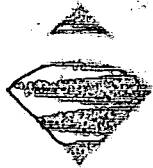


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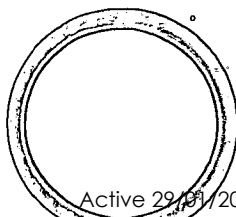
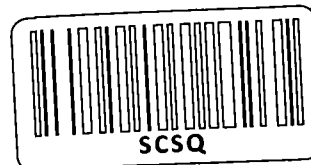
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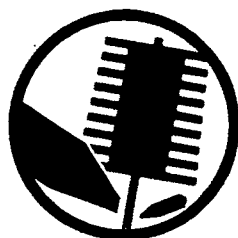
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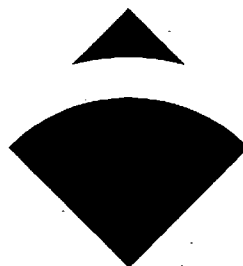
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## **PART 3**

### **Section 25**

### **Electrical**

# **Allen Bradley Compact I/O Analogue Modules User Manual**



**Allen-Bradley**

**Compact I/O  
Analog Modules**  
(Cat. No. 1769-IF4 and  
1769-OF2)

# User 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 a hazard
- recognize the consequences

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

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RSLogix 500™ is a trademark of Rockwell Software.  
Belden is a trademark of Belden, Inc.

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## Preface

Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- who should use this manual
- how to use this manual
- related publications
- conventions used in this manual
- Allen-Bradley support

### Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen-Bradley Compact I/O and/or Micrologix™ 1500 controllers.

### How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate and troubleshoot a control system using the 1769 analog I/O modules.

### Manual Contents

If you want..	See
An overview of the analog input and output modules	Chapter 1
A quick start guide for experienced users	Chapter 2
Installation and wiring guidelines	Chapter 3
Input module addressing, configuration and status information	Chapter 4
Output module addressing, configuration and status information	Chapter 5
Information on module diagnostics and troubleshooting	Chapter 6
Specifications for the input and output modules	Appendix A
Information on understanding two's complement binary numbers	Appendix B
Definitions of terms used in this manual	Glossary

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### Related Documentation

The table below provides a listing of publications that contain important information about MicroLogix 1500 systems.

For	Read this document	Document number
A user manual containing information on how to install, use and program your MicroLogix 1500 controller	MicroLogix™ 1500 User Manual	1764-6.1
Installation guides for 1769 Discrete Compact I/O module 1769-IA16	Compact 1769-IA16 120V ac Input Module Installation Instructions	1769-5.1
Installation guides for 1769 Discrete Compact I/O module 1769-OW8	Compact 1769-OW8 AC/DC Relay Output Module Installation Instructions	1769-5.2
Installation guides for 1769 Discrete Compact I/O module 1769-IQ16	Compact 1769-IQ16 24V dc Sink/Source Input Module Installation Instructions	1769-5.3
Installation guides for 1769 Discrete Compact I/O module 1769-OB16	Compact 1769-OB16 Solid State 24V dc Source Output Module Installation Instructions	1769-5.4
Installation guides for 1769 Discrete Compact I/O module 1769-OA8	Compact 1769-OA8 100 to 240V ac Solid State Output Module Installation Instructions	1769-5.5
Installation guides for 1769 Discrete Compact I/O module 1769-OV16	Compact 1769-OV16 Solid State 24V dc Sink Output Module Installation Instructions	1769-5.6
Installation guides for 1769 Discrete Compact I/O module 1769-IQ6XOW4	Compact 1769-IQ6XOW4 24V dc Sink/Source Input AC/DC Relay Output Module Installation Instructions	1769-5.7
Installation guides for 1769 Discrete Compact I/O module 1769-IM12	Compact 1769-IM12 240V ac Input Module Installation Instructions	1769-5.8
An overview of 1769 Compact Discrete I/O modules	1769 Compact Discrete Input/Output Modules Product Data	1769-2.1
An overview of 1769 Compact Analog I/O modules	1769 Compact Analog Input/Output Modules Product Data	1769-2.2
In-depth information on grounding and wiring Allen-Bradley programmable controllers.	Allen-Bradley Programmable Controller Grounding and Wiring Guidelines	1770-4.1

If you would like a manual, you can:

- download a free electronic version from the internet at [www.theautomationbookstore.com](http://www.theautomationbookstore.com)
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  - visiting [www.theautomationbookstore.com](http://www.theautomationbookstore.com) and placing your order
  - calling 1.800.963.9548 (USA/Canada) or 001.330.725.1574 (Outside USA/Canada)

## Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- Text in this font indicates words or phrases you should type.

## Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

### Local Product Support

Contact your local Allen-Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreement

### Technical Product Assistance

If you need to contact Allen-Bradley for technical assistance, please review the information in Chapter 6, *Module Diagnostics and Troubleshooting* first. Then call your local Allen-Bradley representative.

### Your Questions or Comments on the Manual

If you find a problem with this manual, please notify us using the self-mailer Publications Problem Report in the front of this manual.

If you have any suggestions for how this manual could be made more useful to you, please contact us at the address below:

Allen-Bradley Company, Inc.  
Control and Information Group  
Technical Communication, Dept. A602V, T122  
P.O. Box 2086  
Milwaukee, WI 53201-2086

# Chapter 1

## Overview

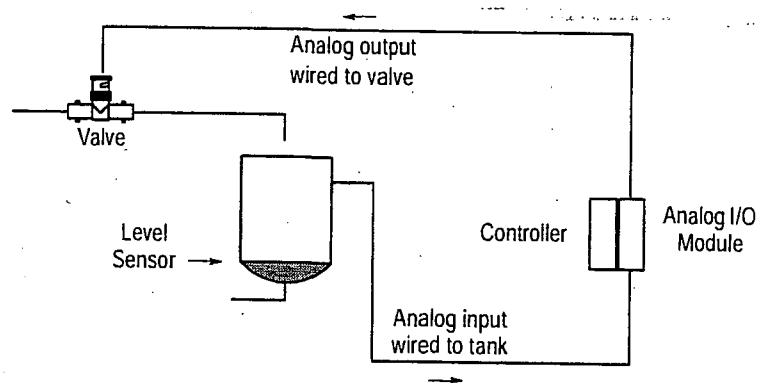
This chapter explains how analog data is used, and describes the 1769-IF4 analog input module and the 1769-OF2 analog output module. Included is information about:

- the use of analog I/O
- the modules' hardware and diagnostic features
- an overview of the 1769 analog input system operation
- an overview of the 1769 analog output system operation

### How to Use Analog I/O

Analog refers to the representation of numerical quantities by the measurement of continuous physical variables. Analog applications are present in many forms. The following application shows a typical use of analog data.

