

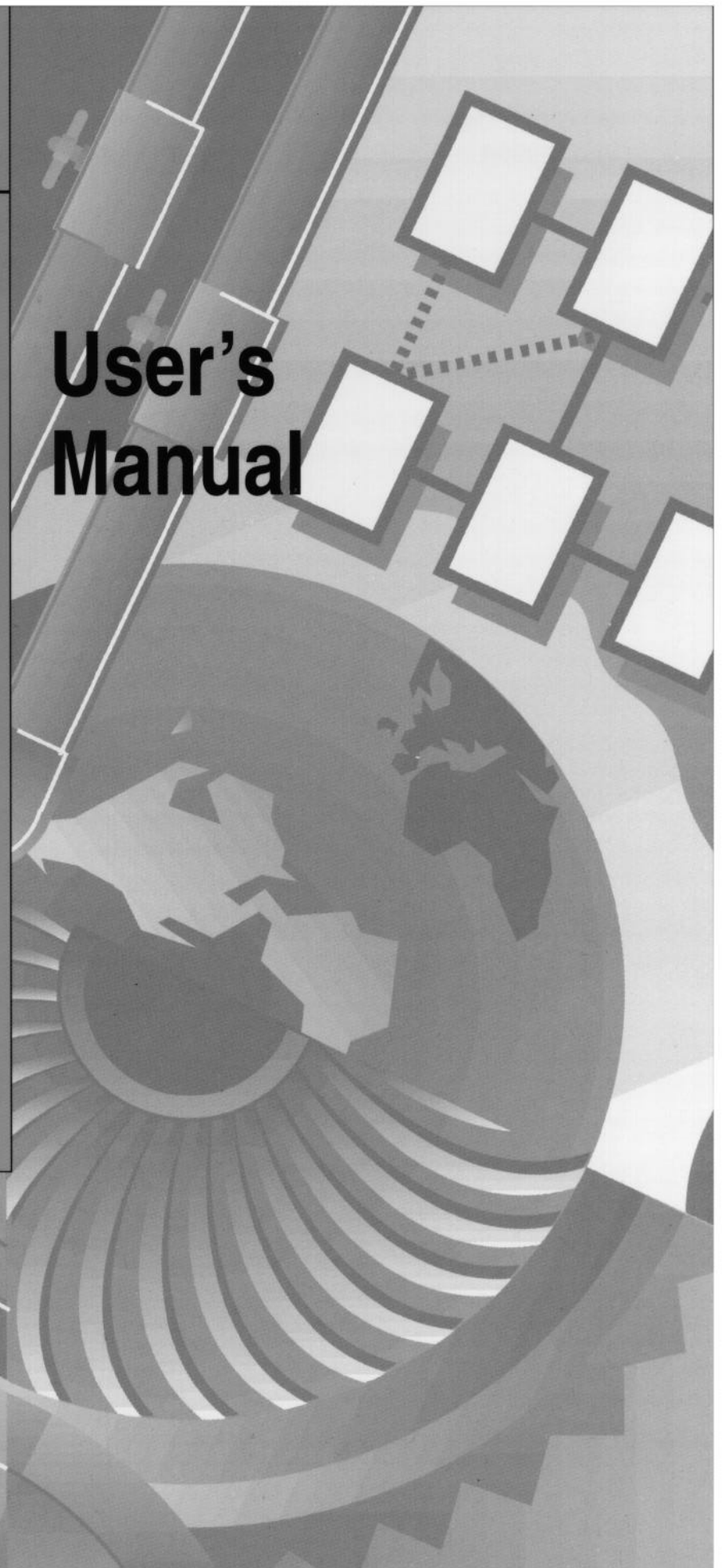


Allen-Bradley

***Bulletin 2706
Dataliner
Message Displays***

DL10 Series

User's Manual



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 the hazard
- recognize the consequences

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



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Overview

DL10 Dataliner Message Displays are available in one-line, two-line, and four-line versions, designed for panel mounting in industrial environments. The units require a 110/120VAC power source.

In operation, the DL10 message display interfaces with a host device, displaying alphanumeric messages in response to serial ASCII data it receives from the host. The host device can be a programmable controller, a computer, or a master DL20 Dataliner message display. All programming and storage of messages is performed at the host.

You can select either the Slave operating mode or the Terminal operating mode for the DL10. And you can use either RS-232 (single device) or RS-422 (multi-drop) serial communication with the host. RS-422 communication allows you to use up to 100 DL10 displays on a single line up to 4000 feet in length.

In the Slave mode, the DL10 receives data from a DL20 display, which acts as the "master". The DL20 display can in turn communicate with a host programmable controller or computer. Each of the DL10 displays on the network can be individually addressed. **Note:** Since the DL20 display has only one serial port, you will not be able to connect a printer to the DL20 in addition to the slave DL10 displays. Whatever is sent out of the DL20's RS-422 port is also sent out the RS-232 port, and vice versa.

In the Terminal mode, the DL10 can receive data from a computer or Allen-Bradley 1771-DB, 1775-GA, or 1771-DA modules (these modules interface to Allen-Bradley programmable controllers) or other intelligent devices capable of sending serial ASCII. In this mode, the DL10 responds to ASCII control codes, similar to the way a CRT terminal responds. In the terminal mode, displays are *not* addressable; all DL10 displays on an RS-422 link will show the same message.

This manual shows you how to make serial cable connections to various host devices, and how to select the baud rate, operating mode, and parity via dip switch settings.

In addition, the manual explains the slave mode protocol and terminal mode commands. Installation, power wiring, and dimensional information is also included.

RS-232 Connections

The RS-232 interface allows connection of only one DL10 display, with a maximum recommended cable length of 50 feet.

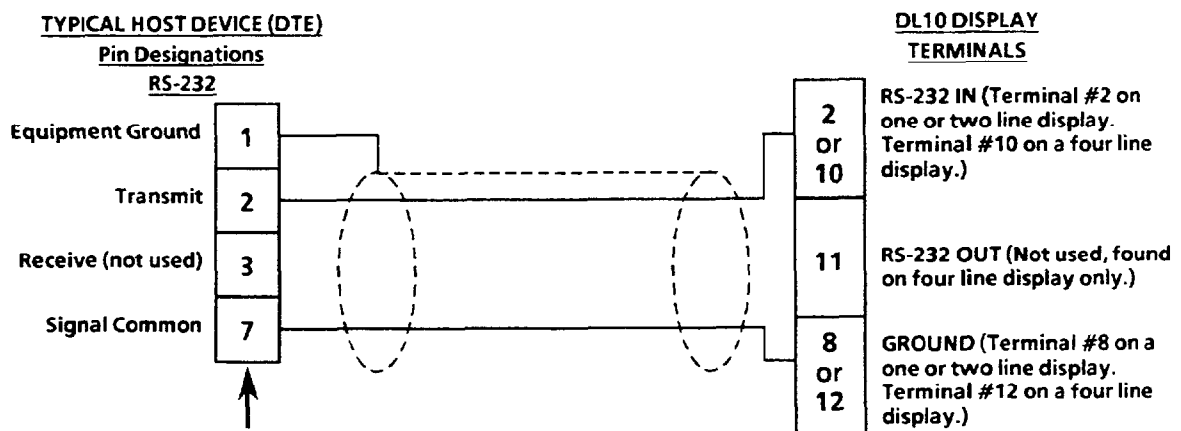
The RS-232 port of the DL10 display does not currently support any hardware or software handshaking functions. Only the RS-232 IN (Receive) terminal is used, along with the respective "ground" terminal.

The following figure shows a typical connection between a host device RS-232 port and the DL10 display. We recommend that you use Belden 9463 shielded, twisted pair cable, or equivalent.

The DL10 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, then you should make your connection to pin 3 of the host device instead of pin 2, as shown in the diagram.

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

Note: If noise problems occur between a DL20 master display and the slave DL10 display when RS-232 communication is 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 the same.



Note: Some devices require that certain hardware handshaking lines be asserted. This may require a jumper from RTS to CTS. Refer to applicable product literature.

