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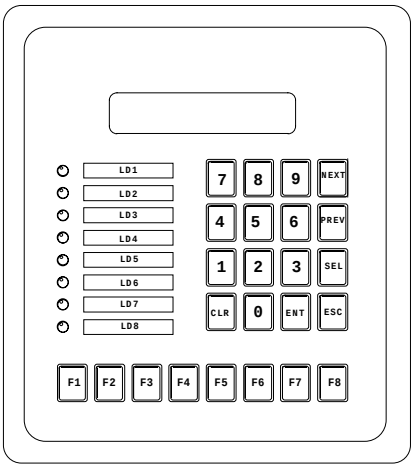
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Greyline 2000 Series

Operator Workstation Hardware Manual



TOTAL CONTROL

Greyline 2000 Series
Operator Workstation Hardware Manual
2024-701
Revision D
December, 1997

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Chapter 1 - Welcome

Welcome!

Total Control Products, Inc. is proud to present its newest family of products, the Greyline 2000 Series Operator Workstations.

What Manual Should I Use...?

...to Install and Connect the Greyline Workstation

For information on installing and connecting the Greyline Workstation, refer to this manual, the "Greyline Operator Workstation Hardware Manual." This manual provides installation information, dimensions, connections and specifications. In addition, this manual introduces the user to the hardware features of the Greyline.

...to Program and Operate the Greyline Workstation

For information on programming and operating the Greyline Workstation, refer to the "Greyline Universal Software Manual" in combination with the applicable protocol reference guide.

CAUTION Please read this documentation before attempting to install the unit.

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Chapter 2 - Receiving Inspection

Packing List

After receiving your Greyline Operator Workstation, you should immediately check to confirm that you have received the following items:

- Greyline Operator Workstation
- Greyline Operator Workstation Hardware and Software Manuals
- Set of Replaceable Legend Sheets
- Protocol Reference Guides
- Ten 10-16 x 3/8" Hi-Lo Thread Forming Fasteners with Blunt Point (8 required; 2 spares)
- Ten Lockwashers (8 required; 2 spares)

What to Do if Something is Missing or in Error

If you find that there has been a packing error, contact Customer Service at:

(708) 345-5500	Customer Service
(708) 345-5670	FAX

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Chapter 3 - Introduction: Main Features

Introduction to the Greyline Operator Workstation

The 2000/2100 Series Greyline Operator Workstations feature 2 or 4 line alphanumeric LCD displays, encased in lightweight molded plastic. The following sections describe the hardware features of the Greyline Operator Workstation. There are two models, the 2000 Series which feature a Backlit Supertwist LCD display, and the 2100 Series, which feature a Vacuum Fluorescent display.

Options

The following options may be specified for the Greyline Operator Workstation:

1. 10-30 VDC powered unit
2. 230 VAC powered unit
3. Clock/Calendar Chip

10-30 VDC Powered Unit (10VDC)

If you specified the 10-30 VDC powered unit as an option, refer to the section addressing connections for the 10-30 VDC.

230 VAC Powered Unit (230VAC)

If you specified the 230 VAC powered unit as an option, refer to the section addressing connections for the 230 VAC.

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Clock/Calendar Chip

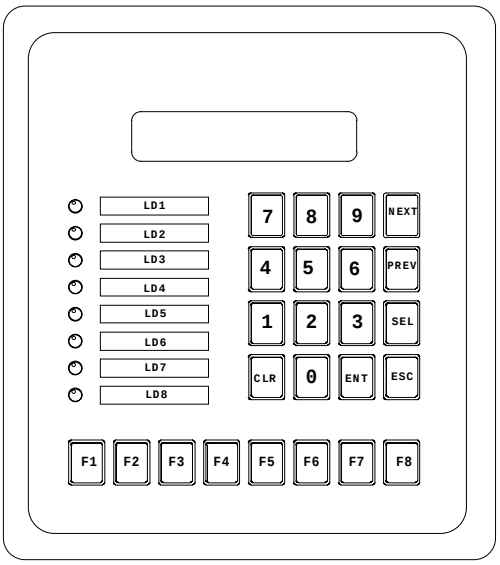
This option keeps track of the time and date. Refer to the Greyline Universal Software Manual for further information.

Main Features

The following sections describe the main features of the Greyline Operator Workstation.

Front Panel Features

The following sections describe the front panel features of the Greyline Operator Workstation. Below is an illustration of the front panel.