In this application, the processor controls the amount of fluid in a holding tank by adjusting the valve opening. The valve is initially open 100%. As the fluid level in the tank approaches the preset point, the processor modifies the output to close the valve 90%, 80%, and so on, continuously adjusting the valve to maintain the fluid level.



## General Description

The 1769-IF4 analog input module converts and digitally stores analog data for retrieval by controllers, such as the MicroLogix™ 1500. The module supports connections from any combination of up to four voltage or current analog sensors. The four high-impedance input channels can be wired as either single-ended or differential inputs.

The 1769-OF2 output module provides two single-ended analog output channels, each individually configurable for voltage or current.

Both modules provide the following input/output types/ranges:

Table: 1.A Normal and Full Ranges

Normal Operating Input Range	Full Module Range
$\pm 10\text{V dc}$	$\pm 10.5\text{V dc}$
1 to 5V dc	0.5 - 5.25V dc
0 to 5V dc	-0.5 - +5.25V dc
0 to 10V dc	-0.5 - +10.5V dc
0 to 20 mA	0 - 21 mA
4 to 20 mA	3.2 - 21 mA

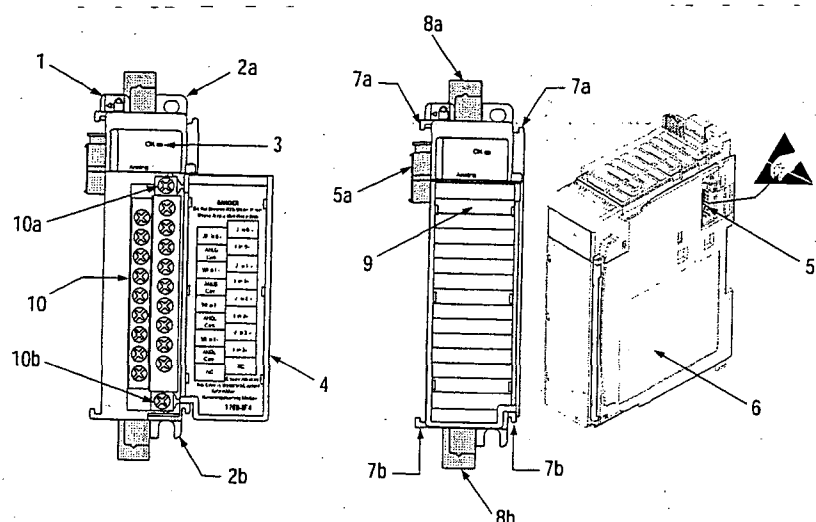
The data can be configured on board each module as:

- Engineering Units
- Scaled-for-PID
- Percent
- Raw/Proportional Data

## Hardware Features

The modules contain removable terminal blocks. The 1769-IF4's four channels can be wired as either single-ended or differential inputs. The 1769-OF2's two channels are single-ended only. Module configuration is normally done via the controller's programming software. In addition, some controllers support configuration via the user program. In either case, the module configuration is stored in the memory of the controller. Refer to your controller manual for more information.

The illustration below shows the hardware features of both the 1769-IF4 and the 1769-OF2 modules.



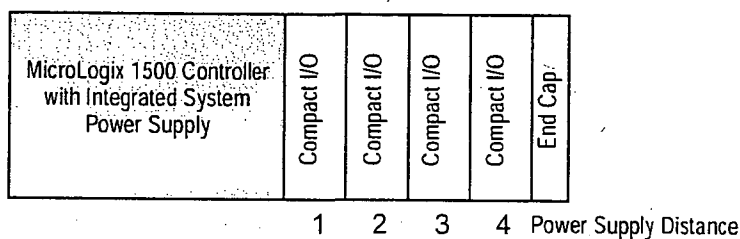
Item	Description
1	bus lever
2a	upper panel mounting tab
2b	lower panel mounting tab
3	Module Status LED
4	module door with terminal identification label
5a	movable bus connector (bus interface) with female pins
5b	stationary bus connector (bus interface) with male pins
6	nameplate label
7a	upper tongue-and-groove slots
7b	lower tongue-and-groove slots
8a	upper DIN rail latch
8b	lower DIN rail latch
9	write-on label for user identification tags
10	removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw

## General Diagnostic Features

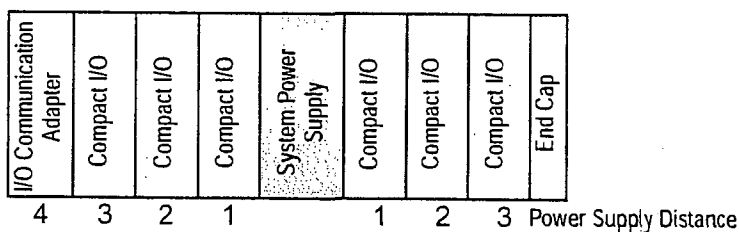
The 1769-IF4 and 1769-OF2 modules contain diagnostic features that can help you identify the source of problems that may occur during power-up or during normal channel operation. These power-up and channel diagnostics are explained in chapter 6, *Module Diagnostics and Troubleshooting*.

## System Overview

The modules communicate to the controller through the bus interface. The modules also receive 5 and 24V dc power through the bus interface. You can install as many analog modules as your power supply can support. However, the modules have a power supply distance rating of 8, which means that they may not be located more than 8 modules away from the system power supply.



OR



## System Operation

At power-up, the module performs a check of its internal circuits, memory, and basic functions. During this time, the module status LED remains off. If no faults are found during power-up diagnostics, the module status LED is turned on.

After power-up checks are complete, the module waits for valid channel configuration data. If an invalid configuration is detected, the module generates a configuration error. Once a channel is properly configured and enabled, it begins the analog-to-digital or digital-to-analog conversion process.

### Input Module

Each time a channel is read by the input module, that analog data value is tested by the module for an over-range or under-range condition. If such a condition is detected, a unique bit is set in the channel status word. The channel status word is described in "1769-IF4 Input Data File" on page 4-2.