RS-422 Connections

The RS-422 interface has these advantages over the RS-232:

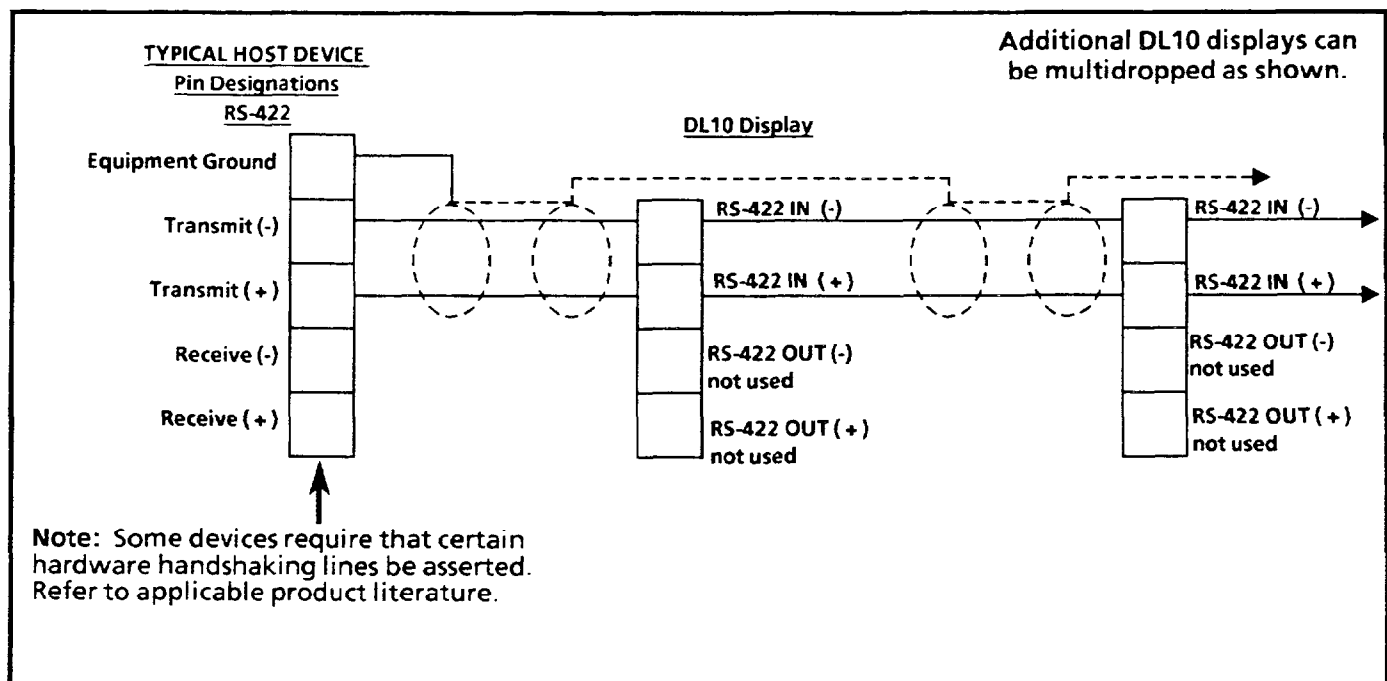
- Improved noise immunity.
- DL10 displays can be a distance of up to 4000 feet (3/4 mile) from the host device.
- Up to 32 DL10 displays can be connected directly to the RS-422 port of the host controller. Up to 100 DL10 displays can be addressed when line drivers are used.

The RS-422 input port of the DL10 display does not currently support any hardware or software handshaking functions. Only the RS-422 IN (Receive) terminals are used.

The following figure shows a typical connection between a host device RS-422 port and DL10 displays. We recommend that you use Belden 9463 shielded, twisted pair cable, or equivalent.

Note that pin or terminal numbers are not shown for the host device. This is because the numbers vary for different products. For actual pin numbers, refer to the appropriate host device product literature. Terminal numbers for the DL10 display are not shown either, since they are different on one/two line and four line displays.

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



**Connection to
Allen-Bradley
Programmable
Controllers**

Most Allen-Bradley Programmable Controllers provide a variety of methods to interface RS-232 or RS-422 devices. Almost all PLC-2 Family and PLC-3 Family Programmable Controllers are applicable. They include the following:

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

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

1771-DB Basic Module (All Programmable Controllers listed above)

1775-GA Peripheral Communications Module (PLC-3 Family only)

1771-DA ASCII I/O Module (All Programmable Controllers listed above)

1771-DB The Allen-Bradley 1771-DB Basic Module provides a cost-effective and efficient serial interface to almost all Allen-Bradley programmable controllers. It can be plugged into any slot of a standard 1771 local or remote I/O rack. This includes Mini PLC applications. The module can store all messages in battery-backed RAM or EPROM. It can be programmed to transmit these messages along with status or variable data from the programmable controller. The 1771-DB Module has access to the programmable controller's program and memory.

The 1771-DB Module supports both RS-232 and RS-422 (multidrop) applications. If RS-422 is used, up to 32 DL10 Displays can be directly connected and uniquely addressed. Up to 100 DL10 displays can be uniquely addressed if RS-422 repeaters are used.

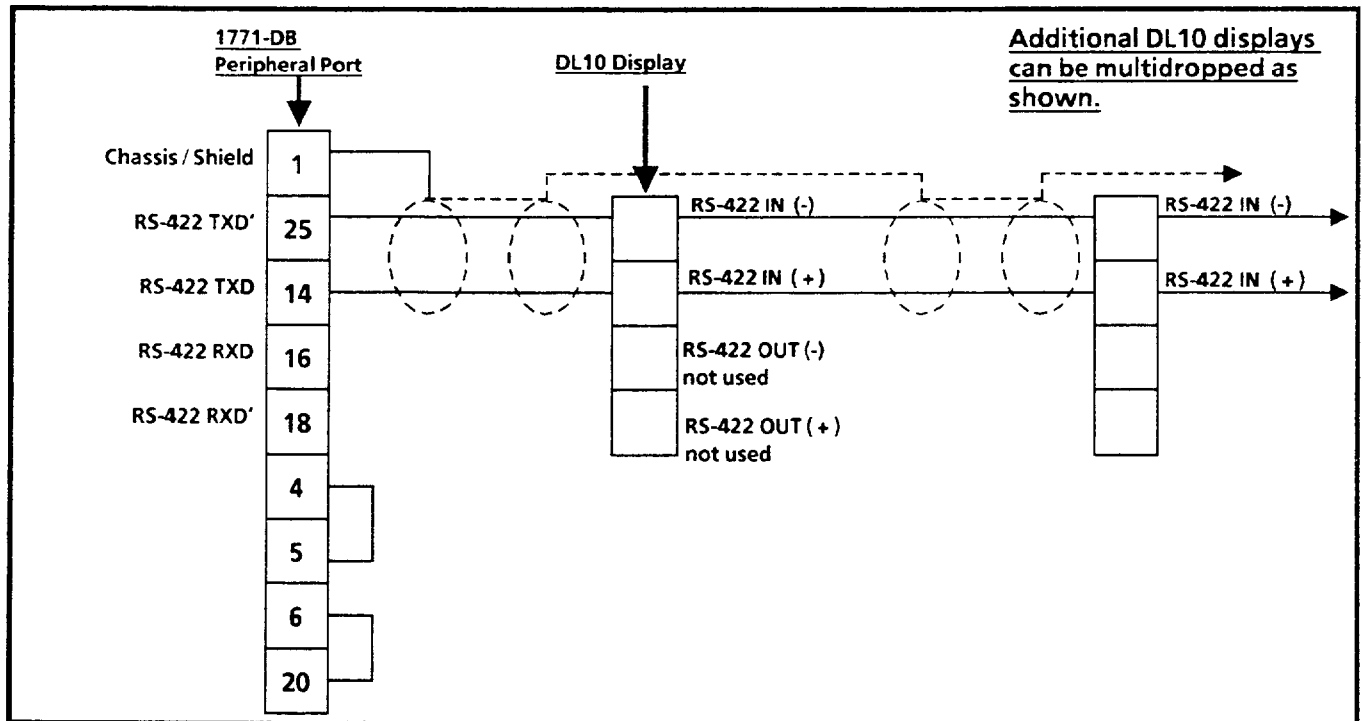
For more information on the 1771-DB Basic Module, refer to its user's manual. Connection of DL10 displays to the 1771-DB peripheral port and a program statement example are described later.

1775-GA The 1775-GA Peripheral Communications Module is only applicable to Allen-Bradley PLC-3 Family Programmable Controllers. It is a more powerful module and 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 1775-GA currently supports only RS-232 serial port specifications. However, an RS-422 network with many DL10 displays can easily be implemented by using an RS-232 to RS-422 Converter. Refer to 1775-GA literature for more information.

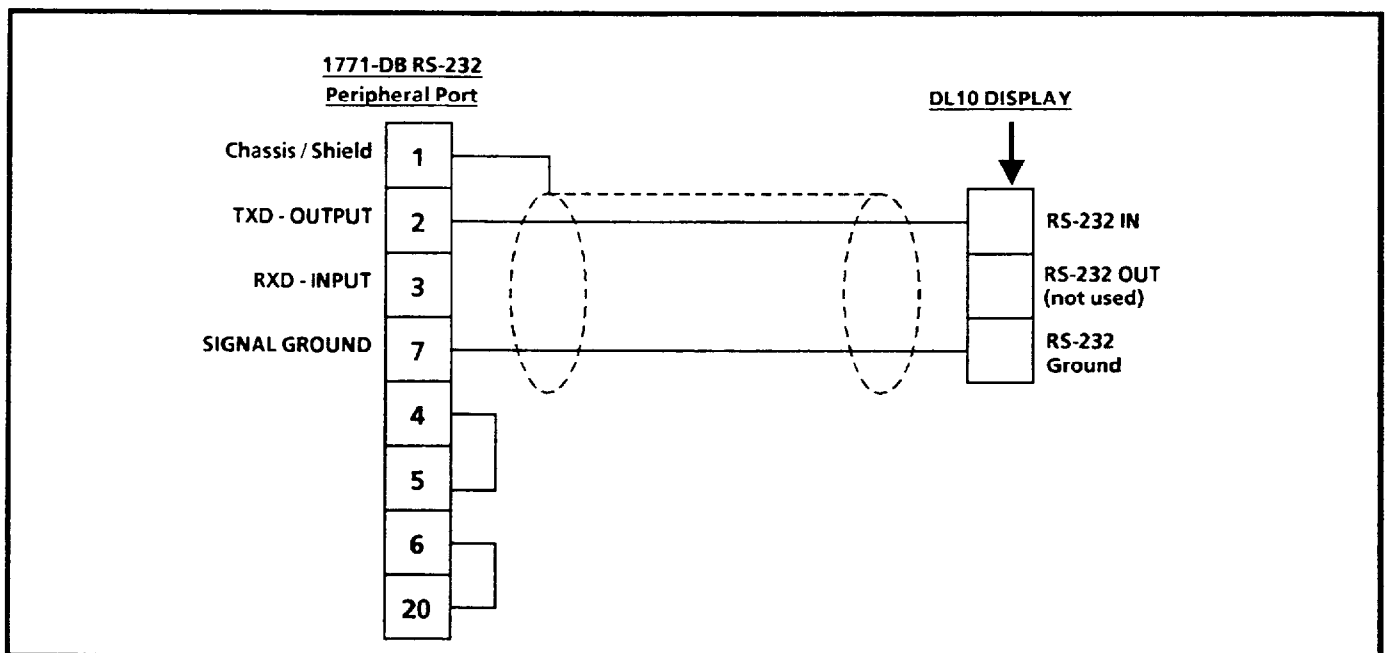
1771-DA The 1771-DA ASCII I/O Module provides a serial interface for almost all Allen-Bradley programmable controllers. It can be plugged into any slot of a standard 1771 local or remote I/O rack.