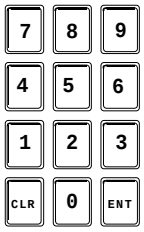
Alphanumeric Display

The Greyline Operator Workstation features a 2 or 4 line alphanumeric display. This 5mm Backlit Super Twist LCD display (2000 Series) is capable of displaying up to 20 characters per line. Models 2024 and 2124 feature the 2 line display. Model 2025 and 2125 feature the 4 line display. Model 20xx is LCD and Model 21xx is VF.

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Numeric Keypad

The numeric keypad features digits 0-9, Clear and Enter keys, and 4 additional function keys. The Clear key cancels the keypad data entry in progress. The Enter key completes the keypad data entry.



Refer to the following section for a description of the numeric function keys.

Note:	The Greyline Operator Workstation features a "beep" which provides audible feedback to the user. One beep signals a positive acknowledgement and two beeps signal a negative acknowledgement.

Numeric Function Keys

There are four numeric function keys to the right of the numeric keypad. These numeric function keys are user definable and are independent of the numeric keypad. Refer to your Greyline Universal Software Manual for further information.



Note:	The Greyline Operator Workstation features a "beep" which provides audible feedback to the user. One beep signals a positive acknowledgement and two beeps signal a negative acknowledgement.

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Function Keys

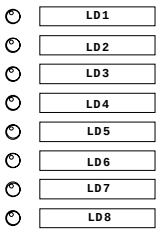
Function keys F1 through F8 are located below the numeric keypad. These function keys are user definable. Refer to your Greyline Universal Software Manual for further information.



Note: The Greyline Operator Workstation features a "beep" which provides audible feedback to the user. One beep signals a positive acknowledgement and two beeps signal a negative acknowledgement.

LEDs

LEDs, located on the left side of the front panel, are user definable and typically reflect the status of a bit in the PLC. The LEDs are independent of the function keys. Refer to the Greyline Universal Software Manual for further information.



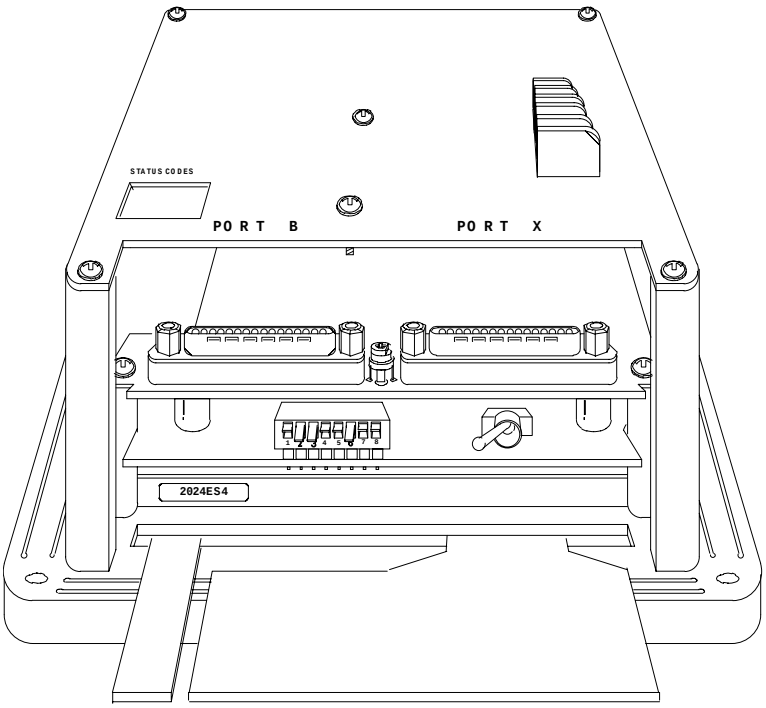
Replaceable Legends

Replaceable legends (blank slip-in legend sheets) are provided for function keys, LEDs, and the numeric function keys. These legend sheets are made of durable plastic and are comprised of two separate strips -- one for the LEDs, function keys F1 through F7, and another for the numeric function keys and function key F8. The removable legends are located beneath the surface of the Greyline front panel. The following section describes how to remove and replace the legend strips.