The controller reads the two's complement binary converted analog data from the module. This typically occurs at the end of the program scan or when commanded by the control program. If the controller and the module determine that the bus data transfer was made without error, the data is used in your control program.

### Output Module

The output module monitors channels for over-range and under-range conditions and also for broken output wires and high load resistance (in current mode only). If such a condition is detected, a unique bit is set in the channel status word. The channel status word is described in "1769-OF2 Input Data File" on page 5-2.

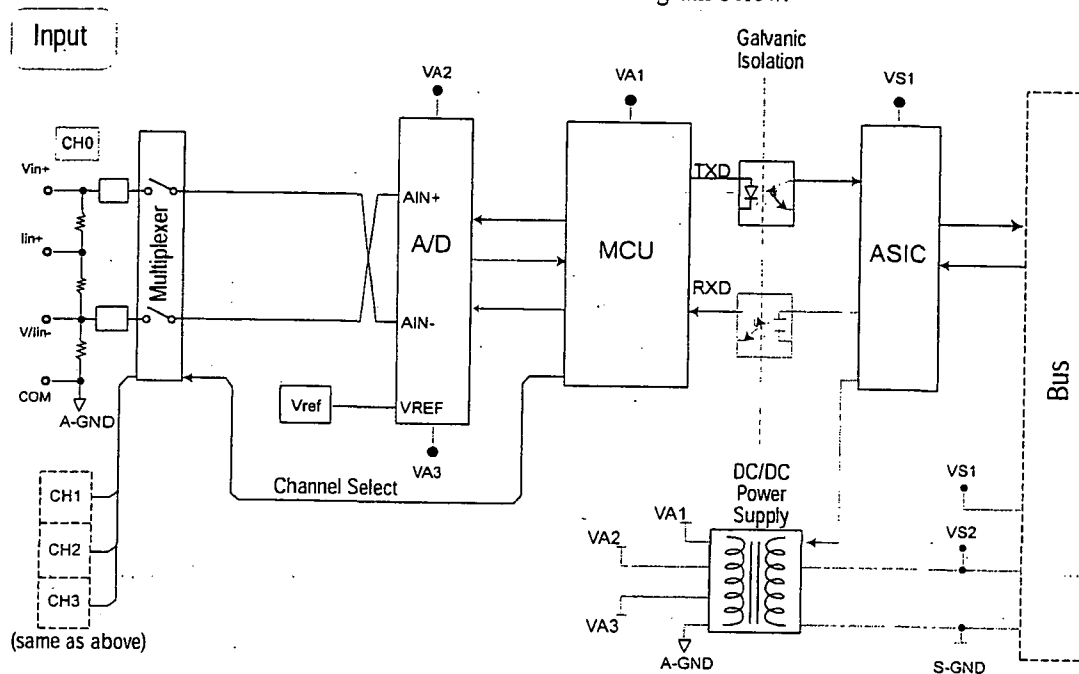
The output module receives two's complement binary values from the bus master. This typically occurs at the end of the program scan or when commanded by the control program. If the controller and the module determine that the bus transfer was completed without error, the output module converts the data to an analog output signal.

## 1-6

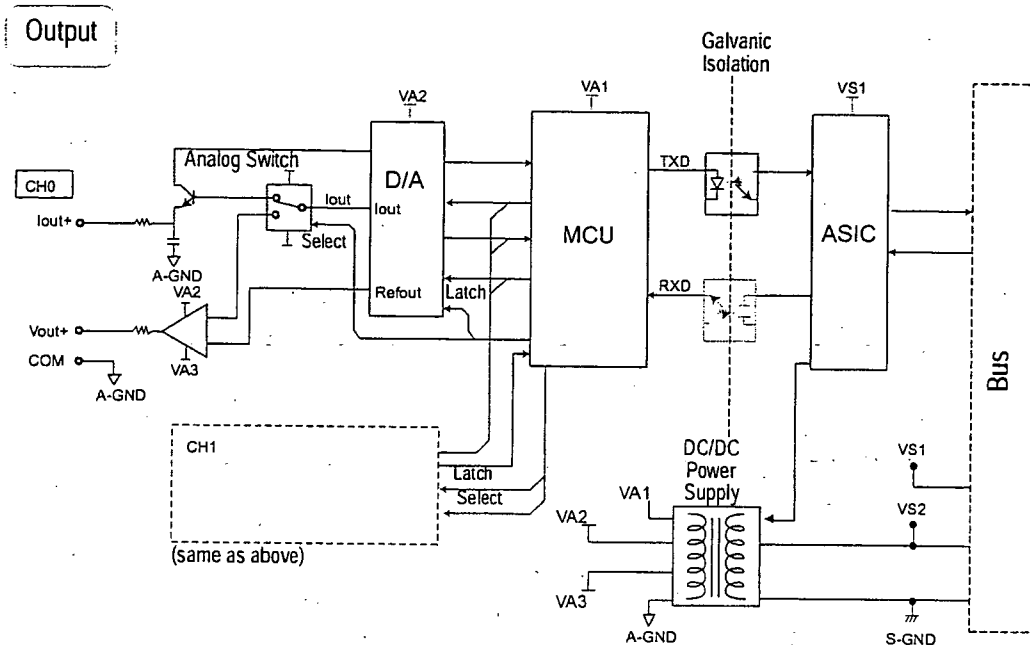
## Overview

## Module Operation

The input module's input circuitry consists of four differential analog inputs multiplexed into a single analog-to-digital (A/D) converter. The A/D converter reads the selected input signal and converts it to a digital value which is presented to the controller. The multiplexer sequentially switches each input channel to the module's A/D converter. See the block diagram below.



The output module uses a digital-to-analog (D/A) converter to read the digital output data from the controller and convert it to an analog output signal. See the block diagram below.



### Module Field Calibration

The 1769-IF4 input module performs autocalibration when a channel is initially enabled. In addition, if a channel is configured differently than the previously scanned channel, an autocalibration cycle is run as part of the reconfiguration process.

The 1769-OF2 output module's calibration is guaranteed by its design. No field calibration is required.

## Chapter 2

### Quick Start for Experienced Users

#### Before You Begin

This chapter can help you to get started using the analog modules. We base the procedures here on the assumption that you have an understanding of Allen-Bradley controllers. You should understand electronic process control and be able to interpret the ladder logic instructions required to generate the electronic signals that control your application.

Because it is a start-up guide for experienced users, this chapter *does not* contain detailed explanations about the procedures listed. It does, however, reference other chapters in this book where you can get more information about applying the procedures described in each step. It also references other documentation that may be helpful if you are unfamiliar with programming techniques or system installation requirements.