The 1771-DA has no memory or programming language. All DL10 display messages would be stored in the programmable controller's memory. Having messages stored in PC memory, along with the application program, could be considered an advantage; however, in many cases ASCII message storage is too great a burden for the limited memory capacity of programmable controllers. Also, the programming requirements may be considered "less friendly" by unfamiliar users.

RS-422 Connection to 1771-DB Basic Module



RS-232 Connection to 1771-DB Basic Module



Connection to DL20 "MASTER" Displays

As previously described, up to 32 DL10 displays (slave mode) can be connected to the RS-422 port of a DL20 display (Master). If RS-422 line drivers are used, up to 100 DL10 displays could be connected to, and uniquely addressed by, the DL20 display (Master). The DL20 Display (Master) can then connect to a host programmable controller or Computer via either its RS-232 port or its parallel input port.

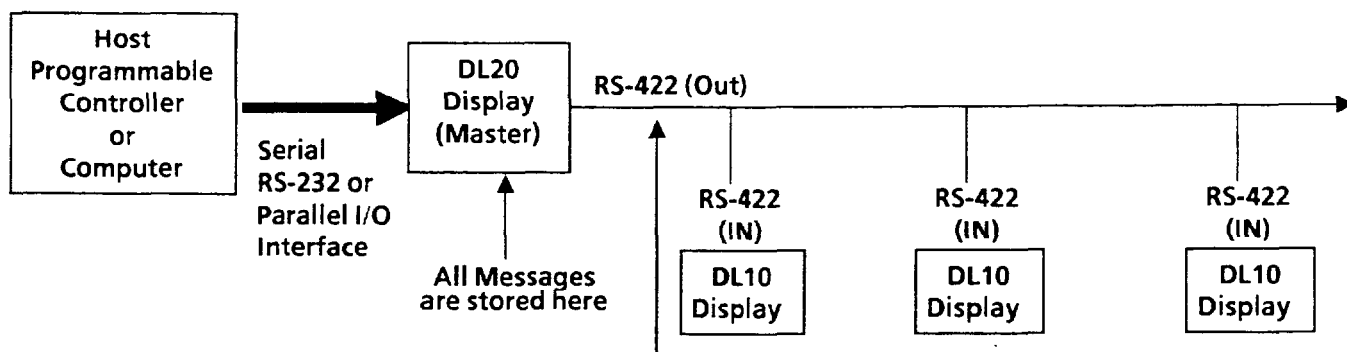
When this type of configuration is used, all messages are stored in the Master DL20 display. All the host controller is required to do is trigger a particular message stored in the Master DL20 display. When particular messages are created, they can be assigned an attribute which designates that messages to be displayed on any particular slave DL10 display, all slave DL10 displays, or just the DL20 display.

Note: Since the DL20 display has only one serial port, you will not be able to connect a printer to the DL20 in addition to the slave DL10 displays. 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.

Addresses can be assigned to Slave DL10 displays by setting DIP Switches as described in Chapter 3 of this manual. The "slave mode" must be selected for this configuration.

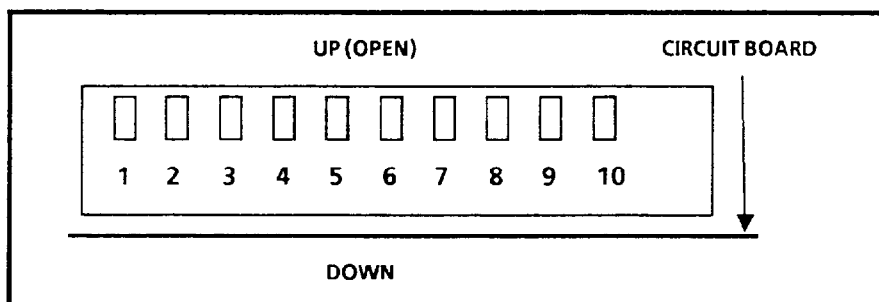
The following diagram illustrates this configuration:



Note: If noise problems occur between a DL20 master display and one slave DL10 display when RS-232 communication is used, 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. This will help to improve noise immunity.

DIP Switch Location

The DL10 displays are configured via a 10-position DIP switch located under the top cover of a one or two line display, or on the right side of a four line DL10.



Each individual switch has a number associated with it, as shown above. A switch is OPEN when it is UP with respect to the circuit board. If any changes in DIP switch settings are made while power is on, then AC power to the DL10 display must be recycled before the new switch selections are recognized.

On power-up, the DL10 will display prompts which indicate which mode and baud rate have been selected.

EXAMPLE: TESTING UNIT 1.0 4L
SLAVE MODE
BAUD RATE = 300

**Baud Rate
Selection**

BAUD RATE SWITCHES		
Baud Rate	Switch #9	Switch #10
300	UP	UP
1200	UP	DOWN
9600	DOWN	UP
9600	DOWN	DOWN

The baud rate must be selected to match the baud rate of the host device. Generally, any of the above selections can be used, however it is possible that some host devices could be programmed to transmit too many characters too fast at the 9600 baud rate. If a problem is encountered, the baud rate can be lowered. The DL10 will display the selected baud rate as one of its initial power up prompts.

Operating Mode Selection

MODE SELECTION	
Mode	Switch #8
Terminal	UP
Slave	DOWN

Depending on which mode is selected via Switch #8, the remaining switches (1 - 7) will have different meanings. If, for example, "Slave Mode" is selected, Switches 1 - 7 will define the DL10 display's address. If "Terminal Mode" was selected, Switches 1 - 7 would have other meanings. These switches are defined separately for each mode.

Slave Mode

If the "slave mode" has been selected (Switch #8 down), then switches 1 through 7 define an address for that DL10 display. The values for each switch are illustrated below. The address of the DL10 is the sum of the values for all of the switches (1 - 7) that are up.

Address							
Switch #	1	2	3	4	5	6	7
Value	64	32	16	8	4	2	1

Addressing Example							
Switch #	1	2	3	4	5	6	7
Switch Position	Dn	Up	Dn	Up	Up	Dn	Dn

The above Address = 44.

The SLAVE MODE is generally selected for applications requiring more than one DL10 Display to be connected and uniquely addressed on an RS-422 network (although a single DL10 Display and RS-232 interface could be used). It allows displays on the link to each display different messages.

The SLAVE MODE must also be selected when multiple DL10 Displays are connected to a Master DL20 Display.

The SLAVE MODE protocol is different from the terminal mode protocol. They are defined separately in Chapters 4 and 5 respectively.

Slave Mode
(continued)

Certain slave addresses are not valid for DL10 displays when connected as slaves to a DL20 master. These illegal decimal addresses are: 0, 4, 6, 7, 13, 18, 20, 22, 43, 45, 48-57. It should be noted that address 127 performs a special function explained in the Slave Mode Protocol in Chapter 4.

When multiple DL10 displays are placed on one RS-422 link, more than one DL10 can have the same address. DL10's with the same address will all respond to commands addressed to them.

Terminal Mode

If the terminal mode is selected (Switch #8 up), then switches 1 through 7 have the following meanings.

Switch #	Status	Definition
1	UP DOWN	Enable Cursor Disable Cursor
2	DOWN	Not Used
3	UP DOWN	Enable Auto New Line Disable Auto New Line
4	DOWN	Not Used
5	UP DOWN	Odd Parity Even Parity
6	UP DOWN	Enable Parity Disable Parity (None)
7	DOWN	Must be down for terminal mode

Note: When parity is selected send 7 data bits plus parity bit and 1 stop bit. When no parity is selected send 7 or 8 data bits and 1 stop bit.