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Installing the Replaceable Legends

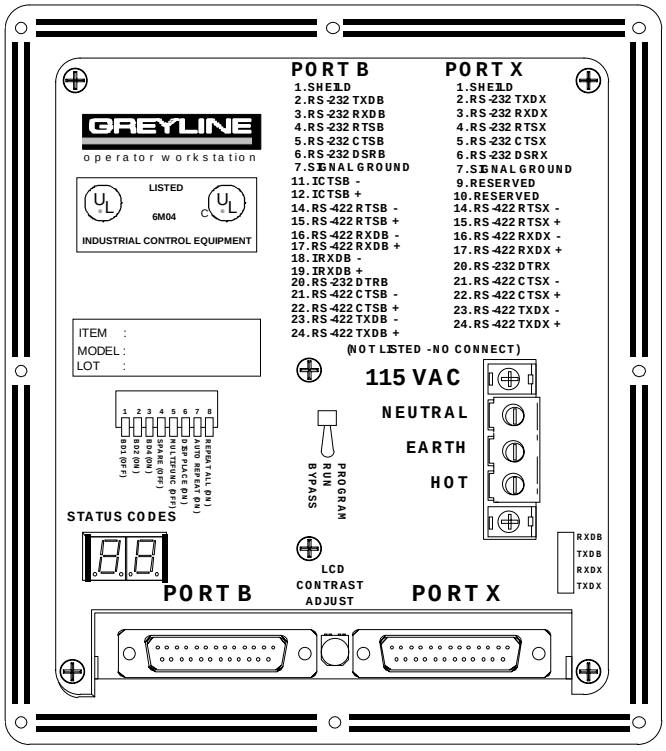
The illustration below shows where the legend sheets are located. To remove the legend sheets, tilt the Greyline and pull firmly on the ends of the legend sheets protruding from the unit. To replace the legend sheets, insert the replacement set into the openings where the original legend sheets were removed. If you have problems inserting the new legends, try trimming the edges so that the new legends are the same size or slightly smaller than the originals.



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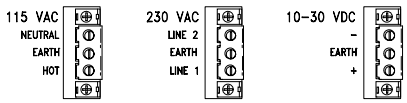
Rear Panel Features

The following sections describe the rear panel features of the Greyline Operator Workstation. Below is an illustration of the rear panel (2000 Series).



Power Connection

The power connection for the Greyline is located on the lower right portion of the rear panel. The illustration below shows the power connections for 115 VAC, 230 VAC, and 10-30 VDC.



Port B

Port B is located to the left of Port X on the lower portion of the Greyline rear panel. Serial communication using RS-232, RS-422, RS-485 or current loop may be used for connecting Port B to the PLC. Communication connections are made through 25 pin "D" type connectors.

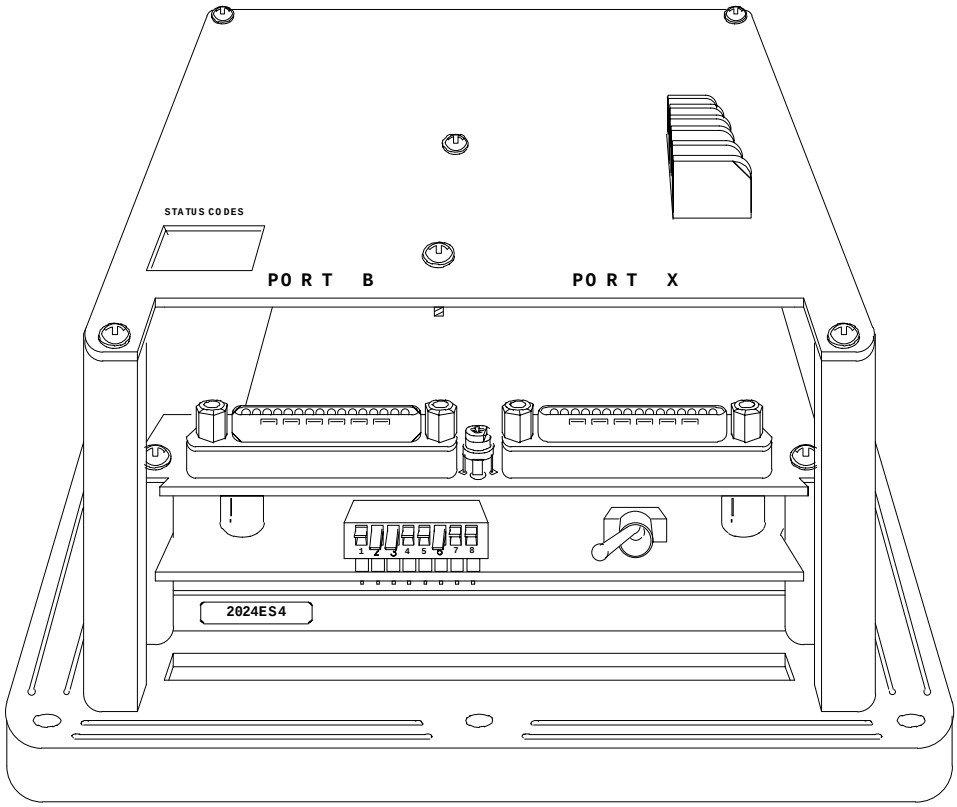
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Port X