If you have any questions or are unfamiliar with the terms used or concepts presented in the procedural steps, *always read the referenced chapters* and other recommended documentation before trying to apply the information.

#### Required Tools and Equipment

Have the following tools and equipment ready:

- medium blade or cross-head screwdriver
- analog input or output device
- shielded, twisted-pair cable for wiring (Belden™ 8761 or equivalent)
- controller  
(for example, a MicroLogix™ 1500 controller)
- analog input or output module
- programming device and software  
(for example, RSLogix 500™)

#### What You Need To Do

This chapter covers:

- Ensuring that your power supply is adequate
- Attaching and locking the module
- Wiring the module
- Configuring the module
- Going through the startup procedure
- Monitoring module operation

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## 2-2

## Quick Start for Experienced Users

**Step 1: Ensure that your power supply has sufficient current output to support your system configuration.**

Reference: Chapter 3 (Installation and Wiring)

The modules maximum current draw is shown below.

Module	5V dc	24V dc
1769-IF4	120 mA	150 mA
1769-OF2	120 mA	200 mA

**Note:** The module may not be located more than 8 modules away from the system power supply.

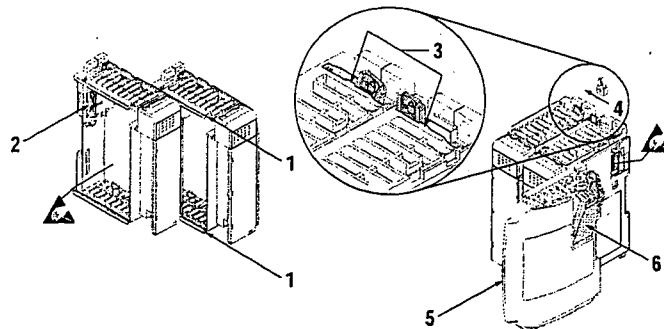
**Step 2: Attach and lock the module.**

Reference: Chapter 3 (Installation and Wiring)

**Note:** The modules can be panel or DIN rail mounted.  
Modules can be assembled before or after mounting.



**ATTENTION:** Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur.



1. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
2. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
3. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
4. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.

5. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.



**ATTENTION:** When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

6. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
7. Lock the end cap bus terminator (6).

### Step 3: Wire the module.

Reference: Chapter 3 (Installation and Wiring)

Follow the guidelines below when wiring the module.

#### General

- All module commons (ANLG COM) are connected in the analog module. The analog common (ANLG COM) is not connected to earth ground inside the module.
- Channels are not isolated from one another.
- Do not use the analog module's NC terminals as connection points.
- Keep shield connection to ground as short as possible.
- To ensure optimum accuracy, limit overall cable impedance by keeping your cable as short as possible. Locate the I/O system as close to your sensors or actuators as your application will permit.
- Use Belden™ 8761, or equivalent, shielded connection wire.

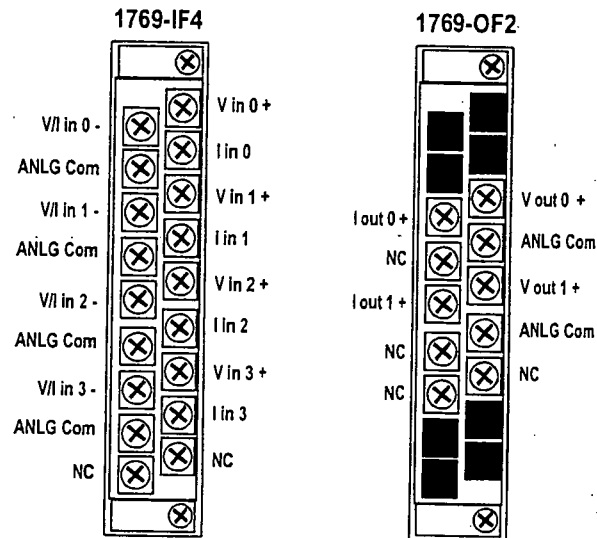
#### 1769-IF4 Input Module

- If multiple power supplies are used with analog inputs, the power supply commons must be connected.
- The 1769-IF4 module does not provide loop power for analog inputs. Use a power supply that matches the input transmitter specifications.
- Differential analog inputs are more immune to noise than single-ended analog inputs.
- Voltages on Vin+, V/Iin-, and Iin+ of the 1769-IF4 module must be within  $\pm 10V$  dc of analog common.

**1769-OF2 Output Module**

- Voltage outputs (Vout 0+ and Vout 1+) of the 1769-OF2 module are referenced to ANLG COM. Load resistance for a voltage output channel must be equal to or greater than  $2K \Omega$ .
- Current outputs (Iout 0+ and Iout 1+) of the 1769-OF2 module source current that returns to ANLG COM. Load resistance for a current output channel must remain between 0 and  $500 \Omega$ .

The terminal connections are shown below:



See "1769-IF4 Analog Input Wiring" on page 3-14 for examples of wiring using differential and single-ended inputs. See "1769-OF2 Analog Output Wiring" on page 3-16 for more information on output module wiring.

**Step 4: Configure the module.**

**Reference:** Chapter 4 (Module Data, Status, and Channel Configuration for 1769-IF4)  
Chapter 5 (Module Data, Status, and Channel Configuration for 1769-OF2)

The configuration file is typically modified using the programming software configuration screen as shown below. It can also be modified through the control program, if supported by the controller. See the configuration file chart on page 4-5 for 1769-IF4 and page 5-6 for 1769-OF2.

## 1769-IF4 Configuration Screen in RSLogix500™

## 1769-OF2 Configuration Screen in RSLogix500™

**Note:** The configuration default is to enable an analog channel. For improved system performance, especially for analog inputs, disable any *unused* channels.

**Step 5: Go through the startup procedure.**

Reference: Chapter 6 (Module Diagnostics and Troubleshooting)

1. Apply power.
2. Download your program, which contains the analog module configuration settings, to the controller and put the controller into Run mode.
3. During a normal start-up, the module status LED turns on.

4. If the module status LED does not turn on, cycle power. If the condition persists, contact your local distributor or Allen-Bradley for assistance.
5. Module and channel configuration errors are reported to the controller. These errors are typically reported in the controller's I/O status file. Check the controller's I/O status file.