The terminal mode is generally selected for applications that do not require more than one DL10 display to be uniquely addressed by a host controller. In this mode, DL10 displays can be connected to a host controller's RS-232 or RS-422 interface. As previously described, several DL10 displays could be multidropped on an RS-422 network, however in terminal mode unique addresses cannot be assigned. Therefore, transmitted messages would be displayed on all DL10 displays connected to the RS-422 network.

Terminal Mode
(continued)

In terminal mode, the DL10 display acts on simple control codes and escape sequences similar to a “dumb” CRT terminal. This terminal mode protocol is different from the slave mode protocol. The slave and terminal mode protocols are defined separately in Chapters 4 and 5 respectively.

Slave Mode Protocol

The protocol described here is applicable when the slave mode has been selected as described in Chapter 3. Applicable ASCII characters are listed in Appendix A.

How to display text on a DL10 display: Send the four items shown in this packet:

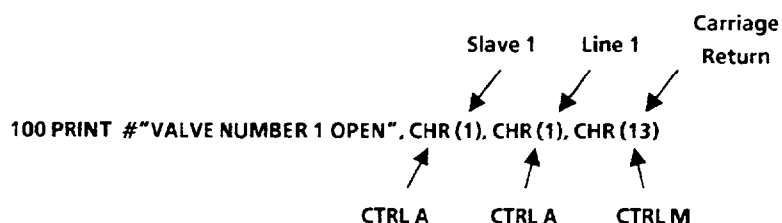
20 Characters for Display	Slave Address	Line Number	Carriage Return
------------------------------	------------------	----------------	--------------------

1. Send out the twenty characters you want to be displayed. Any valid ASCII character, upper or lower case, can be sent. Control codes do not apply.
2. Send out the slave address (byte). This is a one-byte character, ranging from 1 thru 127 decimal equivalent (1 thru 7F hex).

Invalid decimal slave addresses: You cannot use decimal addresses 0, 4, 6, 7, 13, 18, 20, 22, 43, 45, 48-57.

3. Send out the line number (byte). Currently, valid line numbers are line 1 thru line 4. This byte should be 1 thru 4 (decimal equivalent), *not* ASCII 1 thru ASCII 4. The ASCII characters for lines 1 thru 4 are: Control A, Control B, Control C, and Control D.
4. Finally, send a carriage return (ASCII Control M, Dec 13, Hex OD).

An example of a typical print statement for a Catalog No. 1771-DB basic module with a DL10 connected to its peripheral port would be



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

CTRL A CTRL A CTRL M

The message "VALVE NUMBER 1 OPEN" on line one of slave number one would be displayed. Note that to send the address, line number, and carriage return required that you use the print CHR (decimal character equivalent) function.

Slave Mode Protocol
(continued)

Wild card feature: A DL10 display addressed as 127 will understand any data transmitted to it, regardless of what address is assigned in the packet. Also, any packet containing the address 127 will be received by all DL10 displays, regardless of their addresses. This allows you to efficiently route a message to all displays. Multiple DL10 displays on an RS-422 link can have the same address and will respond to messages sent to that address.

Control code F: This is a flash code. Send this code if you wish to have characters flashing in your display. Every character received after you send control F will flash. To cancel the flash mode, send a second control F.

Control code R: This is a reset command. When the DL10 display receives a control R, all data registers in the DL10 are reset, clearing transmitted data. For example, if you send 10 characters, then control R, the 10 characters will be cleared and you can then start over by sending 20 characters followed by the slave address, line number, and carriage return.

Control R also resets the flash status to non-flash.

We recommend that you send a control R to all DL10 displays when the host controller is powered up. This clears any erroneous data which may be inadvertently transmitted when the serial port powers up.

To clear one or all lines of a DL10 display: Send the following packet:

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

The table below indicates what line number byte you must send to clear line 1, 2, 3, 4, or all lines.

Action	Line Number Byte		
	Dec	ASCII	Hex
Clear Line 1	1	Control A	1
Clear Line 2	2	Control B	2
Clear Line 3	3	Control C	3
Clear Line 4	4	Control D	4
Clear all Lines	50	2	32

**Terminal Mode
Commands**

Commands in this section are applicable only when the "Terminal Mode" of operation has been switch-selected as described in Chapter 3.

This chapter defines each command. These definitions are followed by a "Command Quick Reference" on Page 5-4.

Applicable ASCII characters are listed in the ASCII conversion table in Appendix A. **Note:** ^ denotes a CONTROL prefix, ESC denotes an ESCAPE code.

The commands in this section can be sent serially to DL10 Displays along with the message characters to implement the various display functions.

Cursor Up (^K)

Positions the cursor directly above the current position unless on the top line, then the cursor is moved to the bottom line.

Cursor Down (^V)

Positions the cursor directly below the current position unless on the bottom line, then the cursor is moved to the top line.

Cursor Left (^H)

Moves the cursor one position to the left. If cursor is at the beginning of the line, the cursor is moved to the last position on the above line. If on top line, the cursor is brought to the last position on the bottom line.

Cursor Right (^L)

Moves the cursor one space to the right. If cursor is at the end of the line, the cursor is moved to the beginning of the next line. If it is at the last line, the cursor is brought to the top line.

Cursor Return (^M)

Moves the cursor to the beginning of the current line.

Line Feed (^J)

Moves the cursor down one line. If the cursor is at the last line, the cursor stays put and the above lines are moved up one line.

Reverse Line Feed (ESC J)

Same as the line feed, but in the opposite direction.

Cursor Home (^T)

The cursor is moved to the first position on the display.

Terminal Mode Commands

(continued)

Clear Screen (ESC*)

The cursor is moved to the first position and the display is cleared.

New Line (^I)

Performs both carriage return and line feed. Cursor remains on the same line.

Delete Line (ESC R)

Clears the line the cursor is on and the cursor remains where it is.

Insert Line (ESC E)

The line the cursor is on and all lines below it are moved down one. The last line is deleted from the display. The line the cursor is on is cleared. The cursor remains in the same position on the display.

Set Cursor Position (ESC = Row Column)

The cursor will move to the row and column defined by this character sequence. "Row" and "column" are each one character as defined by the following table. Notice that the respective characters required to designate "row" and "column" are not the Decimal, Hex, nor ASCII equivalent of the actual row and column position. If a parameter exceeds those noted below, the cursor will default to the greatest row and/or column.

Column	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Row	1	2	3	4																
ASCII Equivalent	SP	!	"	#	\$	%	&	'	()	*	+	,	_	.	/	Ø	1	2	3
Decimal Equivalent	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Hex Equivalent	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33

Example: The following ASCII character sequence will place the cursor in Row 3, Column 9 of a four line display:

ESC = "(

Cursor Attribute Set

ESC . 0 Set cursor invisible.

ESC . 1 Set cursor visible.

**Terminal Mode
Commands**
(continued)**Character Attribute Set**

ESC G 0 Normal Mode Set
ESC G 2 Flash Mode Set

Every character received after "flash mode set" will flash until a "normal mode set" command is received.

Monitor Mode (Esc U)

Monitor Mode will force the DL10 to display all control codes it receives as HEX numerical code. While in this mode, the display will ignore the command associated with the control code.

ESC u or ESC X

Cancels monitor mode.

Display Status (ESC H)

The unit will temporarily display for approximately three seconds the current status of the display in the following format:

Terminal Mode – Baud Rate

**Terminal Mode
Command Quick
Reference**

<u>COMMAND</u>	<u>ASCII CHARACTER(S)</u>	<u>DECIMAL EQUIVALENT</u>	<u>DECIMAL EQUIVALENT</u>
Cursor Up	^K	11	0B
Cursor Down	^V	22	16
Cursor Left	^H	08	08
Cursor Right	^L	12	0C
Carriage Return	^M	13	0D
Line Feed	^J	10	0A
Reverse Line Feed	ESC J	27 106	1B 6A
Cursor Home	^T	20	14
Clear Screen	ESC*	27 42	1B 2A
New Line	^ /	31	1F
Delete Line	ESC R	27 82	1B 52
Insert Line	ESC E	27 69	1B 45
Set Cursor Pos.	ESC = (line)(column)	27 61	1B 3D
Set Cursor Invisible	ESC . 0	27 46 48	1B 2E 30
Set Cursor Visible	ESC . 1	27 46 49	1B 2E 31
Set Normal Mode	ESC G 0	27 71 48	1B 47 30
Set Flash Mode	ESC G 2	27 71 50	1B 47 32
Monitor Mode Enable	ESC U	27 85	1B 55
Monitor Mode Disable	ESC u or ESC X	27 117 27 88	1B 75 1B 58
DISPLAY STATUS	ESC h	27 104	1B 68

Note: ^ denotes a CONTROL prefix, ESC denotes an ESCAPE code.

**Example of a 1771-DB
Basic Module Print
Statement**

The following statement would display a message on line one of a DL10 display in the terminal mode connected to the 1771-DB module peripheral port.

PRINT #CHR (20)

(moves cursor to the first character position on the DL10)

PRINT #VALVE NUMBER 1 CSD,

Note: If the comma at the end of the print statement is not included, the 1771-DB module will automatically send out a carriage return. This will move the cursor of the DL10 to the first position of the same line. With the comma, the cursor will stay at its finish position. This is useful when updating variable information in a message, or stringing two consecutive print statements.

Dimensions

Refer to Appendix B for panel cutout dimensions, overall dimensions, optional flush mount dimensions, and enclosure dimensions.