Port X, a serial expansion port, is located to the right of Port B on the lower portion of the Greyline rear panel. This Auxiliary port provides flexibility for the Greyline user. Although used primarily for programming the workstations, Port X may also be configured to interface with a SERIES TWO network, a serial printer, a host computer, or a different model PLC. Serial communication using RS-232, RS-422, and RS-485 may be used. Communication connections are made through 25 pin "D" type connectors.

Dip Switch

The Dip Switch is located on the underside (interior) of the rear panel, beneath Port B and to the far left of the Program/Run/Bypass Switch. The switches are marked 1 through 8. Refer to Chapter 4 for information on the Dip Switch settings. The following illustration depicts the underside of the rear panel.



Status Codes

The Status Codes are located to the left, above Port B on the rear panel of the Greyline Operator Workstation. When lit, these status codes display coded numbers which indicate possible errors or status information. Refer to the tables in the Greyline Universal Software Manual for a complete listing of the Status Codes.

Program/Run/Bypass Switch

The Greyline features a Program/Run/Bypass Switch located on the underside (interior) of the rear panel, beneath Port X and to the right of the Dip Switch. This switch allows the user to program the workstation,

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run the program following completion of programming, and/or bypass directly to the PLC for programming purposes. Refer to the Greyline Universal Software Manual for further information.

Note:	Before Bypass mode can be selected, the user must first download a TSP or Greyline Universal Software configuration matching the communication parameters of Port B and the PLC model.

LCD Adjust

The LCD Contrast Adjust is located at the center of the underside (interior) of the rear panel. A blue-colored knob, this LCD Adjust is used to change the contrast of the display of the Greyline Operator Workstation. Refer to paragraph 4.3 for instructions. This adjustment is only available on Backlit Supertwist LCD models (20xx Series).

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Chapter 4 - Switch Settings

Dip Switch

Default settings for dip switches 1 through 8 are shown below.

Switch No.	Function	Position
1	Baud Rate 1	OFF
2	Baud Rate 2	ON
3	Baud Rate 4	ON
4	Spare	OFF
5	Multiple Function Keys	OFF
6	Displacement Placeholder	ON
7	Auto Repeat	ON
8	Repeat All	ON

Baud Rate

The baud rate for the Greyline Operator Workstation is switch selectable if in Program mode, and software selectable if in Run and Bypass mode. Refer to the Greyline Universal Software Manual for a more complete explanation for baud rates that are software selectable (Run and Bypass mode).

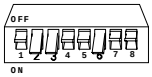
In Program mode, the baud rate is switch selectable, meaning that the baud rate is determined by the position of the Dip Switch. Although the baud rate choices are 300, 600, 1200, 2400, 4800, 9600, and 19200, at this time, the software **only supports 9600**. Therefore, after switches 1, 2, and 3 are initially set for 9600 baud, there is no need to make future adjustments.

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Baud Rate 1, Baud Rate 2, and Baud Rate 4 constitute Dip Switch switches 1, 2, and 3 respectively. If in Program mode, adjust the switches as indicated by the gray area shown below, to select the appropriate baud rate:

BD RT 1	BD RT 2	BD RT 4	Baud Rate
0	0	0	Test Mode
1	0	0	300 baud
0	1	0	600 baud
1	1	0	1200 baud
0	0	1	2400 baud
1	0	1	4800 baud
0	**1**	**1**	**9600 baud**
1	1	1	19200 baud

*A "0" in the above chart represents a switch which is **off** or **open**. A "1" in the chart represents a switch which is **on** or **closed**.*



Note: Set switches then cycle power. Switches are only read during power up.