### Step 6: Monitor the module status to check if the module is operating correctly.

Reference: Chapter 6 (Module Diagnostics and Troubleshooting)

Module and channel configuration errors are reported to the controller. These errors are typically reported in the controller's I/O status file:

Channel status data is also reported in the module's input data table, so these bits can be used in your control program to flag a channel error.

**1769-IF4 Input Data Table**

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	SGN	Analog Input Data Channel 0														
1	SGN	Analog Input Data Channel 1														
2	SGN	Analog Input Data Channel 2														
3	SGN	Analog Input Data Channel 3														
4	Not Used												S3	S2	S1	S0
5	U0	O0	U1	O1	U2	O2	U3	O3	Set to 0							

**1769-OF2 Input Data Table**

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	D0	H0	D1	H1	Not Used (Bits set to 0)										S1	S0
1	U0	O0	U1	O1	Bits set to 0											
2	SGN	Output Data Loopback/Echo Channel 0														
3	SGN	Output Data Loopback/Echo Channel 1														

The bit definitions are as follows:

- Dx = Diagnostic bits. When set, they indicate a broken output wire or high load resistance (not used on voltage outputs).
- Hx = Hold Last State bits. When set, they indicate that the channel is in a hold last state condition.
- Sx = General Status bits. When set, these bits indicate an error (over-range, under-range, or diagnostic bit) associated with that channel or a module hardware error.
- Ux = Under-range flag bits.
- Ox = Over-range flag bits.
- SGN = Sign bit in two's complement format.

## Chapter 3

### Installation and Wiring

This chapter tells you how to:

- determine the power requirements for the modules
- avoid electrostatic damage
- install the module
- wire the module's terminal block
- wire input devices
- wire output devices

#### Compliance to European Union Directives

This product is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

##### EMC Directive

The analog modules are tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and 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 EN61131-2, see the appropriate sections in this publication, as well as the following Allen-Bradley publications:

- Industrial Automation, Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1
- Automation Systems Catalog, publication B111

**3-2 Installation and Wiring****Power Requirements**

The modules receive power through the bus interface from the +5V dc/+24V dc system power supply. The maximum current drawn by the modules is shown in the table below.

Module	5V dc	24V dc
1769-IF4	120 mA	150 mA
1769-OF2	120 mA	200 mA

**Module Installation**

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2<sup>1</sup>) and to circuits not exceeding Over Voltage Category II<sup>2</sup> (IEC 60664-1).<sup>3</sup>

**Prevent Electrostatic Discharge**

**ATTENTION:** Electrostatic discharge can damage integrated circuits or semiconductors if you touch analog I/O module bus connector pins or the terminal block on the input module. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When it is not in use, keep the module in its static-shield box.

1. Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.
2. Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.
3. Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

**Remove Power**

**ATTENTION:** Remove power before removing or inserting this module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine motion
- causing an explosion in a hazardous environment
- Electrical arcing causes excessive wear to contacts on both the module and its mating connector and may lead to premature failure.

**General Considerations****Reducing Noise**

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference. Analog inputs and outputs are highly susceptible to electrical noise. Electrical noise coupled to the analog inputs will reduce the performance (accuracy) of the module.

Group your modules to minimize adverse effects from radiated electrical noise and heat. Consider the following conditions when selecting a location for the analog module. Position the module:

- away from sources of electrical noise such as hard-contact switches, relays, and AC motor drives
- away from modules which generate significant radiated heat, such as the 1769-IA16. Refer to the module's heat dissipation specification.

In addition, route shielded, twisted-pair analog input and output wiring away from any high voltage I/O wiring.

**Protecting the Circuit Board from Contamination**

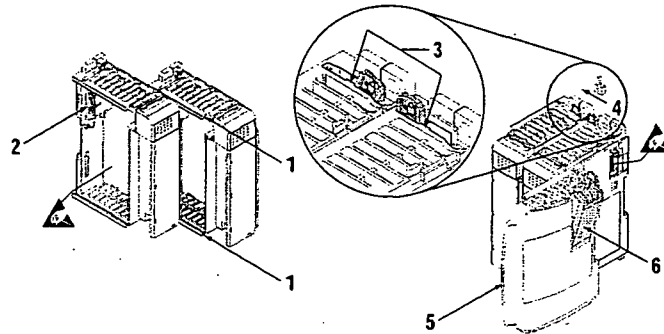
The printed circuit boards of the analog modules must be protected from dirt, oil, moisture, and other airborne contaminants. To protect these boards, the system must be installed in an enclosure suitable for the environment. The interior of the enclosure should be kept clean and the enclosure door should be kept closed whenever possible.

**System Assembly**

The module can be attached to the controller or an adjacent I/O module *before* or *after* mounting. For mounting instructions, see "Panel Mounting Using the Dimensional Template" on page 3-5, or "DIN Rail Mounting" on page 3-6. To work with a system that is already mounted, see "Replacing a Single Module within a System" on page 3-7.

### 3-4 Installation and Wiring

The following procedure shows you how to assemble the Compact I/O system.



1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.



**ATTENTION:** When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end cap bus terminator (6).

**Important:** A 1769-ECR or 1769-ECL right or left end cap must be used to terminate the end of the bus.

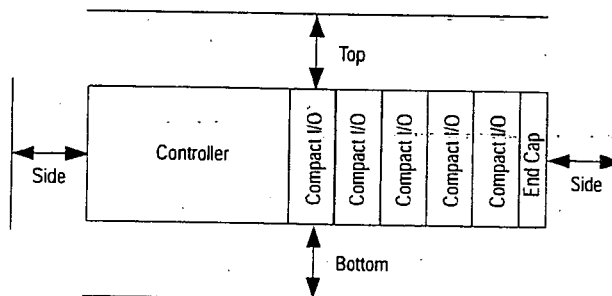
## Mounting



**ATTENTION:** During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage at power up.

## Minimum Spacing

Maintain spacing from enclosure walls, wireways, adjacent equipment, etc. Allow 50 mm (2 in.) of space on all sides for adequate ventilation, as shown below:

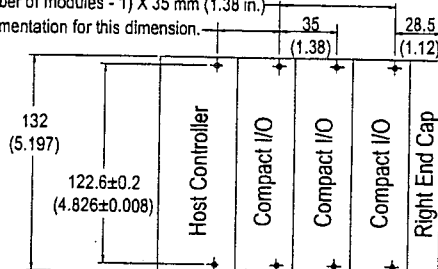


## Panel Mounting

Mount the module to a panel using two screws per module. Use M4 or #8 panhead screws. Mounting screws are required on every module.