Installation Procedure

The procedures below will guide you in mounting and wiring the DL10 display in a custom panel or enclosure, or in a Bulletin 2706 enclosure, Catalog Number 2706-NE1 or 2706-NE2.

To install the display in a Bulletin 2706 enclosure: The Series A enclosures have threaded nuts welded inside the six display mounting holes and are intended for use with Series A and B DL20 displays or Series A DL10 displays only.

Series B enclosures will work with all series letter DL10 and DL20 displays. They do not have threaded holes. If a Series B enclosure is not available, it is possible to use a Series A enclosure by drilling out the six threaded mounting holes with a 3/16" drill.

When a DL10 display is installed properly, the display faceplate will provide NEMA Type 12, Type 13, and Type 4 (indoor use only) enclosure integrity. Earlier Series A displays will provide NEMA Type 12 and Type 13 enclosure integrity only.

To install the display in a panel or custom enclosure:

1. Cut out a rectangular opening and drill six holes according to panel cutout dimensions in Appendix B.



CAUTION: Do not install the display in the panel or enclosure until all cutouts and holes are completed. Metal filings accumulated when cutting and drilling could enter ventilation holes on the display and cause the display to fail.

2. Insert the display in the panel or enclosure cutout. Screw the six mounting nuts (supplied) onto the mounting studs and tighten.

Note: Series A devices are not equipped with mounting studs. Use #10 mounting screws.

Installation Procedure
(continued)

To wire power and communication lines:

1. Series B and later displays: Connect a 110/120 VAC $\pm 10\%$, 47/63 Hz voltage source to terminals H, N, G of the DL10 display. Terminals are explained on Pages 6-3 and 6-4.

Series A displays: Connect a 120 VAC $\pm 10\%$, 50/60 Hz voltage source to terminals H, N, G of the DL10 display. The 120 VAC supply line to the display must have 15 Amp branch short circuit protection maximum (this is not required for Series B and later displays).



WARNING: Terminal 3 (the G terminal) must be connected to a reliable low impedance earth ground to protect the display from electrical noise. This ground connection will also protect personnel from electrical shock if the electronics short to the DL10 case.

Do not turn on power to the display until all wiring to the serial port is completed.

2. Connect communication lines from the host programmable controller, computer or DL20 master to the serial port of the DL10. Belden 9463 shielded twisted pair is recommended. Refer to Chapter 2 of this manual for details on serial port connection.



WARNING: The DL10 has simplex (single direction) communication only. The DL10 should only be used for non-critical display applications. Simplex communication provides no ACK/NAK (duplex) verification that messages sent by the programmable controller or computer have been received and displayed by the DL10.

Installation Procedure (continued)

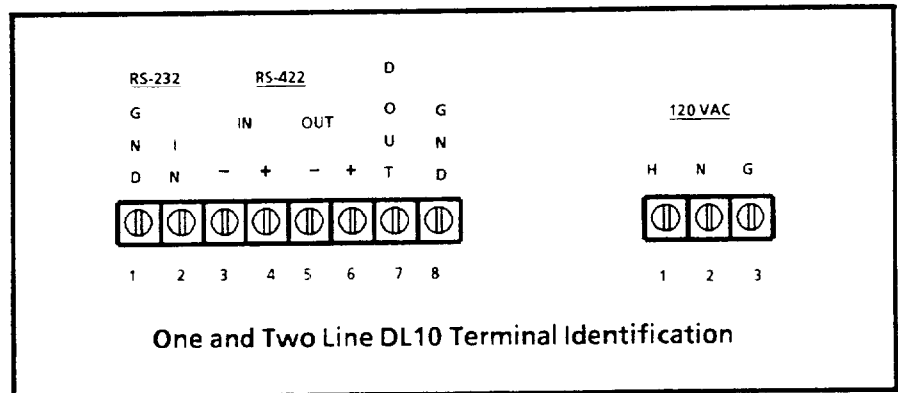
The serial data format for the RS-232 and RS-422 ports is identical. It is very important that the format for the DL10 and the connected device be set the same.

Baud rate: 300, 1200, or 9600

Data length: 8 bits (including parity if any).

Parity: odd, even, or none.

Stop bits: 1

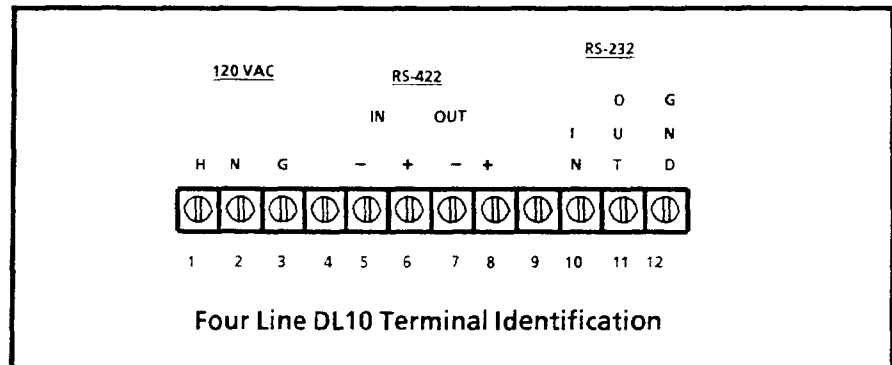


TERMINAL

DEFINITION

1	RS-232 Port Common (Internally connected to equipment ground)
2	RS-232 IN - Receive Data
3	RS-422 IN (-) - Receive Data
4	RS-422 IN (+) - Receive Data
5	Not Used
6	Not Used
7	Not Used
8	Serial Port Common (Internally connected to equipment ground)
1	110/120 VAC Hot
2	110/120 VAC Neutral
3	Equipment Ground

Installation Procedure (continued)



TERMINAL	DEFINITION
1	110/120 VAC Hot
2	110/120 VAC Neutral
3	Equipment Ground
4	Not Used
5	RS-422 IN (-) - Receive Data
6	RS-422 IN (+) - Receive Data
7	Not Used
8	Not Used
9	Not Used
10	RS-232 IN - Receive Data
11	Not Used
12	Serial Port Common (Internally connected to equipment ground)

The DL10 uses low voltage signaling on the serial input. Any low voltage signals in a control panel are particularly noise susceptible. Although the DL10 contains circuitry to filter noise, reasonable precautions are necessary to ensure proper operation of the DL10. The 120 VAC ground terminal (3) of the DL10 must be tied to a good earth ground. Data input lines should be routed away from high energy wiring, transformers, solenoids or coils, and devices known to generate large amounts of EMI or RFI. The communications cable should not be installed in the same conduit or in close proximity with AC or high level DC I/O lines. It can be installed in the same conduit with low level DC I/O lines (less than 10 Volts) and low power signals. A shielded cable should be used, and the shield should be connected to ground at the transmitting device end only.

Installation Procedure
(continued)

Transient noise suppressors across solenoids and coils are often helpful in reducing interference. Noise is a very insidious thing. A device may work for months and then fail due to noise. After the power is cycled OFF then ON, the failure may disappear, and attempts to duplicate it will prove frustrating.

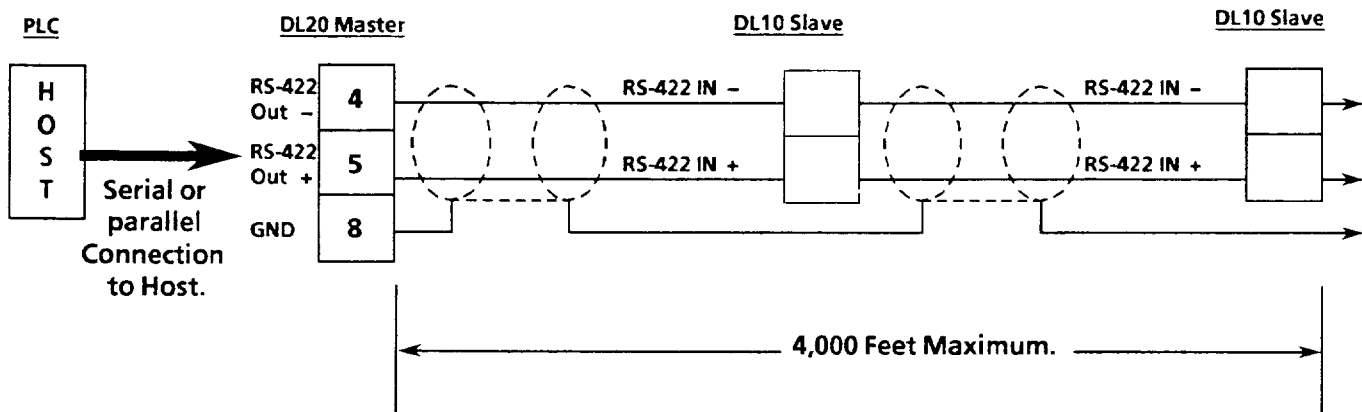
Connection as Slave to DL20 "Master" Display

DL10 slave displays can be connected to the DL20 display serial RS-232, or RS-422 port. Up to 32 DL10 slaves can be connected to the RS-422 output port of the DL20 display at a maximum distance of 4,000 feet without the use of in-line amplification. Using in-line RS-422 amplification up to 100 separately addressable slave DL10s can be connected to the RS-422 output of the DL20 out to a maximum distance of 4,000 feet.