Multiple Function Keys

Switch 5 on the Dip Switch. When this switch is activated, the Greyline is capable of recognizing multiple function keys.

Display Placeholder

Switch 6 on the Dip Switch. When this switch is activated, variable data placeholders appear as underscore characters on the Greyline display. When not activated, variable data placeholders appear as space characters on the Greyline display. Refer to your Greyline Universal Software Manual for further information.

Auto Repeat

Switch 7 on the Dip Switch. When this switch is activated, the function keys will automatically repeat when pressed and held down.

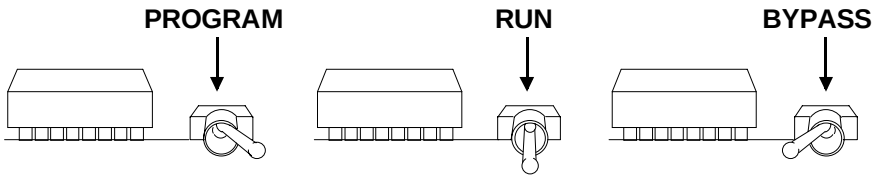
Repeat All

Switch 8 on the Dip Switch. When this switch is activated, both the function keys and numeric function keys will automatically repeat when pressed and held down.

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Program/Run/Bypass Switch

The illustration below shows the position of the toggle switch for all three modes.

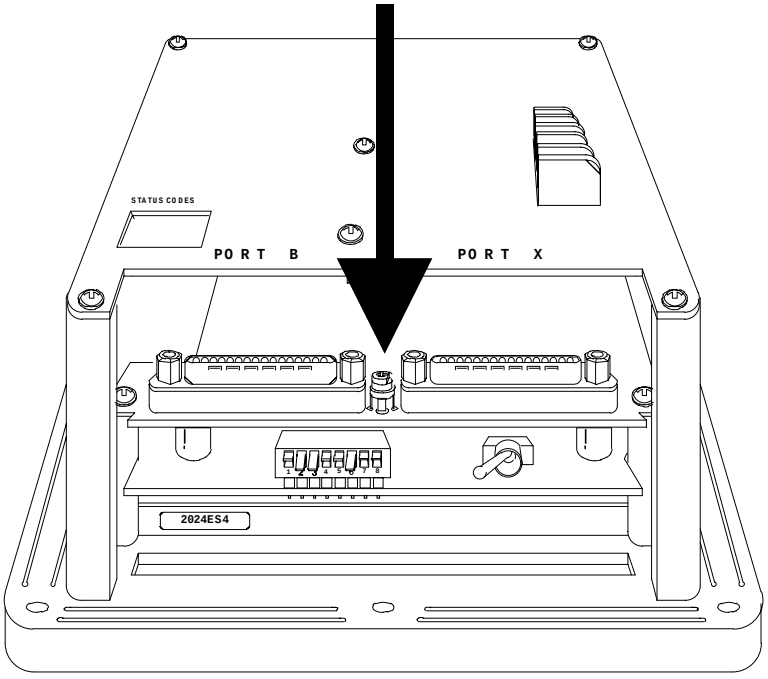


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LCD Contrast Adjust

To calibrate the Backlit Supertwist LCD display (2000 Series), use a Phillips type screwdriver and turn the Contrast Adjust until the desired contrast is achieved. The graphic below illustrates the location of the adjustment screw.

ADJUST LCD CONTRAST WITH PHILLIPS TYPE SCREWDRIVER



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Chapter 5 - Electrical Connections

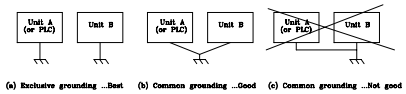
Power Connections

Power connections are made to the rear panel of the Greyline. The following sections address the specific connections for the standard 115 VAC, in addition to 230 VAC and 10-30 VDC.

Chassis Ground

Connect an exclusive grounding circuit to the power supply of the Greyline, at the connection marked "EARTH." Grounding is third wire grounding with less than 100 ohms resistance.

When exclusive grounding is not possible, use a common grounding circuit (Figure B).



Make the grounding point as close to the unit as possible, keeping the ground wire as short as possible.

Logic Ground

Important! The communication driver circuits of some Total Control devices may be damaged if communication cables are not properly grounded! This will require that the device be returned to Total Control for repairs. Read the following material for grounding information.