## Panel Mounting Using the Dimensional Template

For more than 2 modules: (number of modules - 1) X 35 mm (1.38 in.)  
Refer to host controller documentation for this dimension.



NOTE: All dimensions are in mm (inches). Hole spacing tolerance:  $\pm 0.4$  mm (0.016 in.)

**3-6 Installation and Wiring**

---

**Panel Mounting Procedure Using Modules as a Template**

The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. If you have sophisticated panel mounting equipment, you can use the dimensional template provided on page 3-5. Due to module mounting hole tolerance, it is important to follow these procedures:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw.
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.  
**Note:** If mounting more modules, mount only the last one of this group and put the others aside. This reduces remounting time during drilling and tapping of the next group.
7. Repeat steps 1 to 6 for any remaining modules.

**DIN Rail Mounting**

The module can be mounted using the following DIN rails:  
35 x 7.5 mm (EN 50 022 - 35 x 7.5) or 35 x 15 mm  
(EN 50 022 - 35 x 15).

Before mounting the module on a DIN rail, close the DIN rail latches. Press the DIN rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

### Replacing a Single Module within a System

The module can be replaced while the system is mounted to a panel (or DIN rail).

1. Remove power. See important note on page 3-3.
2. On the module to be removed, remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or phillips-style screw driver).
3. Move the bus lever to the right to disconnect (unlock) the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.
5. Gently slide the disconnected module forward. If you feel excessive resistance, check that the module has been disconnected from the bus, and that both mounting screws have been removed (or DIN latches opened).

**Note:** It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement module, be sure that the bus lever on the module to be installed, and on the right-side adjacent module are in the unlocked (fully right) position.
7. Slide the replacement module into the open slot.
8. Connect the modules together by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws (or snap the module onto the DIN rail).

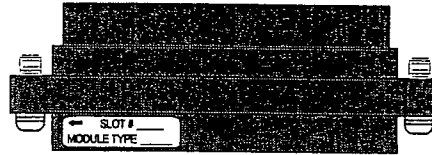
### Field Wiring Connections

#### Grounding

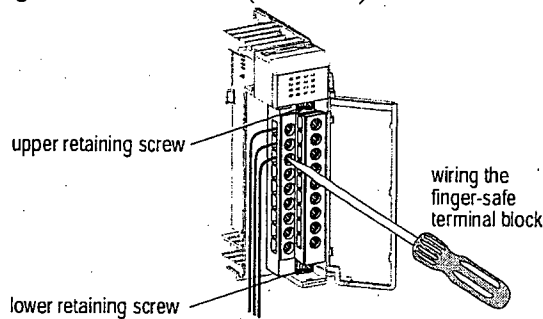
This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used) are not required unless the mounting surface cannot be grounded. Refer to *Industrial Automation Wiring and Grounding Guidelines*, Allen-Bradley publication 1770-4.1, for additional information.

### Removing the Finger-Safe Terminal Block

When installing the module, it is not necessary to remove the terminal block. If you remove the terminal block, use the write-on label located on the side of the terminal block to identify the module location and type.



To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).



### Wiring the Finger-Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place.

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate. You can use the bare wire or a spade lug. The terminals accept a 6.35 mm (0.25 in.) spade lug.
3. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lbs).

**Note:** If you need to remove the finger-safe cover, insert a screw driver into one of the square, wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you will not be able to put it back on the terminal block because the wires will be in the way.

### Wire Size and Terminal Screw Torque

Each terminal accepts up to two wires with the following restrictions:

Wire Type		Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)
Stranded	Cu-90°C (194°F)	#16 to #22 AWG	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)

### System Wiring Guidelines

Consider the following when wiring your system:

#### General

- All module commons (ANLG COM) are connected in the analog module. The analog common (ANLG COM) is not connected to earth ground inside the module.
- Do not use the analog module's NC terminals as connection points.
- Channels are not isolated from each other.
- Keep shield connection to ground as short as possible.
- To ensure optimum accuracy, limit overall cable impedance by keeping your cable as short as possible. Locate the I/O system as close to your sensors or actuators as your application will permit.
- Use Belden™ 8761, or equivalent, shielded wire.

#### 1769-IF4 Input Module

- If multiple power supplies are used with analog inputs, the power supply commons must be connected.
- The 1769-IF4 module does not provide loop power for analog inputs. Use a power supply that matches the input transmitter specifications.
- Differential analog inputs are more immune to noise than single-ended analog inputs.
- Voltages on Vin+, V/lin-, and Iin+ of the 1769-IF4 module must be within  $\pm 10V$  dc of analog common.

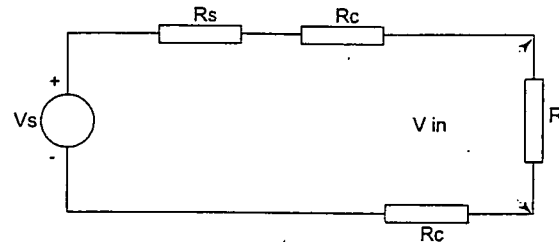
#### 1769-OF2 Output Module

- Voltage outputs (Vout 0+ and Vout 1+) of the 1769-OF2 module are referenced to ANLG COM. Load resistance for a voltage output channel must be equal to or greater than  $2K \Omega$ .
- Current outputs (Iout 0+ and Iout 1+) of the 1769-OF2 module source current that returns to ANLG COM. Load resistance for a current output channel must remain between 0 and  $500 \Omega$ .

### 3-10 Installation and Wiring

#### Effect of Transducer/Sensor and Cable Length Impedance on Voltage Input Accuracy

For voltage inputs, the length of the cable used between the transducer/sensor and the 1769-IF4 module can affect the accuracy of the data provided by the module.



