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

European Communities (EC) Directive Compliance

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

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

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131-2 Programmable Controllers, Part 2 - Equipment Requirements and Tests. For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as the Allen-Bradley publication Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1.

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

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Using this Manual

Chapter Objectives

Read this chapter to familiarize yourself with the rest of the Dataliner DL5 Slave Message Display manual. You will learn about:

- contents of this manual
- intended audience
- conventions used
- related publications

Overview of this Manual

This manual describes how to install and use your DL5 Slave display. This manual contains the following:

Chapter	Title	Purpose
1	Introduction to the DL5 Slave Display	Describes basic features and operating capabilities.
2	Installation and Startup	Provides installation and wiring instructions. The status display sequence on powerup is described.
3	Configuring the DL5	Describes configuration of the display using DL5 configuration software or an ASCII terminal.
4	Dataliner (DL) Slave Mode	Describes operation of the display in the DL Slave Mode (the display receives message information from a DL40 Plus master display or enhanced PanelView terminal).
5	PanelView (PV) Slave Mode	Describes operation of the display in the PV Slave Mode (displays data that would normally be printed on the PanelView printer port).
6	Terminal Mode	Describes operation of the display in the Terminal Mode. In this mode, the slave display receives ASCII message and formatting data from a host device.
7	Diagnostic Mode	Describes how to use the diagnostic mode to correct communication problems or data formatting errors.
Appendix A	Specifications	Mechanical and electrical specifications.
Appendix B	Character Sets	ASCII character set

Intended Audience

No specialized knowledge is required to configure and install the DL5 slave display. However, we assume the following:

- The person responsible for equipment connections is familiar with standard wiring practices and electrical codes in your area.
- Communication cabling is done by a person having an understanding of basic communications terminology and cabling.
- Panel cutouts are made using the same methods and safety practices followed for other panel mounted equipment.

Conventions Used

The following conventions are used in this manual.

- The up caret, ^, may be used in place of [Ctrl] (Control key) where space is limited.
- Values in a hexadecimal format have the suffix “hex”.
- Keys on your keyboard are shown in brackets. For example “press [Y] to acknowledge message”.
- [Enter] refers to the return key on your keyboard.

Related Publications

You may need to refer to the following related publications:

Publication Title	Description	Publication Number
Dataliner DL40 Plus Message Display User Manual	Provides installation, wiring and operating instructions for the DL40 Plus display (not slave display). Also describes use of the onboard message editor.	2706-6.1
DL40 Plus Off-line Programming Software User Manual	Describes the installation and use of the DOS based message development software for the DL40 Plus.	2706-6.2
BASIC Module (Catalog No. 1771-DB) User Manual	Operating instructions for the PLC-5 BASIC module.	1771-6.5.113
SLC500 BASIC Module (Catalog No. 1746-BAS) User Manual	Operating instructions for the SLC 500 BASIC module.	1746-6.1
PLC-5 Programmable Controller (Catalog No. 1785-LT2) Quick Reference	PLC5 Programmable Controller reference.	1785-7.1
PanelBuilder Software User Manual	Describes how to output messages to the PanelView printer port for display on the DL5 Slave.	2711-6.0
PanelBuilder 1400e Configuration Software for Windows User Manual	Provides useful information when using a PanelView enhanced terminal as a master for a DL5 Slave.	2711e-819

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Introduction to the DL5 Slave

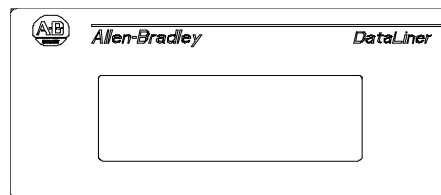
Chapter Objectives

This chapter describes the DL5 Slave display and summarizes its capabilities. The following topics are included in this chapter:

- DL5 Slave description
- Operating modes
- Features
- Typical configurations

Description

The DL5 Slave displays are available in one-line and two-line versions. These displays are designed for panel mounting in industrial environments and require a 12-24V DC power source.



2706-D11JS

2706-D21JS

DL5 Slave displays receive message text from a host device. The host device may be a DL40 Plus master display, PanelView terminal, programmable controller, or a personal computer. All messages are created and stored in the host device.

The DL5 Slave displays appear similar to the standard DL5 one and two-line displays except they do not have a parallel port.

Operating Modes

The DL5 Slave has four operating modes:

- DL Slave
- PV Slave
- Terminal
- Diagnostic

DL (Dataliner) Slave Mode

Use this mode when connecting one or more DL5 slaves to a DL40 Plus master display, PLC or SLC controller. A DL5 Slave may be connected to a DL40 Plus using an RS-232 link (single drop only).

Multiple DL5 slave displays may be connected to an RS-485 link using an RS-485 to RS-232 converter such as the Black Box LD-485A-MP. Each DL5 slave may be individually addressed to display only the messages sent to a specific address. Displays with the same address, display the same message. Addresses 13 & 18 cannot be used.

PV (PanelView) Slave

Use this mode when connecting a single DL5 Slave to the printer port of a standard PanelView operator terminal (PV550, 600, 900, 1000 or 1400). The DL5 Slave displays any text that would normally be sent to a printer. The DL5 Slave may be connected to the PanelView using the RS-232 port. Only one display may be connected on the communication link, the DL5 slave displays cannot be addressed individually in this mode.

Terminal Mode

In this mode, the DL5 Slave can receive data from any device capable of sending serial ASCII characters. The ASCII characters sent by the host device control the message text, line scrolling and formatting of the messages.