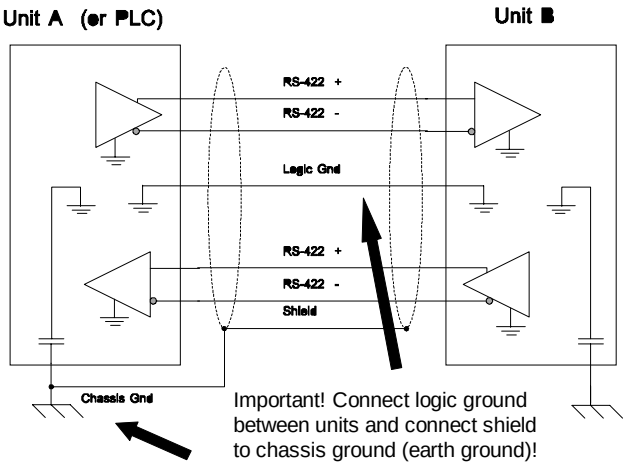
It is important that communication cables connected to Total Control devices be properly grounded. This is true of all types of communication (RS-232, RS-422, and RS-485).

When connecting communication cables you must connect the logic ground line from each device to the next in the serial link.

In addition to the logic ground, it is also important to properly connect the cable shield. For increased noise immunity, the shield should be connected to chassis ground, **not** logic ground.

Refer to the diagram below.

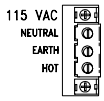
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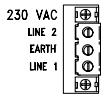
115 VAC

The following illustration indicates the power supply connections for standard 115 VAC.



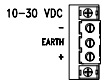
230 VAC

230 VAC is an option. The following illustration indicates the power supply connections for 230 VAC.



10-30 VDC

10-30 VDC is an option. The following illustration indicates the power supply connections for 10-30 VDC.



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Chapter 6 - Greyline Communication Ports

SERIES TWO Devices on a Port

SERIES TWO devices may be connected to Port B or Port X.

PLCs on a Port

PLCs may be connected to either Port B or Port X, depending on the PLC model. Different PLCs may be connected to Port B and Port X at the same time.

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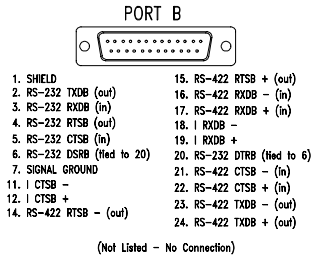
Port B

Port B may be commonly referred to as a "PLC Port," however, it is possible to connect more than just PLCs to Port B.

This port is configured as a DTE (Data Terminal Equipment) port.

Pinout - Port B

The pinout for Port B is illustrated below.



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PLC Cables

To connect PLCs to the Greyline Operator Workstation, PLC cables are required. Since different cables are required for different PLC models, it is recommended that you contact Total Control Customer Service department for specific cable information.

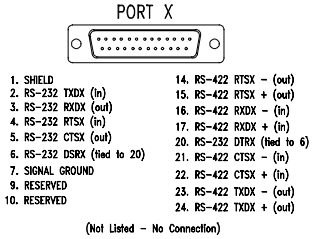
Port X

Port X is a serial expansion port, and may be connected to a SERIES TWO device, a serial printer, a host computer, or a PLC.

This port is configured as a DCE (Data Communication Equipment) port.

Pinout - Port X

The pinout for Port X is illustrated below.



Programming Cable

A programming cable CBL-154 (9 pin or AT) is necessary when downloading to the Greyline. Connect the programming cable to Port X and your personal computer, and disconnect when programming is completed.

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Chapter 7 - Power On and Self Test

Power On

To power on, simply plug in the Greyline Operator Workstation unit.

Note:	If there is no power, check to be certain that you have connected power to the unit, that you have correct polarity and the proper supply (AC, DC, ample current). Refer to the sections which discuss connections and specifications.

Self Test

Self Test automatically occurs when the unit is powered on. Upon completion of self test, the display prompts:

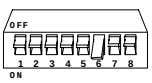
TOTAL CONTROL PRODUCTS

SELF TEST PASSED

Note:	If the unit does **not** pass the Self Test, it is possible that you have a defective unit. Contact Total Control Products, Inc.

Local Self Test

Switches 1, 2 and 3 of the Dip Switch must be set to the "Off" position (Test mode) for Local Self Test.