**Where:**  $R_c$  = DC resistance of the cable (each conductor) depending on cable length

$R_s$  = Source impedance of analog transducer/sensor input

$R_i$  = Impedance of the voltage input (220 K $\Omega$  for 1769-IF4)

$V_s$  = Voltage source (voltage at the transducer/sensor input device)

$V_{in}$  = Measured potential at the module input

%Ai = Percent added inaccuracy in a voltage-based system due to source and cable impedance.

$$V_{in} = \frac{[R_i \times V_s]}{[R_s + (2 \times R_c) + R_i]}$$

For example, for Belden 8761 two conductor, shielded cable:

$R_c = 16 \Omega/1000 \text{ ft}$

$R_s = 0$  (ideal source)

$$\%Ai = \left(1 - \frac{V_{in}}{V_s}\right) \times 100$$

Table: 3.1 Effect of Cable Length on Input Accuracy

Length of Cable (m)	dc resistance of the cable, $R_c$ ( $\Omega$ )	Accuracy impact at the input module
50	2.625	0.00238%
100	5.25	0.00477%
200	10.50	0.00954%
300	15.75	0.0143%

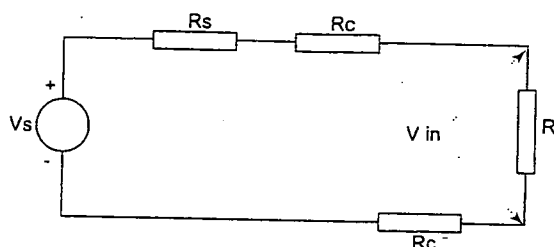
As input source impedance ( $R_s$ ) and/or resistance (dc) of the cable ( $R_c$ ) get larger, system accuracy decreases. If you determine that the inaccuracy error is significant, implementing the following equation in the control program can compensate for the added inaccuracy error due to the impedance of the source and cable.

$$V_s = V_{in} \times \frac{[R_s + (2 \times R_c) + R_i]}{R_i}$$

**Note:** In a current loop system, source and cable impedance do not impact system accuracy.

### Effect of Device and Cable Output Impedance on Output Module Accuracy

The maximum value of the output impedance is shown in the example below, because it creates the largest deviation from an ideal voltage source.



**Where:**  $R_c$  = DC resistance of the cable (each conductor) depending on cable length

$R_s$  = Source impedance of 1769-OF2 (15  $\Omega$ )

$R_i$  = Impedance of the voltage input (220 K $\Omega$  for 1769-IF4)

$V_s$  = Voltage at the output of 1769-OF2

$V_{in}$  = Measured potential at the module input

%Ai = Percent added inaccuracy in a voltage-based system due to source and cable impedance.

$$V_{in} = \frac{[R_i \times V_s]}{[R_s + (2 \times R_c) + R_i]}$$

For example, for Belden 8761 two conductor, shielded cable and a 1769-IF4 input module:

$R_c$  = 16  $\Omega$ /1000 ft

$R_s$  = 15  $\Omega$

$R_i$  = 220.25 K $\Omega$

$$\% Ai = \left(1 - \frac{V_{in}}{V_s}\right) \times 100$$

**Table: 3.2 Effect of Output Impedance and Cable Length on Accuracy**

Length of Cable (m)	dc resistance of the cable, $R_c$ ( $\Omega$ )	Accuracy impact at the input module
50	2.625	0.00919%
100	5.25	0.01157%
200	10.50	0.01634%
300	15.75	0.02111%

As output impedance ( $R_s$ ) and/or resistance (dc) of the cable ( $R_c$ ) get larger, system accuracy decreases. If you determine that the inaccuracy error is significant, implementing the following equation in the control program can compensate for the added inaccuracy error due to the impedance of the output module and cable.

$$V_s = V_{in} \times \frac{[R_s + (2 \times R_c) + R_i]}{R_i}$$

**Note:** In a current loop system, source and cable impedance do not impact system accuracy.

## 3-12

## Installation and Wiring

**Wiring the Modules**

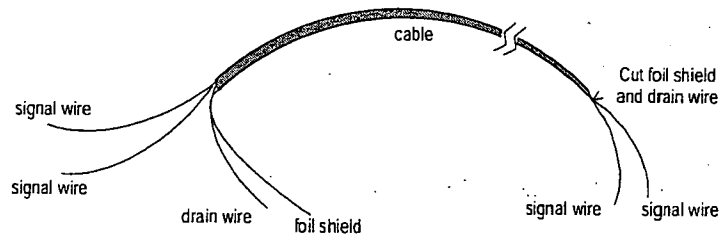
**ATTENTION:** To prevent shock hazard, care should be taken when wiring the module to analog signal sources. Before wiring any analog module, disconnect power from the system power supply and from any other source to the analog module.

After the analog module is properly installed, follow the wiring procedure below. To ensure proper operation and high immunity to electrical noise, always use Belden™ 8761 (shielded, twisted pair) or equivalent wire.



**ATTENTION:** When wiring an analog input, take care to avoid connecting a voltage source to a channel configured for current input. Improper module operation or damage to the voltage source can occur.

**ATTENTION:** Never connect a voltage or current source to an analog output channel.



To wire your module follow these steps.

1. At each end of the cable, strip some casing to expose the individual wires.
2. Trim the signal wires to 2-inch lengths. Strip about 3/16 inch (5 mm) of insulation away to expose the end of the wire.



**ATTENTION:** Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up.

3. At one end of the cable, twist the drain wire and foil shield together.

Under normal conditions, this drain wire and shield junction should be connected to earth ground, via a panel or DIN rail mounting screw at the analog I/O module end. Keep the length of the drain wire as short as possible.

In environments where high frequency noise may be present, it may be necessary to ground the cable shields to earth at the module end via a 0.1  $\mu$ F capacitor at the sensor end for analog inputs and at the load end for analog outputs.

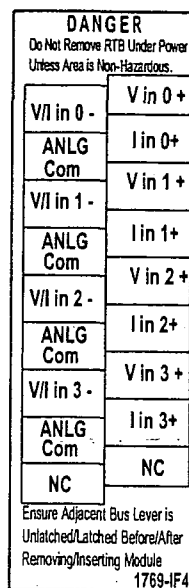
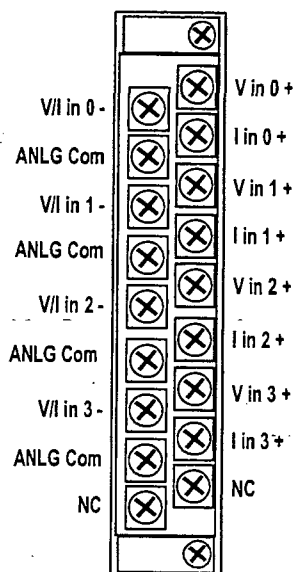
4. At the other end of the cable, cut the drain wire and foil shield back to the cable.
5. Connect the signal wires to the terminal block as shown in "1769-IF4 Analog Input Wiring" on page 3-14 and "1769-OF2 Analog Output Wiring" on page 3-16. Connect the other end of the cable to the analog input or output device.
6. Repeat steps 1 through 5 for each channel on the module.