Connect the slaves to the RS-422 output of the DL20 using a 100% shielded twisted pair cable with drain wire. We recommend Belden 9463, or equivalent cable.

Slave addresses and baud rates are selected by a DIP switch on the DL10 (see Chapter 3). The DL10 baud rate must match that of the DL20's serial port.

Note: When changing the baud rates of either the DL10 or DL20, power must be recycled before the new baud rate takes effect.



Note that it is also possible to use the RS-232 output of the DL20 to connect to one DL10 slave, however the distance limitation is 50 feet.

Selecting Baud Rate, Parity, and Operating Mode

Refer to Chapter 3 for DIP switch settings.

Chapter 7 Specifications

Specifications

General

Character Height	One Line Display: 0.59" (15.1 mm) Two Line Display: 0.44" (11.3 mm) Four Line Display: 0.49" (12.5 mm)
Characters per line:	20
Display Type:	Blue-green vacuum fluorescent, 5x7 dot matrix
Serial Input:	RS-232 and RS-422
Baud Rate (selectable):	300, 1200, or 9600
Parity (selectable):	Odd, even, none
Data Length:	7 data bits, + parity, 1 stop bit

Electrical

Input Power One & Two Line Displays	Series B & later: 110/120VAC ± 10%, 50/60 Hz, 10VA max Series A: 120VAC ± 10%, 60Hz, 10VA max
Four Line Displays	Series B & later: 110/120 VAC ± 10%, 50/60 Hz, 55VA max Series A: 120VAC ± 10%, 60 Hz, 55VA max
Fuse Type One & Two Line Displays	0.25A, Type MDL, 250VAC
Four Line Displays, Series B & later	Aux. power supply board fuse FU1: 0.375A, Type MDL, 250VAC Incoming power fuse: 1.5A, Type MDL, 125VAC
Four Line Displays, Series A:	0.375A, Type MDL, 250VAC

Environmental

Operating Temperature:	0°C to 50°C
Humidity Rating:	5% to 95% (without condensation)
NEMA Rating, Series B & later	NEMA Type 12/13 and 4 (indoor use only) panel mount
NEMA Rating, Series A	NEMA Type 12/13 panel mount

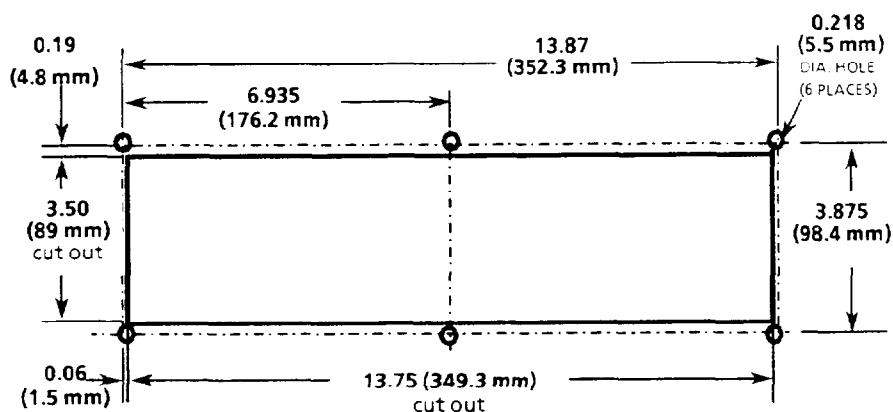
Specifications
(continued)**Approximate
Dimensions**

Series	One and Two Line Displays		Four Line Displays	
	Front Panel	Depth	Front Panel	Depth
Series B & Later	4.4" (111mm) H 14.4" (365mm) W	3.25" (83mm)	6.2" (157mm) H 14.4" (365mm) W	5.1" (130mm)

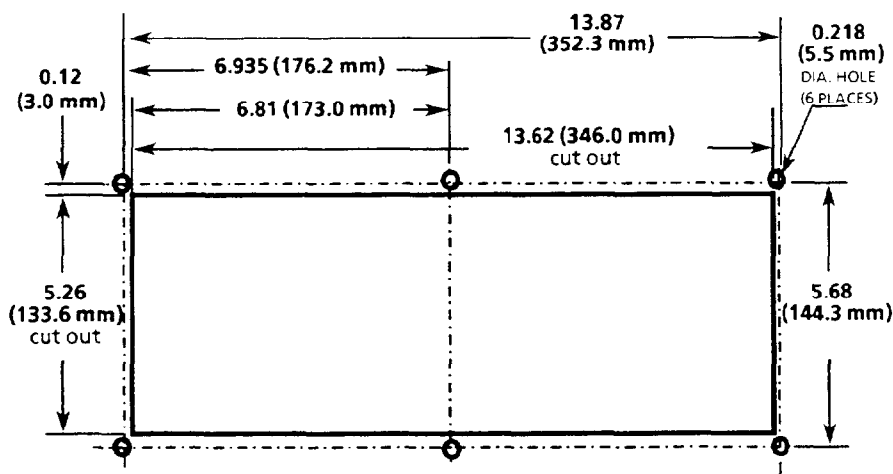
Dec	Oct	Hex	Char	Control Code	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char	Dec	Oct	Hex	Char
0	000	00	NUL	CTRL 0	32	040	20	SP	64	100	40	@	96	140	60	\
1	001	01	SOH	CTRL A	33	041	21	!	65	101	41	A	97	141	61	a
2	002	02	STX	CTRL B	34	042	22	"	66	102	42	B	98	142	62	b
3	003	03	ETX	CTRL C	35	043	23	#	67	103	43	C	99	143	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	Escape	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 D	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	DEL

General This Appendix will illustrate the dimensions for the DL10 one, two and four line displays. Dimensions are shown in inches. (Dimensions in parentheses are in millimeters.) All dimensions are approximate and are not intended for manufacturing purposes.

Panel Cutout Dimensions



One and Two Line
DL10 Displays

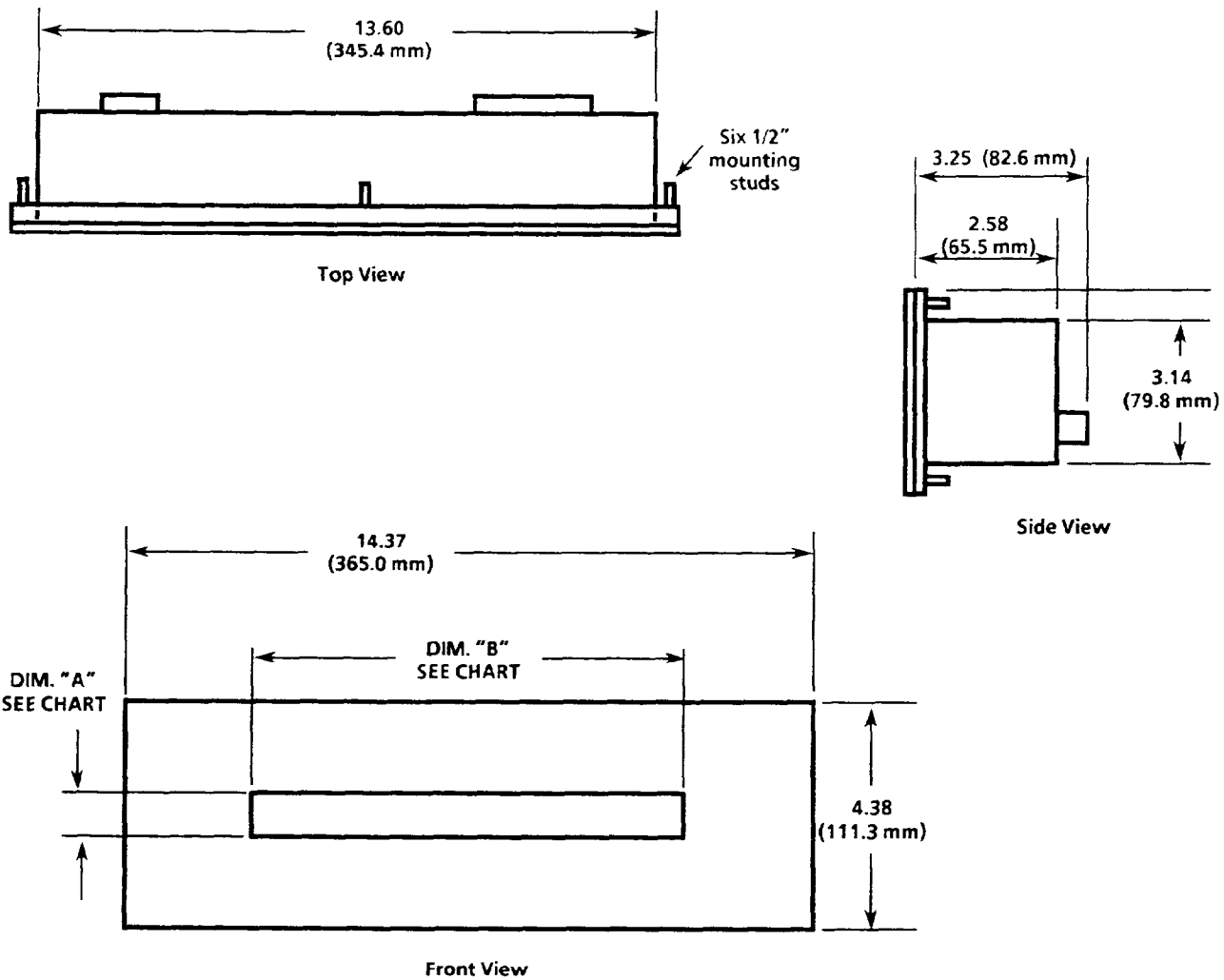


Four Line
DL10 Display

Overall Dimensions

TYPE DISPLAY	DIM A	DIM B
ONE LINE DISPLAY	1.250" (31.8mm)	10.125" (257.2mm)
TWO LINE DISPLAY	1.700" (43.2 mm)	8.812" (223.8mm)