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Testing Switch Settings

In Test mode, test the switch settings of the Dip Switch by pressing numeric keypad digit "0." The display will promptly display the corresponding switch settings in ON and OFF position. (i.e. "00010000"). If the Greyline does not display the actual switch setting(s), a defect may exist. Contact Total Control Products, Inc.' Customer Service department.

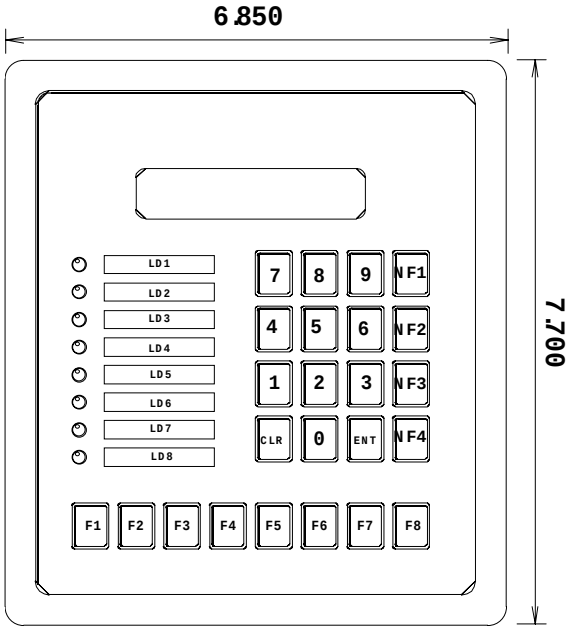
Testing Keys

In Test mode, test the keys of the Greyline Operator Workstation by pressing the individual function keys, numeric function keys and keypad numeric keys (digits 0-9, including Clear and Enter). The display will indicate the key pressed (i.e. "F8/Self Test Passed"). If the Greyline does not recognize the key pressed, a defect may exist. Contact Total Control Products, Inc.' Customer Service department.

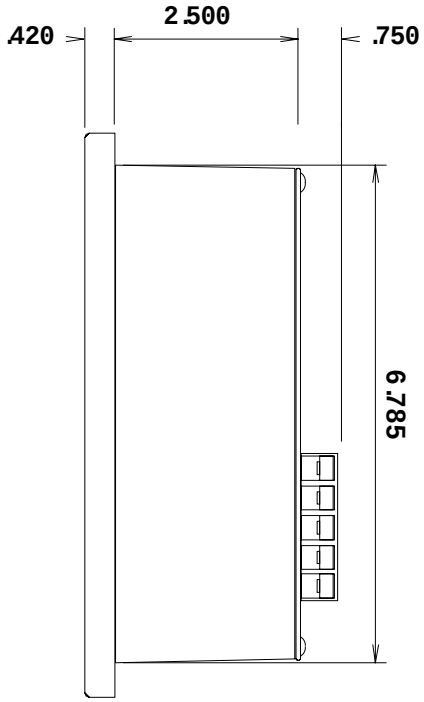
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Chapter 8 - Dimensions

The following illustrations show the front panel, side view, and panel cut out dimensions for the Greyline Operator Workstation.