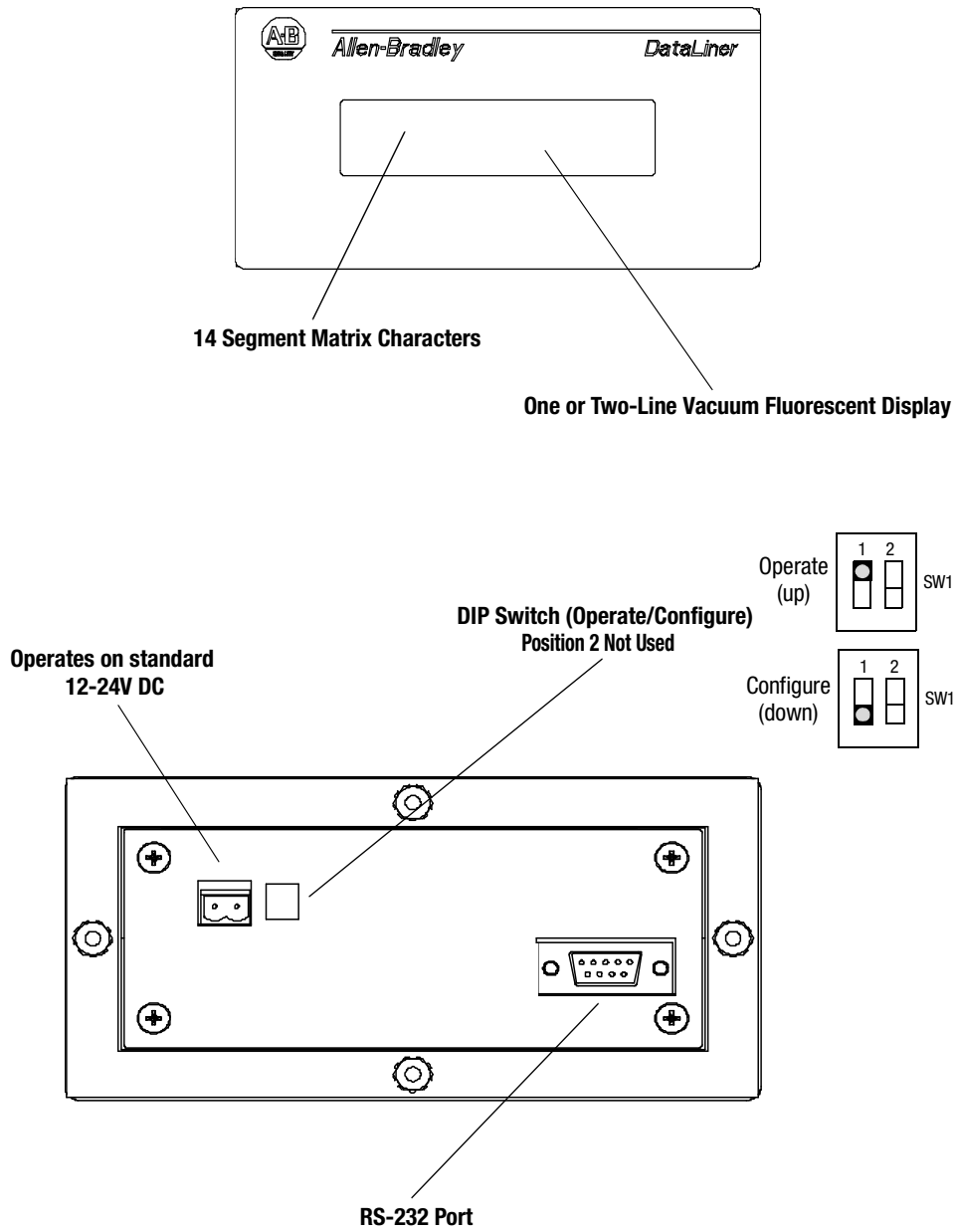
Diagnostic Mode

Use the diagnostic mode for basic setup and troubleshooting. In this mode, the DL5 Slave displays the hex value of all the data it receives. An indication is provided if there is a communication error.

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Features

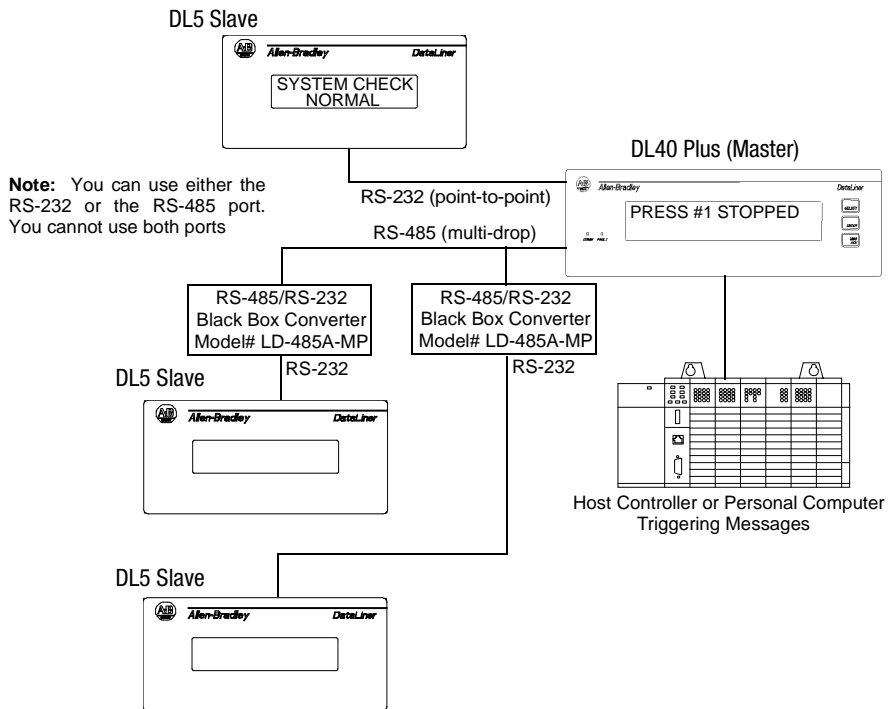
DL5 Slave displays have these features:



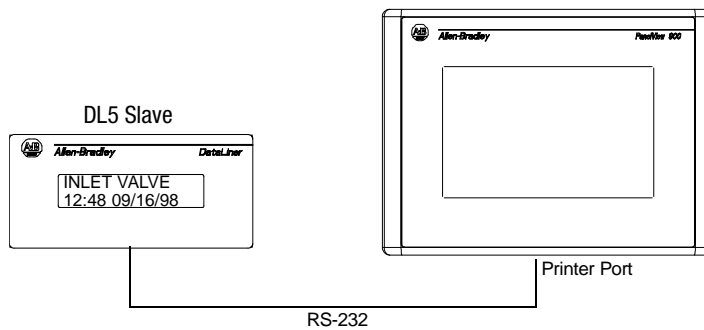
Typical Configurations

Here are some of the most typical applications:

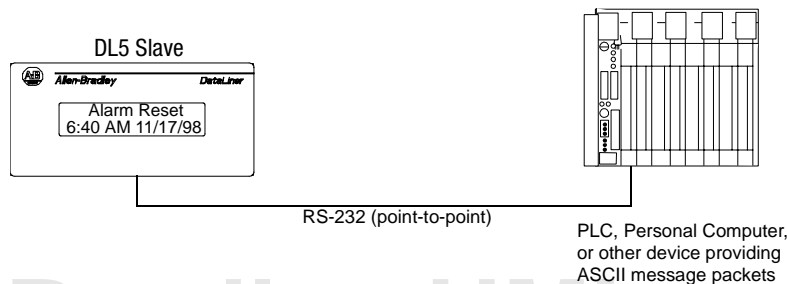
DL40 Plus to DL5 Slave



PanelView to DL5 Slave



PLC, PC, or Other Device to DL5 Slave



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Installation and Startup

Chapter Objectives

This chapter describes how to mount and make electrical connections to the DL5 Slave display. The following topics are described:

- Mounting Instructions
- Panel Cutout Dimensions
- Power Connections
- Powerup Sequence

Mounting the DL5 Slave

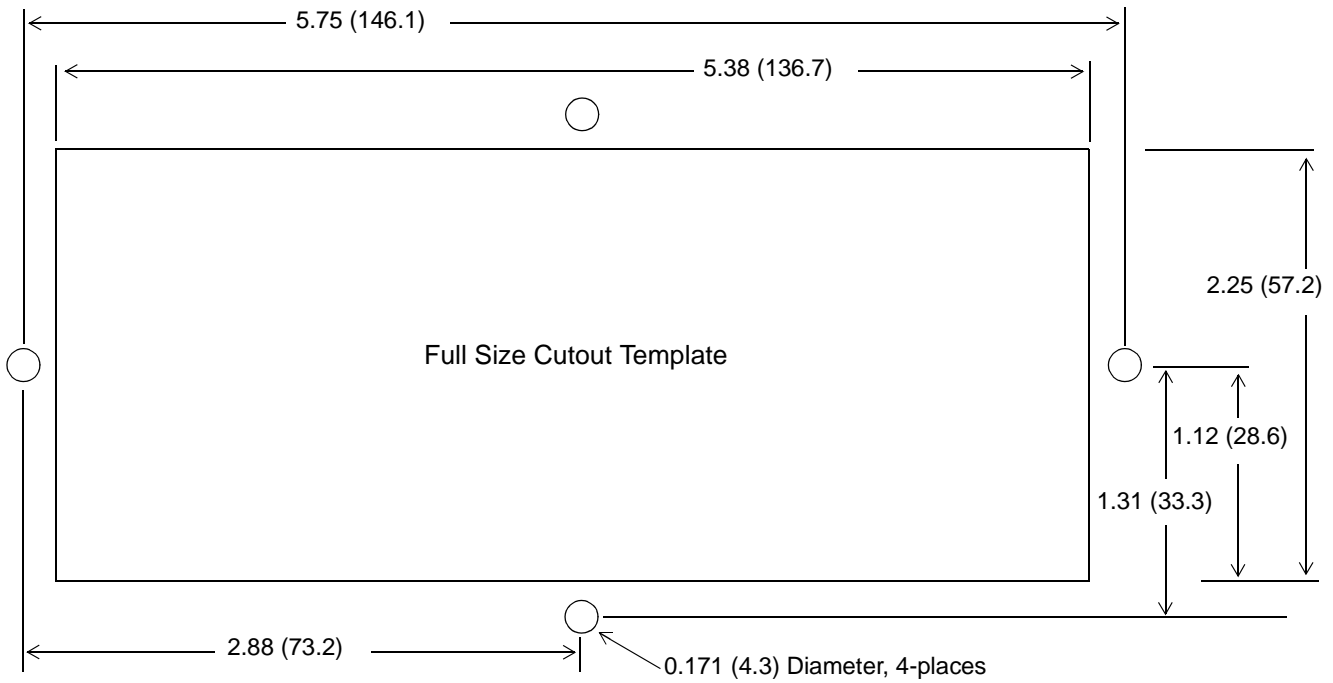
The following pages provide panel cutout dimensions and overall dimensions for the DL5 Slave displays.