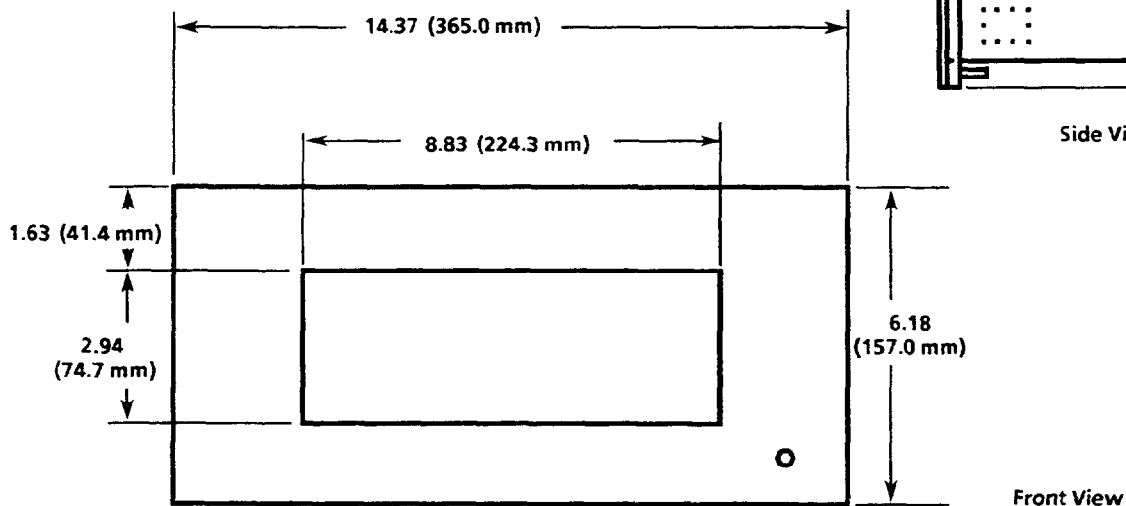
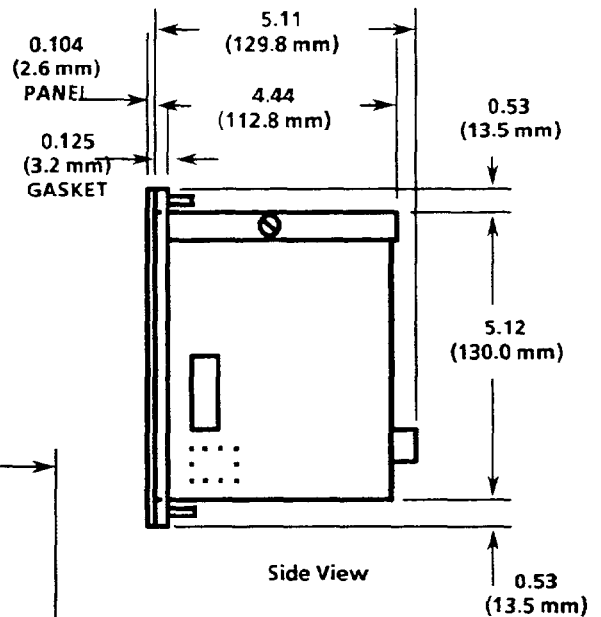
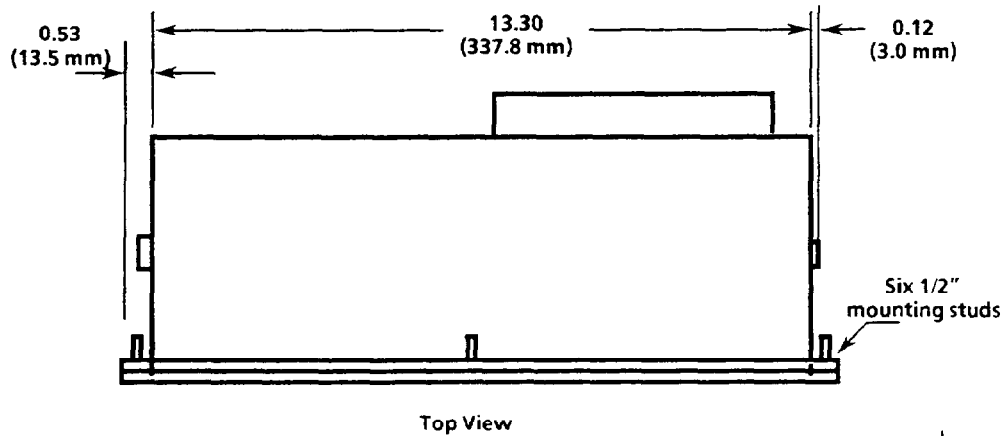
One and two line DL10 dimensions.
Series B and later.



Series A Displays: The dimensions above apply to Series A displays, except that the Series A displays are not equipped with mounting studs. In place of the studs, there are six mounting holes, 0.218" (5.5mm). Use #10 screws in these holes for securing the display to the panel or enclosure.

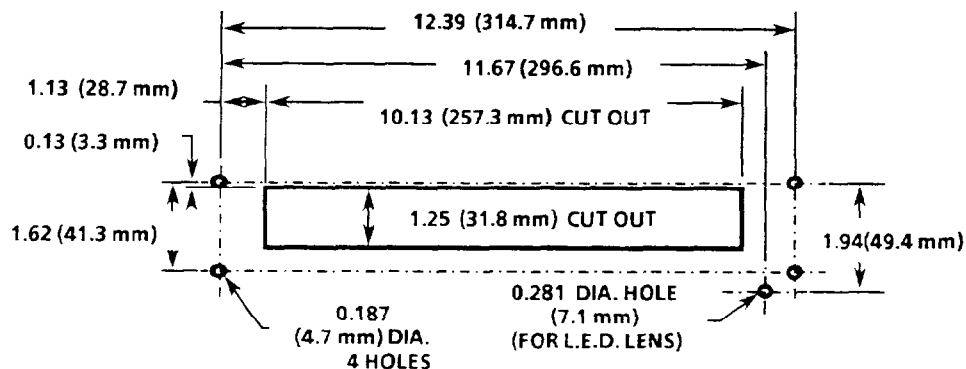
Overall Dimensions (continued)

Four line DL10 dimensions.
Series B and later.

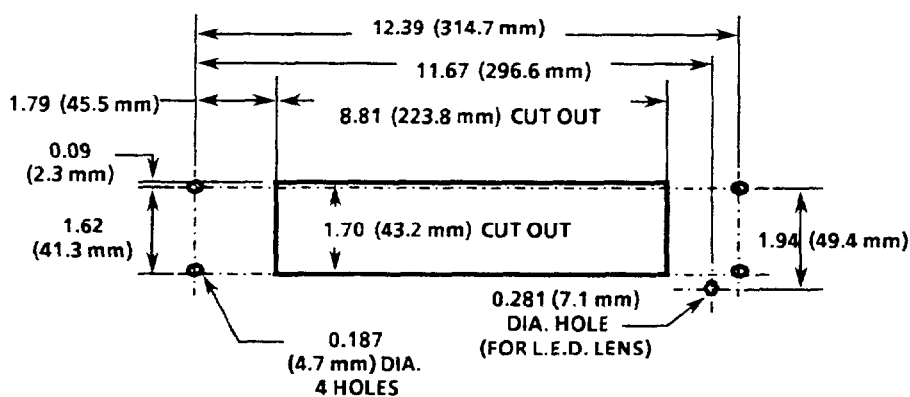


Series A Displays: The dimensions above apply to Series A displays, except that the Series A displays are not equipped with mounting studs. In place of the studs, there are six mounting holes, 0.218" (5.5mm). Use #10 screws in these holes for securing the display to the panel or enclosure.