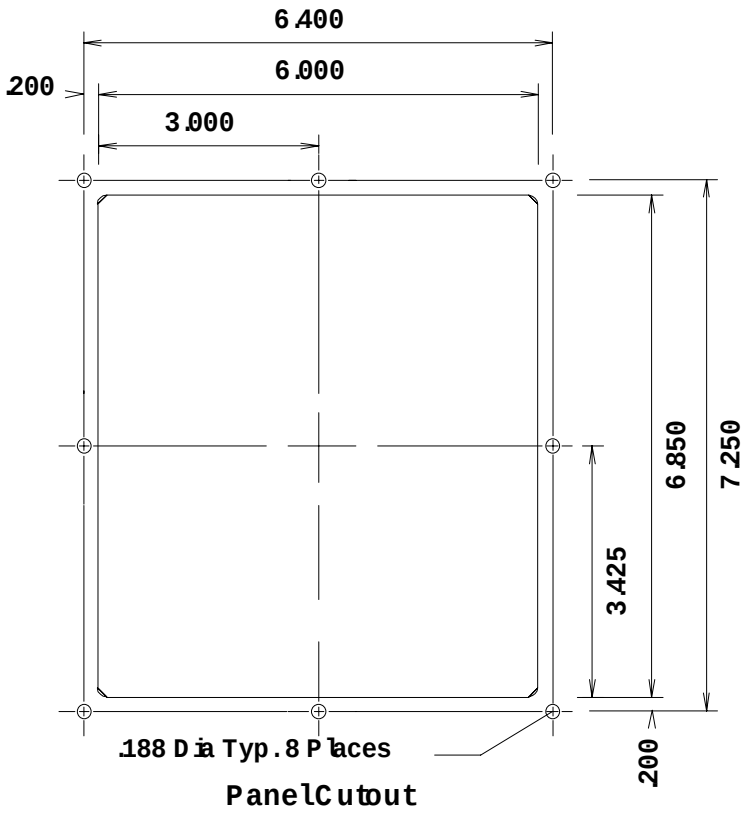


Front View



Side View

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Important!	When mounting the unit, the special 10-16 x 3/8" Hi-Lo Thread Forming Fasteners with Blunt Point must be used. Ten of these fasteners have been shipped with the Greyline Operator Workstation. Only 8 fasteners are required; 2 spares are included. Under no circumstances, should other types of fasteners be substituted.

Note:	The correct panel thickness range for the unit is .060" - .135".

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Chapter 9 - Specifications

2000 Series

Power Requirements:	93-135VAC, 50/60HZ, 6W 190-270VAC, 50/60HZ, 6W 10-30 VDC (unreg.), 6W, max 550 mA @ 10VDC
Panel Sealing:	Type 4X (Indoor Only)
Operating Temperature:	0° to 40° C, -32° to 104°F
Storage Temperature:	-20° to +60° C, -4° to 140°F
Humidity:	10% to 95%, non-condensing
Size:	6.850 W x 7.700 H x 3.670 D (inches) 173.99 W x 195.58 H x 93.22 D (millimeters)
Weight:	Approx. 2 lbs., .907 Kg.
Display Type:	Backlit Super Twist LCD
Display Features:	20 characters per line Adjustable Contrast
Number of Lines:	2 (2024), 4 (2025)
Characters:	5 mm, 5 x 7 dot matrix
Program/Message Storage:	Flash EPROM 128K optional
Greyline Port (Port A):	Internal, fixed parameters
PLC Port (Port B):	Communication: Serial RS-232, RS-422, RS-485 or current loop Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19.2K
Auxiliary Port (Port X):	Serial RS-232, RS-422, RS-485
Baud Rate - Program:	Only 9600 is supported.
Baud Rate - Run:	300, 600, 1200, 2400, 4800, 9600, 19.2K, Software Selectable
Mounting Hardware:	Mounting Screw Torque: 6-8 in./lb. Panel Thickness Range: .060" - .135" when using supplied 10-16 x 3/8" Hi-Lo Thread Forming Fasteners with Blunt Point; and Lockwashers.
Agency Approval:	UL and CUL.

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2100 Series

Power Requirements:	93-135VAC, 50/60Hz, 6W 190-270VAC, 50/60Hz, 6W 10-30 VDC (unreg.), 6W, max 550 mA @ 10VDC
Panel Sealing:	Type 4X (Indoor Only)
Operating Temperature:	0° to 50° C, -32° to 122°F
Storage Temperature:	-20° to +60° C, -4° to 140°F
Humidity:	10% to 95%, non-condensing
Size:	6.850 W x 7.700 H x 3.670 D (inches) 173.99 W x 195.58 H x 93.22 D (millimeters)
Weight:	Approx. 2 lbs., .907 Kg.
Display Type:	Vacuum Fluorescent (green)
Display Features:	20 characters per line Adjustable Contrast
Number of Lines:	2 (2124), 4 (2125)
Characters:	5 mm, 5 x 7 dot matrix
Program/Message Storage:	Flash EPROM 128K optional
Greyline Port (Port A):	Internal, fixed parameters
PLC Port (Port B):	Communication: Serial RS-232, RS-422, RS-485 or current loop Baud Rate: 300, 600, 1200, 2400, 4800, 9600, 19.2K
Auxiliary Port (Port X):	Serial RS-232, RS-422, RS-485
Baud Rate - Program:	Only 9600 supported.
Baud Rate - Run:	300, 600, 1200, 2400, 4800, 9600, 19.2K, Software Selectable
Mounting Hardware:	Mounting Screw Torque: 6-8 in./lb. Panel Thickness Range: .060" - .135" when using supplied 10-16 x 3/8" Hi-Lo Thread Forming Fasteners with Blunt Point; and Lockwashers.
Agency Approval:	UL and CUL.

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