You can also mount the DL5 Slaves in a custom panel or enclosure. When a DL5 Slave is properly installed, the faceplate of the DL5 Slave provides a NEMA Type 12/13 and 4 enclosure rating. To install the DL5 Slave:

1. Cut and drill the appropriate mounting holes in the enclosure or panel as shown on the following pages.
2. Remove the four mounting nuts from the mounting studs on the display.
3. Position the DL5 Slave in the panel or enclosure mounting hole.
4. Install and alternately tighten the nuts to a torque of 9in•lbs (1.02N•m).

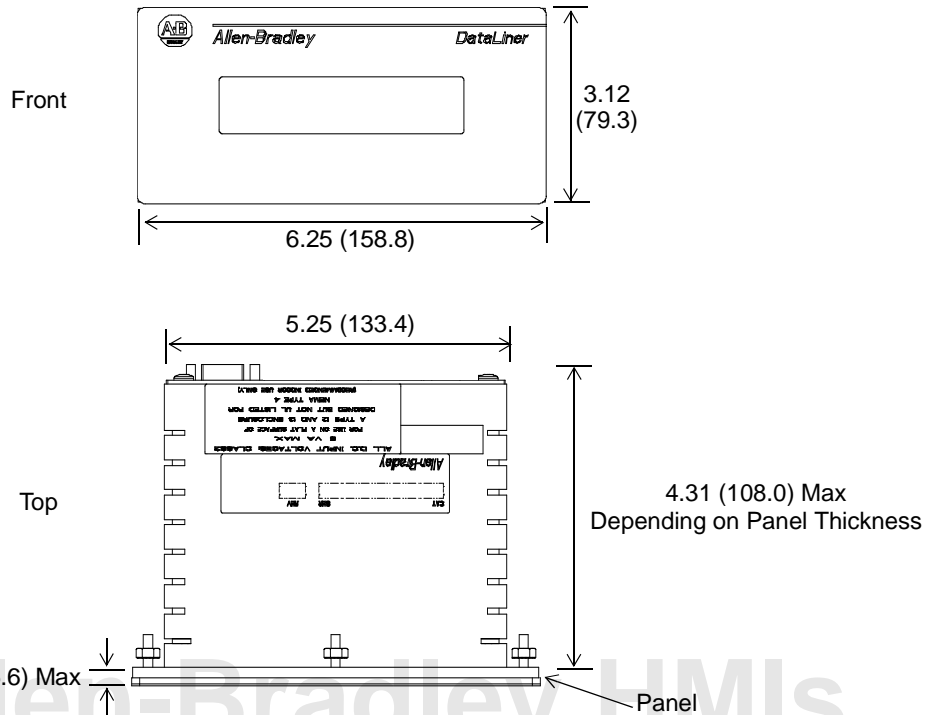
Panel Cutout Dimensions

All dimensions are in inches (millimeters)



DL5 Mounting Dimensions

All dimensions are in inches (millimeters)



Electrical Precautions

Install the DL5 Slave display conforming to NFPA 70E, Electrical Safety Requirements for Employee Workplaces. In addition to the NFPA general guidelines, refer to the following:

Careful cable routing helps minimize electrical noise. Route incoming power to the module by a separate path from the communication cables.

Do not run communications wiring and power wiring in the same conduit!

Where communication and wire paths must cross, make their intersection perpendicular.

Grounding helps limit the effects of noise due to electromagnetic interference (EMI). To avoid problems caused by EMI, properly ground all equipment and use shielded cables.

Input Voltage Requirements

Before connecting the DL5 Slave to the incoming power, verify that the power source provides:

Voltage: 12-24 Volts DC

Current: 250 milliamperes at 12V DC (300mA inrush)

125 milliamperes at 24V DC (300mA inrush)

Fusing: External fuses should be used

Important: Power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods [Article 501-4(b) of the National Electrical Code, NFPA70] and in accordance with the local authority having jurisdiction.

Hazardous Location Installations



ATTENTION: THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D, OR NON-HAZARDOUS LOCATIONS ONLY.



ATTENTION: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.



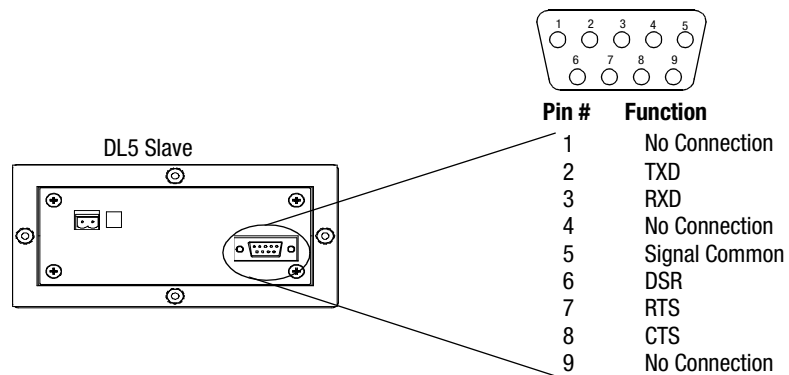
ATTENTION: EXPLOSION HAZARD - DO NOT CONNECT OR DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

RS-232 Connections

Use the RS-232 port to connect the DL5 Slave to:

- DL40 Plus Master
- PanelView Printer Port
- 1771 or 1746-DB BASIC Module
- RS-485/RS-232 Black Box Converter (Model# LD-485A-MD)
- PLC-5 Channel 0
- SLC Channel 0
- Personal Computer (RS-232 serial port)

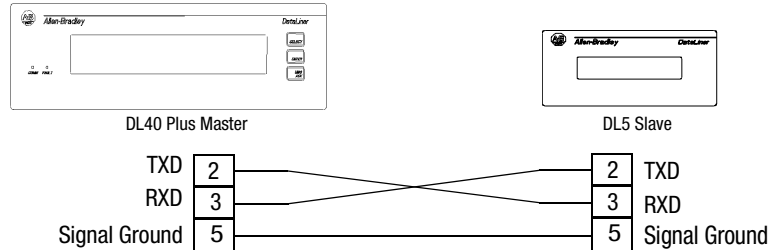
The following figure shows the location and terminal definitions for the RS-232 port.