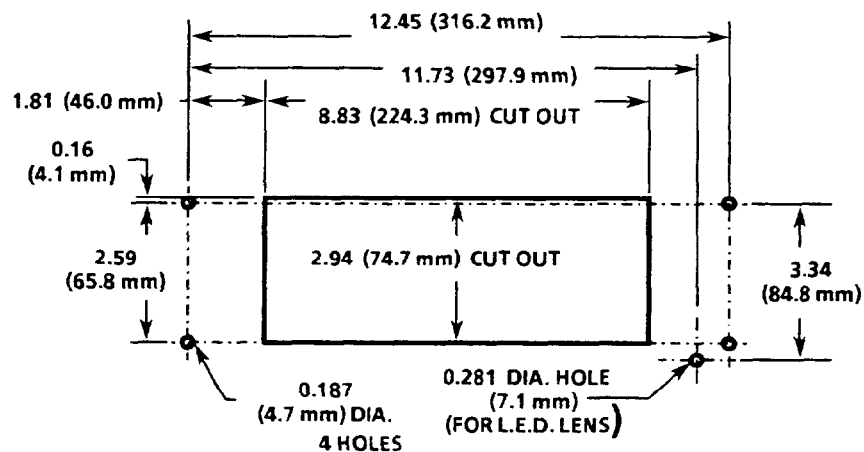
Flush Mount Panel Cutout Dimensions



Panel cutout – 1 line flush mounted display.



Panel cutout – 2 line flush mounted display.

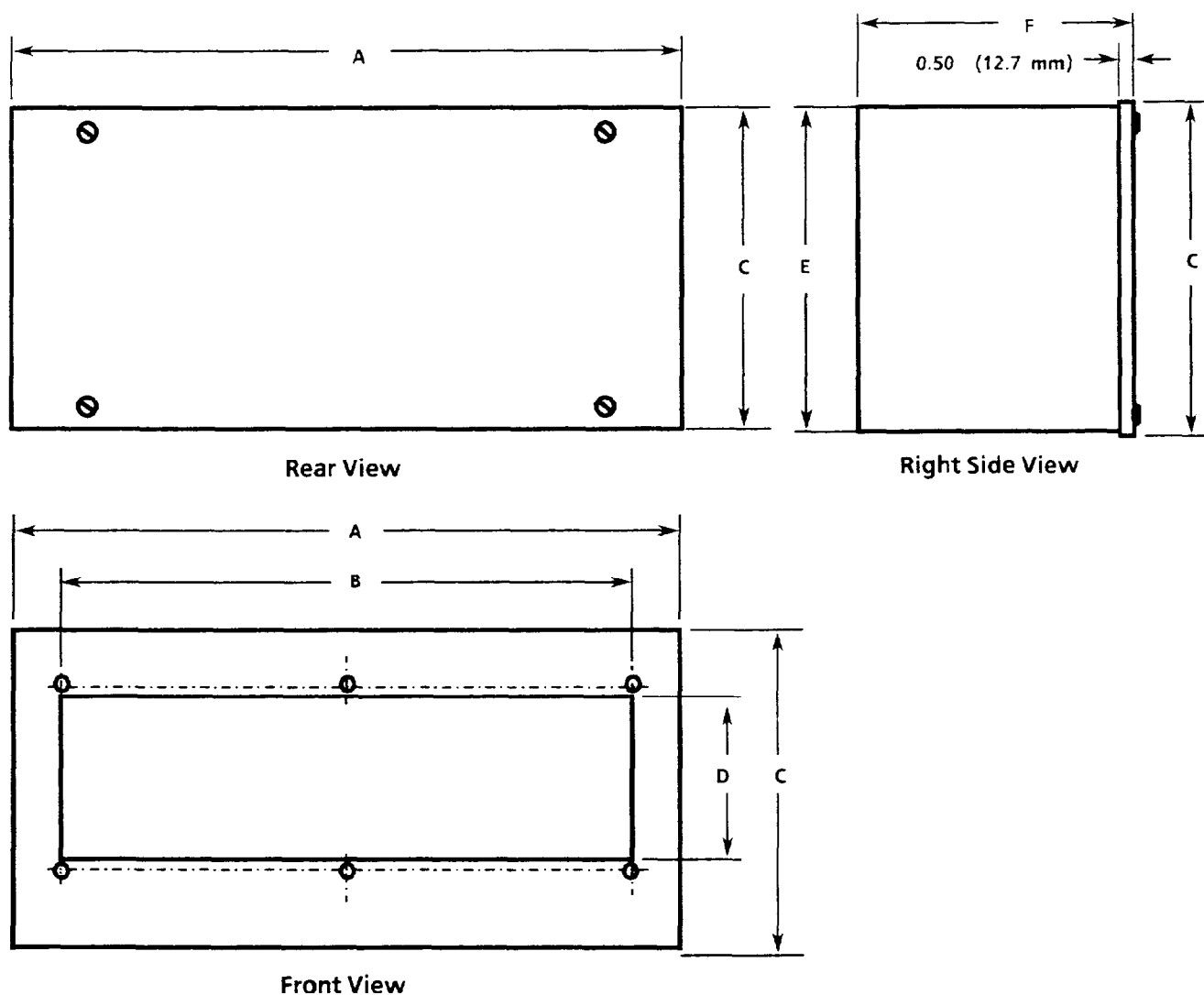


Panel cutout – 4 line flush mounted display.

Enclosure Dimensions Series B and later

NEMA TYPE 12/13 & 4 ENCLOSURES						
Catalog No.	A	B	C	D	E	F
2706-NE1	16.19 (411)	13.88 (352)	6.30 (160)	3.87 (98)	5.96 (151)	8.20 (208)
2706-NE2	16.19 (411)	13.88 (352)	8.10 (206)	5.68 (144)	7.77 (197)	8.20 (208)

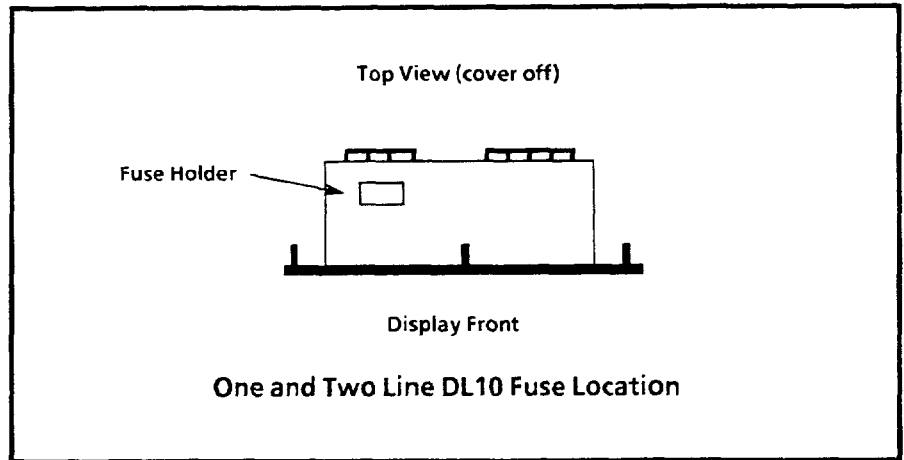
Dimensions are in inches and (millimeters).



Series A Enclosures: The Series A enclosures have threaded nuts welded inside the six display mounting holes and are intended for use with Series A DL10 displays only. However, it is possible to use a Series A enclosure for a Series B DL10 display if you first drill out the six threaded mounting holes with a 3/16" drill.

One and Two Line Displays

The one and two line Series B and later DL10 displays have one internal fuse which is in a fuse holder just under the top cover of the DL10 (see figure below). To access the fuse holder remove power to the display, then remove the top cover of the display by loosening the three cover screws. Replace the fuse, if necessary, with a 0.25 Amp, Type MDL, 250 VAC Fuse.



Four Line Display

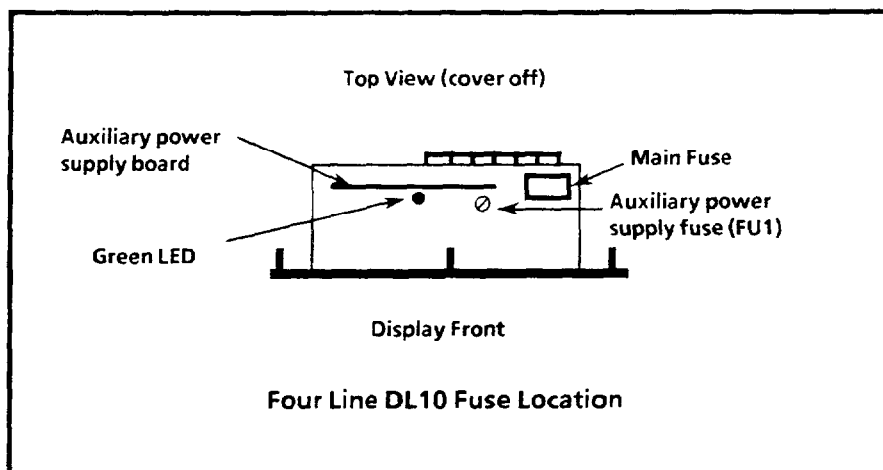
The four line Series B and later DL10 display has two fuses and one LED to aid in determining if either of the fuses are bad (see figure below).

To determine if one of the fuses is bad, remove power to the display and then remove the top cover of the display by loosening the three cover screws.

Once the cover is removed, apply power to the display and observe the state of the LED. If the LED is OFF, it is possible that one or both of the fuses are bad. Remove power and then check and replace one or both fuses if necessary.

Main Fuse – 1.5 Amp, Type MDL, 125 VAC

FU1 on Auxiliary Power Supply – 0.375 Amp, Type MDL, 250 VAC.





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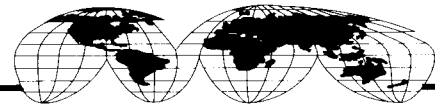


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