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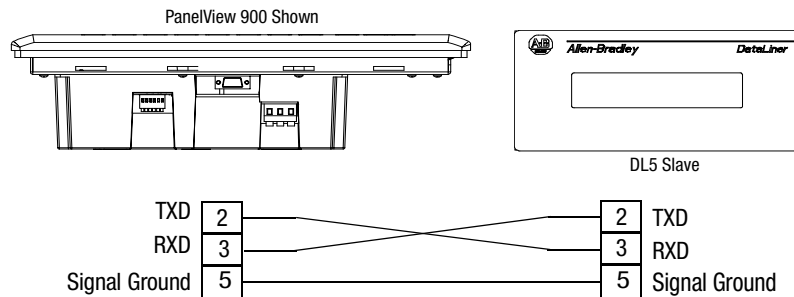
DL5 Slave to DL40 Plus Master RS-232 Port

Connect a single DL5 slave to a DL40 Plus master as shown below. You can also use the DTAM Plus programming cable (Catalog No. 2707-NC2) with a male-female pin adapter.



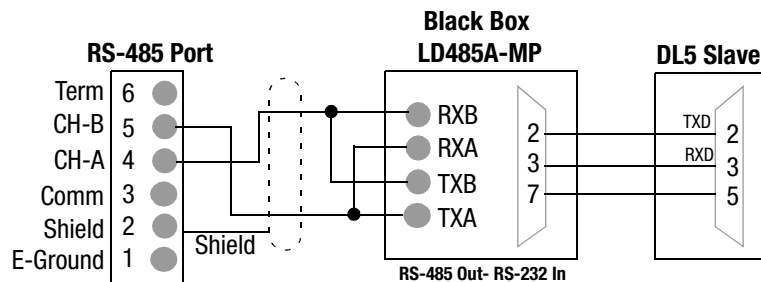
DL5 Slave to PanelView RS-232 Printer Port

Connect the DL5 Slave to a PanelView RS-232 printer port as shown below. The PanelView sends messages to the DL5 Slave using its print messages function. You can also use the DTAM Plus programming cable (Catalog No. 2707-NC2) with a male-female pin adapter.

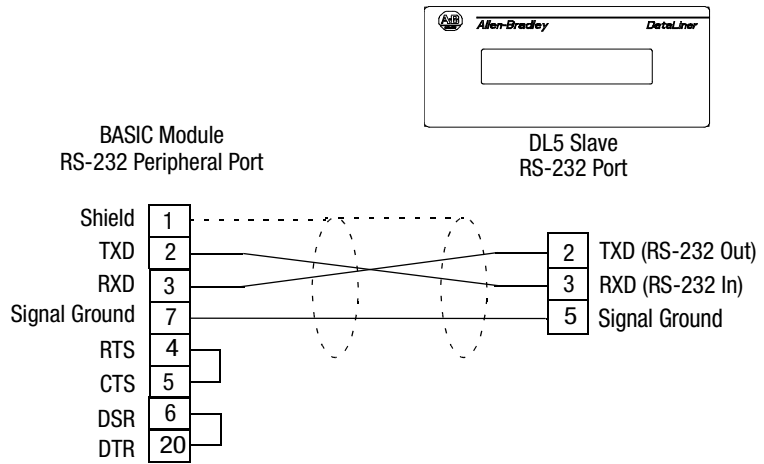


DL5 to RS-485 Port

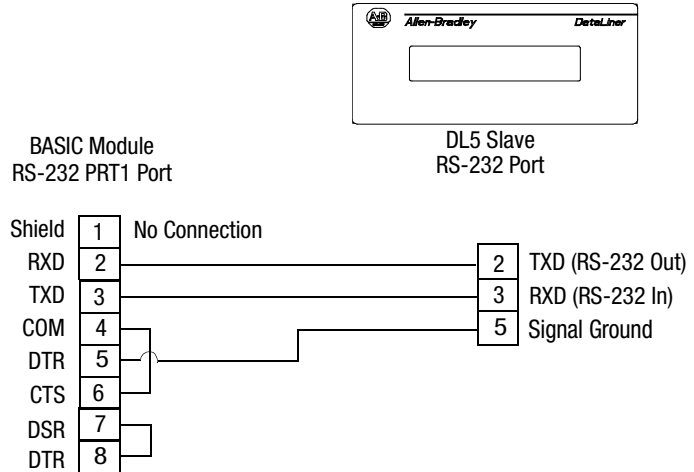
Use an RS-485 to RS-232 converter such as the Black Box LD485A-MP to connect the DL5 to a RS-485 network.



DL5 Slave to 1771-DB BASIC Module

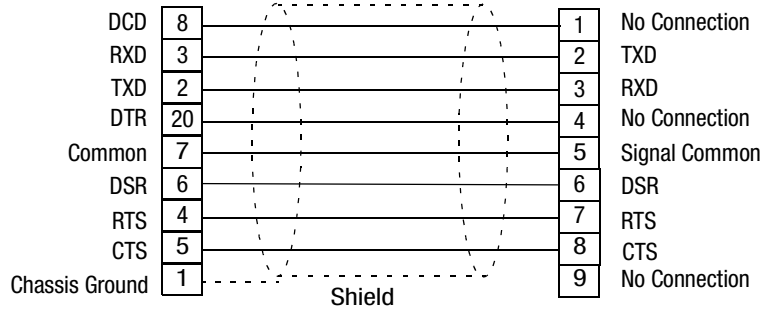
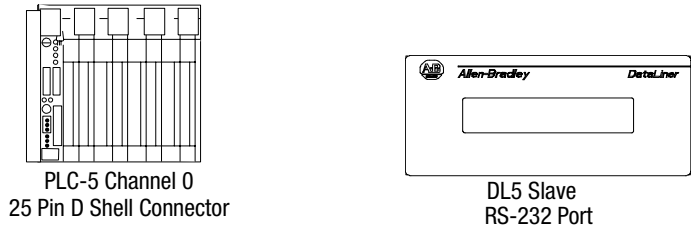


DL5 Slave to 1746-BAS BASIC Module



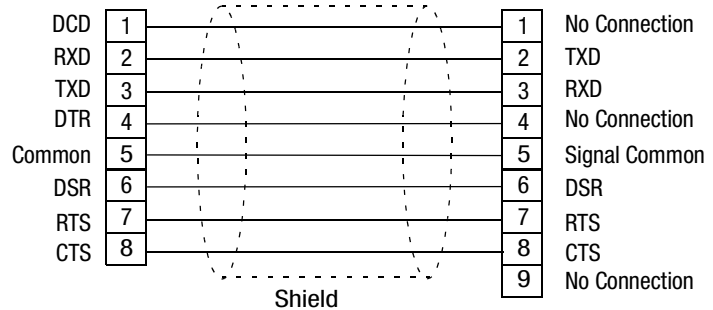
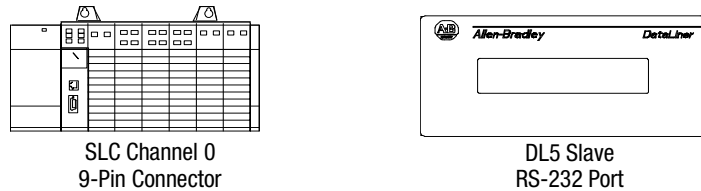
DL5 Slave to PLC-5 Channel 0

Connect the DL5 Slave to a PLC-5 Channel 0 port as shown below. You can also use programming cable (Catalog No. 2706-NC12).



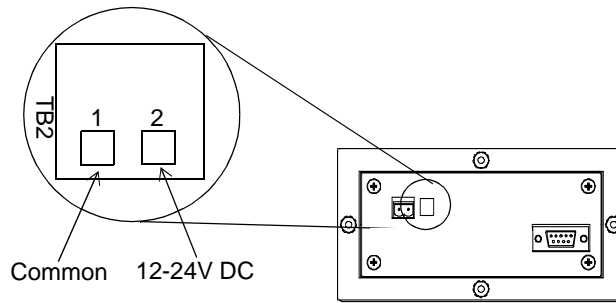
DL5 Slave to SLC Channel 0

Connect the DL5 Slave to an SLC Channel 0 port as shown below. You can also use programming cable (Catalog No. 2706-NC13).



Power Connections

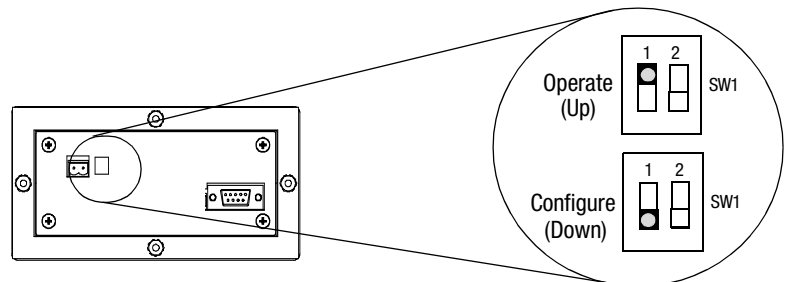
Before making power connections, make sure that the power is turned off. The DL5 Slave requires 12-24Volts DC, 250-125 mA (300mA inrush).



ATTENTION: Improper wiring of the power connections may result in damage to the DL5 Slave. The DL5 Slave does not contain any fuses. We recommend that you use external fusing to prevent damage to the DL5 slave or power supply.

Operate / Configure Switch

The Operate / Configure switch (position 1) is located on the back of the DL5 Slave. The switch in position 2 is not used.



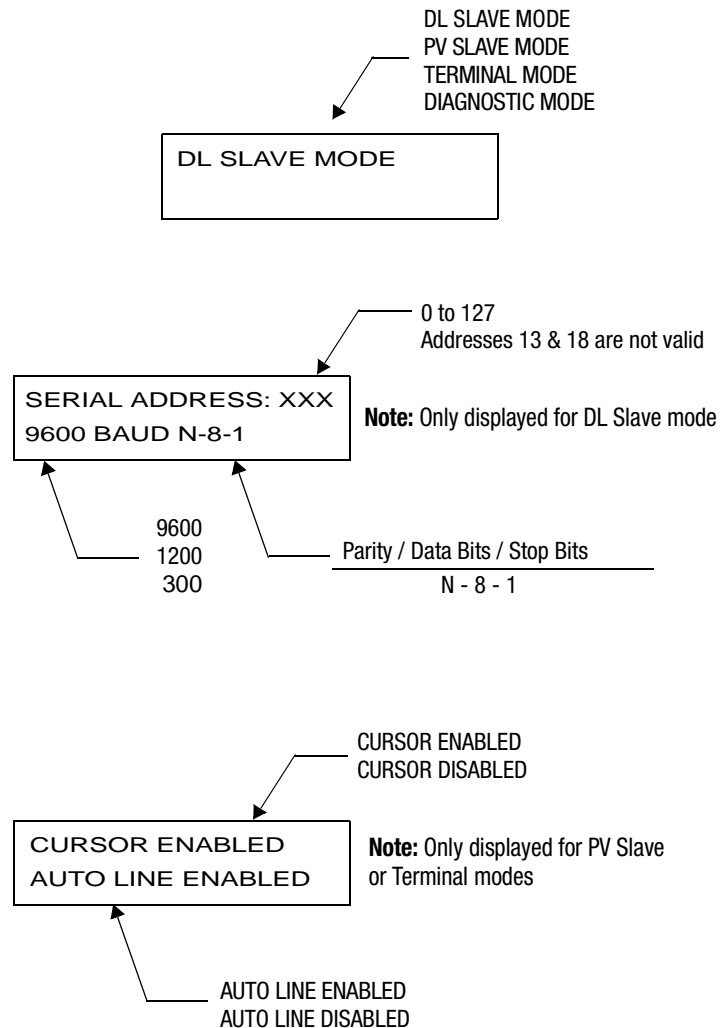
For normal operation, the switch (position 1) should be in the up (on) position. Setting the switch in the down (off) position causes the DL5 to enter the configuration mode.

Startup Sequence

When power is applied to the DL5 Slave a powerup sequence of displays are shown. The first display on powerup is the sign-on banner identifying the hardware and firmware:

DL5 SLAVE 2L
V1.00 04/02/99

Following the sign-on banner, all of the display pixels are turned on for 2 seconds followed by a series of informational messages indicating the current DIP switch settings. Each display lasts for about four seconds.



After the status messages are displayed, the DL5 Slave clears the display and enters the selected run mode. Note: if the Operate / configure switch is in the Configure position (position 1, down), the DL5 Slave displays:
MODE = (Current Operating Mode)

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Configuring the DL5 Slave

Chapter Objectives

This chapter describes how to configure the DL5 display using an ASCII programming terminal or personal computer running a terminal emulation program such as HyperTerminal (Windows 95 or 98).

Configuring a DL5 Slave

You can configure a DL5 Slave with:

- an ASCII (dumb) terminal connected to the DL5 Slave RS-232 port
- a personal computer connected to the DL5 Slave RS-232 port and running a terminal emulation program.

Configuration Cables

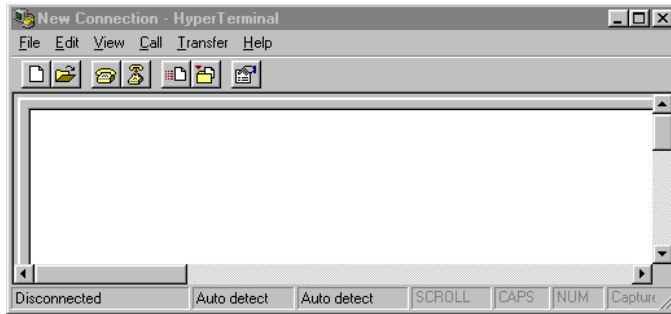
The following cables are available for configuring the DL5 Slave.

Cable:	Use With:
2706-NC12	Personal computers with 25-pin female com port connector. DEC VT52, VT100, or VT101 terminals. Allen-Bradley RAC 6000 industrial computers.
2706-NC13	Personal computers with 9-pin female com port connector (IBM AT and compatible). Allen-Bradley RAC 6000 industrial computers.
2706-NC14	Allen-Bradley RAC 6000 industrial computers (PC/XT).
2706-NC15	Allen-Bradley Industrial Terminals T1 through T4 (25-pin male connector)
2707-NC2	DL40 master or PanelView RS-232 printer port (requires male-female pin adapter).

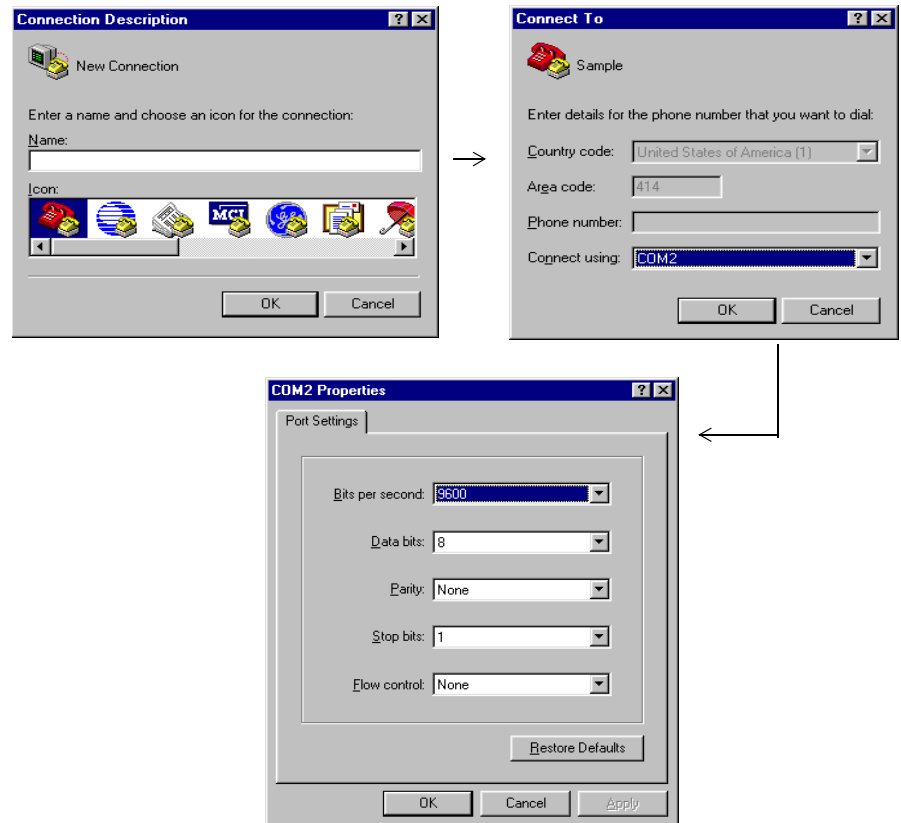
Using Terminal Emulation

If you don't have an ASCII programming terminal, you can use your computer with a terminal emulation program such as HyperTerminal. The following example shows HyperTerminal, other terminal programs will be similar.

5. Locate the HyperTerminal or other program on your computer. Often the terminal emulation programs can be found on the Start>Accessories menu.



6. Setup the terminal emulation program. You will need to specify the port connected to the DL5 Slave and specify a baud rate, parity (none), data bits (8) and stop bits (1). Make sure the baud rate is set to match the DL5 Slave. If you are not sure of the DL5 slave baud rate, cycle the power. The communication settings are displayed in the startup sequence. To use HyperTerminal, go to the File menu and click on New Connection.



Configuring a DL5 Slave Message Display

1. Connect the DL5 Slave to a communication port on your computer or programming terminal. Use cable (Catalog No. 2706-NC13) for standard 9-pin connections or cable (catalog No. 2706-NC12) for 25-pin connections. Page 3-1 lists the available programming cables for other configurations.
2. Set the programming terminal for the following:
 - 9600 baud (see Important below)
 - 8 data bits
 - no parity
 - 1 stop bit
 - flow control (None)

Important: Some terminals require that the terminal be reset (or switched to the ‘Operate’ state) before changes to a communication protocol takes affect. In addition, the DL5 Slave may have been previously configured with a different baud rate. The DL5 Slave displays its baud rate during the power-up sequence. Make sure the programming terminal is set to match.

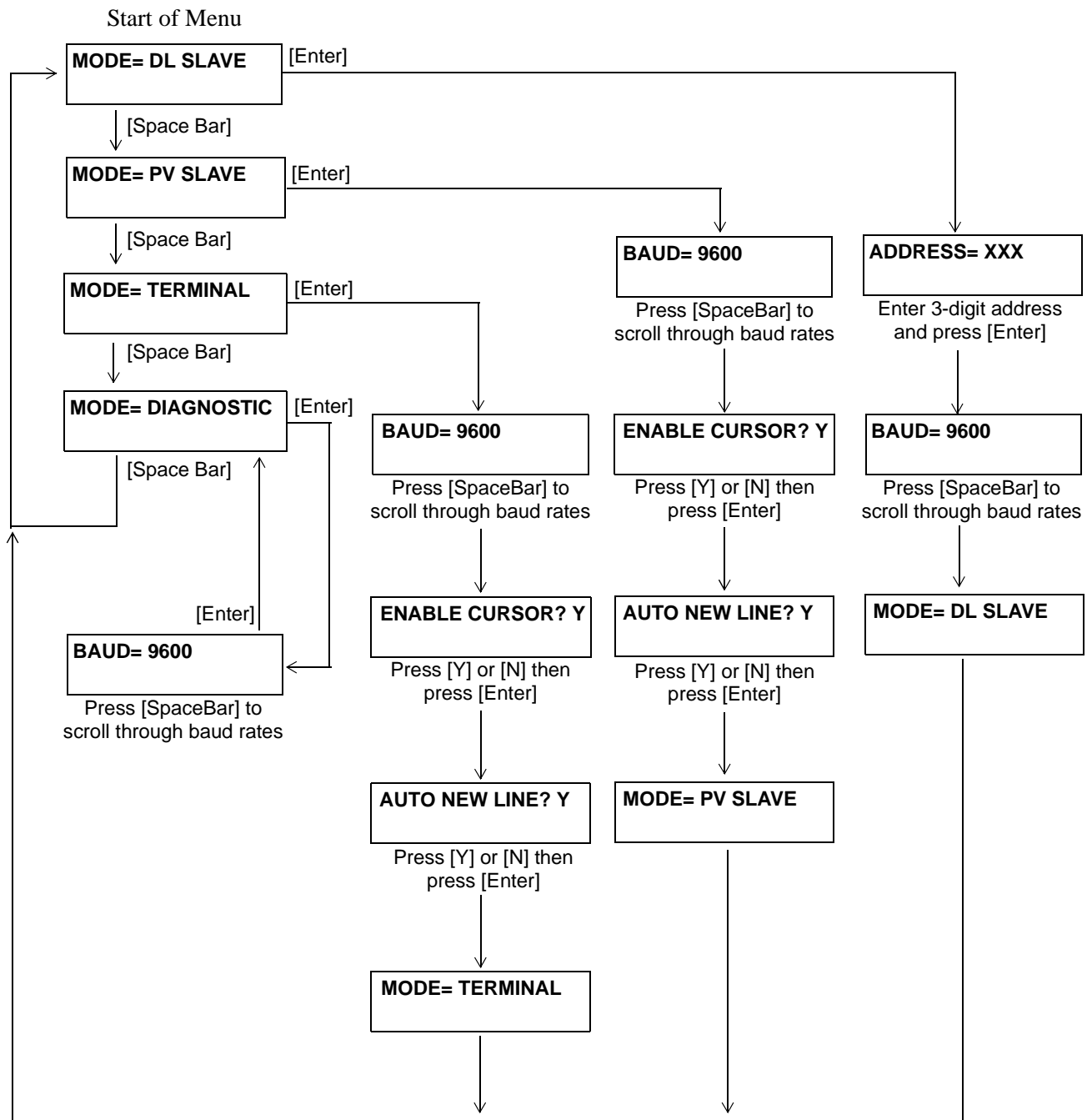
3. Check the Operate / Configure switch on the back of the DL5 Slave. The switch in position 1 should be in the down (Configure) position.
4. Apply power to the DL5 Slave.

The power-up sequence, described in Chapter 2, is displayed.

MODE= DL SLAVE

5. Respond to each prompt by pressing the [Y], [N] or [Space Bar] keys. The following page shows the menu structure.

DL5 Configuration Menu



Important: Make sure you return the Operate / Configure switch (position 1) to the up (Operate) position after configuring the DL5 slave.

DL5 Configuration Options

The following items can be selected or entered from the configuration menu:

Run Mode

Use the [SpaceBar] to select from the following run modes:

- DL Slave Mode
- PV Slave Mode
- Terminal Mode
- Diagnostic Mode

Serial Address

Enter a 3-digit address from 000 to 127 (013 & 018 are invalid). The address is entered as a decimal value. The serial address only applies to the DL Slave mode.

Baud Rate

Use the [SpaceBar] to select one of the following baud rates:

- 9600
- 1200
- 300

Cursor Enable

Only available in Terminal and PV Slave modes. Press [Y] or [N] and then [Enter].

When enabled, the DL5 slave starts up with the cursor visible. When disabled, the DL5 slave starts with the cursor hidden.

Auto New Line

Only available in Terminal and PV Slave modes. Press [Y] or [N] and then [Enter].

When enabled, a line feed (LF) occurs after each carriage return (CR). This allows the DL5 Slave to work with host devices that do not send a CR-LF combination.

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Dataliner (DL) Slave Mode

Chapter Objectives

This chapter describes the operation of the DL5 Slave in DL Slave Mode and contains the following topics:

- Slave mode description
- Slave mode protocol
- Example messages
- Display options
- Clearing one or more lines

Slave Mode Operation

DL Slave Mode is selected through the configuration menu as described in Chapter 3. Dataliner (DL) Slave mode allows one or more DL5 Slaves to display different messages while connected to a single master device such as a DL40 Plus master display.

Important: If you are using a DL40 Plus as the master, configure its communication port for DL Slaves (refer to the DL40 Plus user manual, Publication 2706-6.1). This configures the DL40 master to send message data in the DL Slave format.

In DL Slave Mode, the DL5 Slave accepts messages in the format:

16 Characters to Display	Address	Line Number	Carriage Return
--------------------------	---------	-------------	-----------------

16 Characters to Display

Send the message text characters to be displayed. ASCII characters 32 to 126 (20hex to 7Ehex) are supported. Any valid ASCII character, upper or lower case can be sent however, lowercase letters are displayed as uppercase. All control characters within the message text field, except [Ctrl][F] and [Ctrl][R], are ignored. If fewer than 16 characters are sent, the remaining character positions are filled with spaces. Appendix B shows the DL5 Slave character set.

Address

The address of the slave display that will receive the message. This is a single byte character from 1 to 127 decimal (01 through 7F hex).

Note: Do not use 13 (0Dhex) or 18 (12hex) as an address. These are reserved and the DL5 automatically converts these addresses to 127 (7F hex). Address 127 is a global address that accepts all messages regardless of the address. In addition, any message sent with an address of 127 is sent to all slave displays.

Line Number

A one byte character specifying the line number the message is to be displayed on. Valid line numbers are 1, 2, or 50 decimal (not ASCII). The ASCII characters are Ctrl-A = 1, Ctrl-B = 2, and 2 = 50

Note: 50 decimal as the line number specifies clear both lines.

Carriage Return

Message is terminated by a carriage return, Ctrl-M (decimal 13, 0Dhex).

Example Messages

For example, a print statement using a BASIC module (Catalog No. 1771-DB or 1746-BAS) with a DL5 Slave display would be:

```

100 PRINT#"BLOWER 1 STOPPED", CHR(1), CHR(1), CHR(13)
    
```

The message BLOWER 1 STOPPED would be displayed on line one of slave number one. To send the message fields, the print CHR (decimal character equivalent) function is used.

To send the same message from any PC terminal program, use:

```

BLOWER 1 STOPPED^A^A^M
    
```

Where: ^A is the [Ctrl] and [A] keys pressed at the same time.
 ^M is the [Ctrl] and [M] keys pressed at the same time.

Display Options

Use the following control codes in the message text for flash and reset functions. Any other control codes are ignored.

[Ctrl][F]

Control-F (06 hex) is the flash code. Send this code when you want all the characters on the line to flash. The [Ctrl][F] code can appear anywhere in the text portion of the message. You can turn flash on and off multiple times in a message. At the start of each new line of message text, the flash option is turned off. The [Ctrl][F] code is not included in the 16 character limit of the display protocol.

[Ctrl][R]

Control-R (12 hex) is the reset command. When a [Ctrl][R] is received by the DL5, all data for the current line is discarded. For example, if 10 characters are received by the DL5 Slave and then a [Ctrl][R] is sent, the 10 characters and the [Ctrl][R] are discarded. After using the reset command, you can start a new message. [Ctrl][R] resets the flash status to non-flashing.

Clearing One or More Lines

To clear one or more lines on a DL5 Slave, use:

Slave Address	Line Number	Carriage Return
---------------	-------------	-----------------

The following table lists the line number byte required for clearing any or all lines of the display.

To Clear:	Use this Byte for Line Number:	
	ASCII	Equivalent Value
Line 1	[Ctrl][A]	1 decimal (1 hex)
Line 2	[Ctrl][B]	2 decimal (2 hex)
All Lines	2	50 decimal (32 hex)

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PanelView (PV) Slave Mode

Chapter Objectives

This chapter describes the operation of the DL5 Slave in the PV Mode. The following topics are described:

- PV Slave Mode description
- PV Mode protocol
- Display options

PV Slave Mode

Use the PanelView (PV) Slave Mode to send the DL5 Slave messages from a PanelView operator terminal. The DL5 Slave acts like a printer attached to the PanelView communication port. Any messages printed by the PanelView are displayed on the DL5 Slave.

Note: In PV Mode, only one DL5 Slave display can be connected to the PanelView communication port (RS-232).

PV Slave Mode is configured as described in Chapter 3. For information on setting up a PanelView to print messages, refer to the PanelBuilder Software user manual (Publication 2711-6.0).

PV Slave Mode Protocol

Messages to the DL5 Slave in PV mode consist of the following:

Message Text (Up to 128 Characters)	Carriage Return
-------------------------------------	-----------------

Only ASCII characters 32 to 126 (20hex to 7Ehex) are displayed. ASCII characters 0 through 31 (1F hex) are non-displayable control characters.

Text is displayed from left to right. When the end of the current line is reached, the cursor moves to the start of the line below. If the cursor is on the last line, all the lines are shifted up one line (top line is lost). Some control characters can be used to alter the display of messages and movement of the cursor (refer to display options, next section).

Display Options

Use the following control codes to control the appearance of messages displayed in PV Mode.

[Ctrl][F] (06 hex)

Flash command. Send the [Ctrl][F] command when you want the display characters to flash. Following the first flash code, all the characters on the display will flash. If a second [Ctrl][F] is received, the display stops flashing. At the start of each new line of message text, the flash option is turned off.

[Ctrl][J] (0A hex)

Line Feed command. Send a [Ctrl][J] command to move the cursor down to the next lower line. If the cursor is on the last line, it remains on the last line and all of the lines are shifted up (leaving the last line blank).

Note: The cursor is not moved until the next displayable character is received. This allows the current text to be displayed for the longest period of time before being shifted or cleared.

[Ctrl][L] (0C hex)

Form feed command. Sending a [Ctrl][L] command clears the display and moves the cursor to the upper left corner of the display. Flash mode is set to non-flashing.

[Ctrl][M] (0D hex)

Carriage return command. Sending the [Ctrl][M] command terminates the current message line, sets the flash mode to non-flashing, and moves the cursor to the beginning of the current line.

If Auto New Line is enabled (see Chapter 2), the cursor is also moved down to the start of the next line. If the cursor is on the last line, all of the lines are shifted up (leaving the last line blank).

Note: The cursor is not moved until the next displayable character is received. This allows the current text to be displayed for the longest period of time before being shifted or cleared.

Line Display Characteristics

The PanelView Slave mode has two special display characteristics that make messages easier to read:

Line to Line Delay

After each individual line is displayed, there is a one second pause before the next line is displayed. This delay provides time for each line to be read.

Cursor Movement Command Delay

Line wrap, carriage return, line feed and form feed operations are not executed immediately. These commands are buffered and executed only when the next displayable character (or identical cursor movement) is received. This allows the current text to be displayed for the longest period of time before being shifted or cleared.

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Terminal Mode

Chapter Objectives

This chapter describes the operation of the DL5 Slave in Terminal Mode and contains the following topics:

- Terminal mode operation
- Protocol

Terminal Mode Operation

Terminal mode allows more control over messages than the basic Slave Mode setting. In terminal mode, you can control:

- Cursor position
- Line scrolling
- Character-by-character display options

However, this mode also requires that you control the positioning and formatting of each message. Terminal Mode is configured as described in Chapter 3.

Terminal Mode Protocol

Message text and control codes are sent serially to the DL5 Slave in terminal mode. The following control codes are used:

Cursor Up (Ctrl-K) (0B hex)

Positions the cursor directly above the current cursor position. If the cursor is on the first line, the cursor is moved to the last line on the display. On one line displays, the cursor does not move.

Cursor Down (Ctrl-V) (16 hex)

Positions the cursor directly below the current cursor position. If the cursor is on the last line, the cursor is moved to the first line on the display. On one line displays, the cursor does not move.

Cursor Left (Ctrl-H) (08 hex)

Moves the cursor one position to the left of the current cursor position. If the cursor is at the leftmost position on a line, the cursor is moved to the rightmost position on the line above. If the cursor is at the leftmost position of the first line, the cursor is moved to the rightmost position of the last line.

Cursor Right (Ctrl-L) (0C hex)

Moves the cursor one position to the right of the current cursor position. If the cursor is at the rightmost position on a line, the cursor is moved to the leftmost position on the next lower line. If the cursor is at the rightmost position of the last line, the cursor is moved to the leftmost position of the first line.

Cursor Return (Ctrl-M) (0D hex)

Moves the cursor to the leftmost position on the current line.

Line Feed (Ctrl-J) (0A hex)

Moves the cursor directly below the current position. If the cursor is on the last line, the cursor stays in its position and every line is moved up one line (leaving the first line blank).

Reverse Line Feed (Esc and then J) (1B, 4A hex)

Moves the cursor directly above the current position. If the cursor is on the first line, the cursor stays in its position and every line is moved down one line (leaving the last line blank).

Cursor Home (Ctrl-T) (14 hex)

Moves the cursor to the leftmost position on the first line of the display.

Clear Screen (Esc and then *) (1B, 2A hex)

Clears the display and moves the cursor to the leftmost position on the first line of the display.

New Line (Ctrl-_) (1F hex)

Moves the cursor to the beginning of the line below. If the cursor is on the last line, every line is moved up one line (leaving the last line blank).

Delete Line (Esc and then R) (1B, 52 hex)

Clears the current line. The cursor remains at its current position.

Insert Line (Esc and then E) (1B, 45 hex)

Moves the current line and all lines below it down one line (text on bottom line is lost). Then clears the current line. The cursor remains at its current position.

Set Cursor Position (Esc,=,<row>,<column>) (1B, 3D <r><c> hex)

Moves the cursor to the specified row and column. Refer to the following table. If you exceed the parameters listed in the table, the cursor position defaults to the greatest row or column number.

Column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Row	1	2														
ASCII	SP	!	"	#	\$	%	&	'	()	*	+	,	_	.	/
Decimal	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Hex	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F

For example, the following ASCII character sequence places the cursor in Row 2, Column 9 of a two line display: ESC= ! (

Set Cursor Invisible (ESC . 0) (1B, 2E, 30 hex)

Makes the cursor invisible.

Set Cursor Visible (ESC . 1) (1B, 2E, 31 hex)

Makes the cursor visible.

Set Flashing Mode (ESC G 2) (1B, 47, 32 hex)

Enables flashing text mode. After receiving this command, every character on the display flashes until disabled with a Clear Flashing Mode command.

Clear Flashing Mode (ESC G 0) (1B, 47, 30 hex)

Disables flashing text mode.

Display Status (ESC h) (1B, 68 hex)

Temporarily displays the configuration status of the display. This is the same configuration text displayed on powerup without product version text and pixel test. After displaying the status information, the screen is cleared with the cursor in the leftmost position on the first line.

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Diagnostic Mode

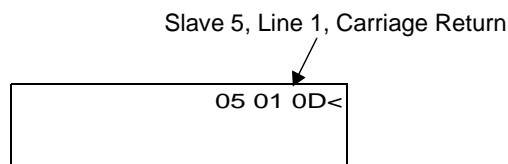
Chapter Objectives

This chapter describes the operation of the DL5 Slave in the Diagnostic Mode. Use the diagnostic mode to verify communications with a host device. Diagnostic mode displays the exact data being sent by a host device. Use the diagnostic mode as a temporary installation and troubleshooting aid.

Set the DL5 Slave for diagnostic mode as described in Chapter 3.

Using the Diagnostic Mode

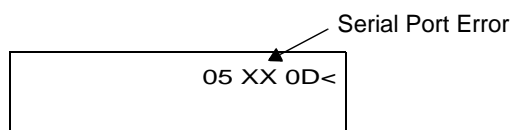
In diagnostic mode, every byte received on the RS-232 port is displayed in a hexadecimal format on line 1 of the display. The bytes shift from right to left as each new byte is received. The byte on the right is always the last byte received. For example:



The value of every byte is displayed including control characters. Characters are displayed as fast as they are received (no buffer). This usually means that only the last 5 bytes of a long message are viewable.

Data Errors

If the DL5 Slave and host device are not set to the same serial port settings, a reception error can occur. Data cannot be displayed if an error occurs. Instead the DL5 Slave displays an error symbol 'XX'. The error symbol indicates serial data was transferred but resulted in an error.



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Specifications

Display Characters

Character Height One line display Two line display	5.31 mm (0.209 inch) 5.94 mm (0.234 inch)
Character Set Alphanumeric	Upper Case Only
Characters per Display Line	16
Viewing Distance - Approximate	3 meters (10 feet)
Character Type	Vacuum fluorescent, 14 segment characters. Filtered to blue/green color.

Electrical

Input Voltage	12-24V DC
Input Current	250 - 125 mA, 300 mA inrush

Serial Communications

Electrical Interface	RS-232 (EIA-/TIA-232-E)
Baud Rate	300, 1200, 9600
Data Format	8 data bits, no parity, 1 stop bit

Environmental

Temperature Range - Operating	0° to 50°C (+32° to 122°F)
Temperature Range - Storage	-40° to 85°C (-40° to 185°F)
Humidity	5% to 95% (non-condensing)

Mechanical

Enclosure Type	UL listed for NEMA Type 12, 13, 4 (indoor use only) when panel mounted in a suitable enclosure of equivalent rating.
Weight - Approximate Catalog No. 2706-D11JS, -D21JS	1.5 lbs. (0.68 kg)

Certifications

Listings	UL listed for UL-508 Industrial Control Equipment Class I, Groups A, B, C, and D Division 2, Hazardous Locations Listed for Canadian Safety Standards Class 1, Division 2, Groups A, B, C, D Hazardous Location
-----------------	--

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Character Set

DL5 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	Q	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	!	81	121	51	Q	113	161	71	Q
18	022	12	DC2	CTRL R	50	062	32	"	82	122	52	R	114	162	72	R
19	023	13	DC3	CTRL S	51	063	33	£	83	123	53	S	115	163	73	S
20	024	14	DC4	CTRL T	52	064	34	¤	84	124	54	T	116	164	74	T
21	025	15	NAK	CTRL U	53	065	35	¥	85	125	55	U	117	165	75	U
22	026	16	SYN	CTRL V	54	066	36	¦	86	126	56	V	118	166	76	V
23	027	17	ETB	CTRL W	55	067	37	/	87	127	57	W	119	167	77	W
24	030	18	CAN	CTRL X	56	070	38	0	88	130	58	X	120	170	78	X
25	031	19	EM	CTRL Y	57	071	39	!	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	'

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