#### Terminal Door Label

A removable, write-on label is provided with the module. Remove the label from the door, mark the identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.

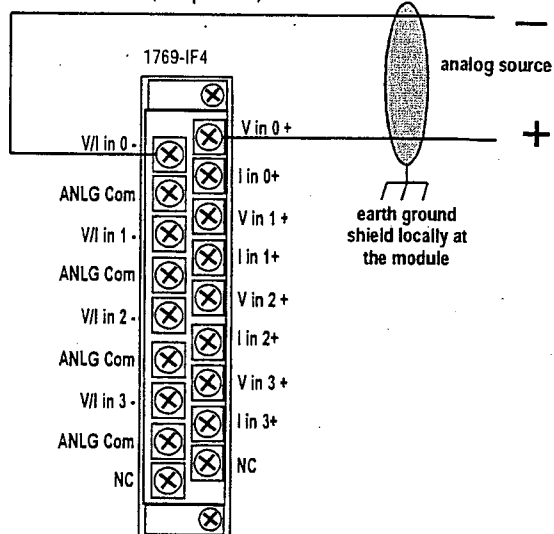
## 1769-IF4 Analog Input Wiring

## Terminal Layout

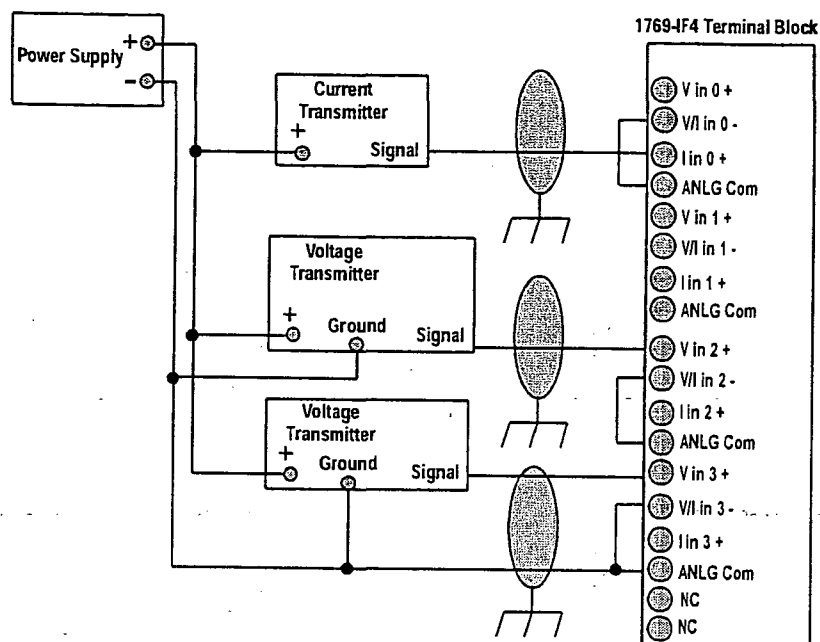


## Wiring Diagram Showing Differential Inputs

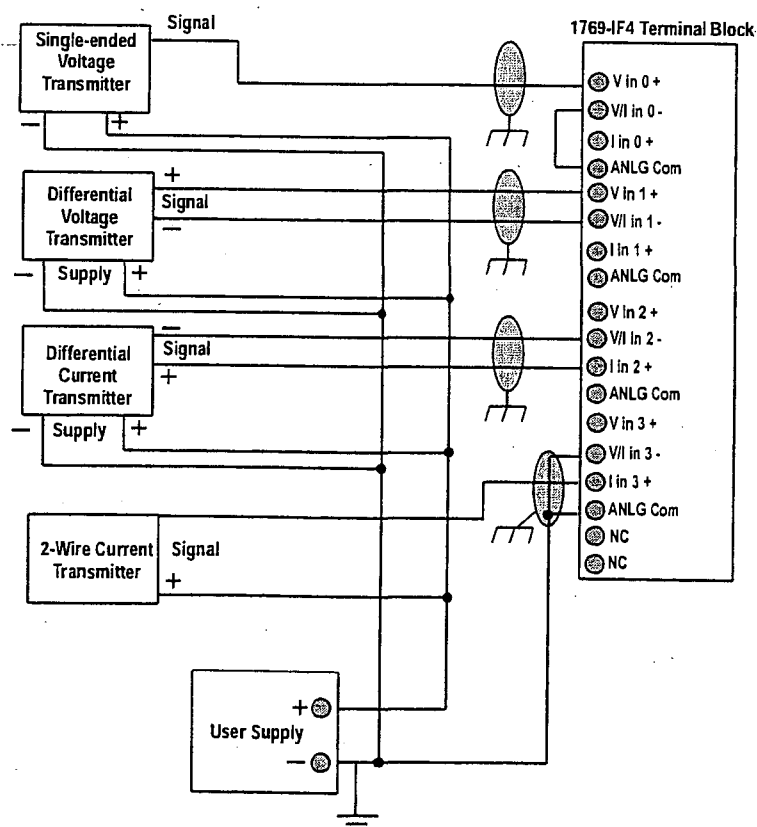
Belden 8761 cable (or equivalent)



## Wiring Single-ended Sensor/Transmitter Types



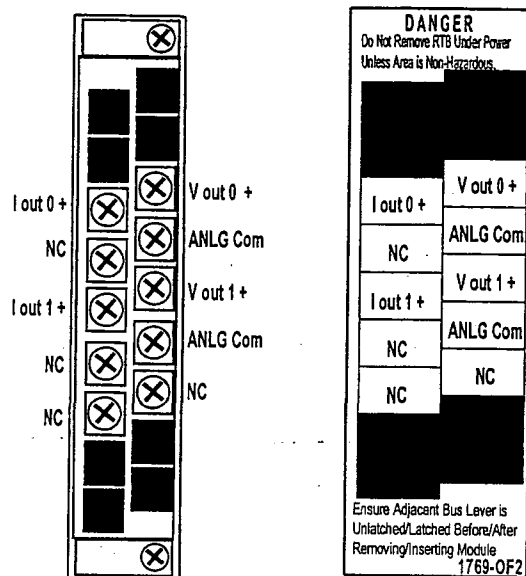
## Wiring Mixed Transmitter Types



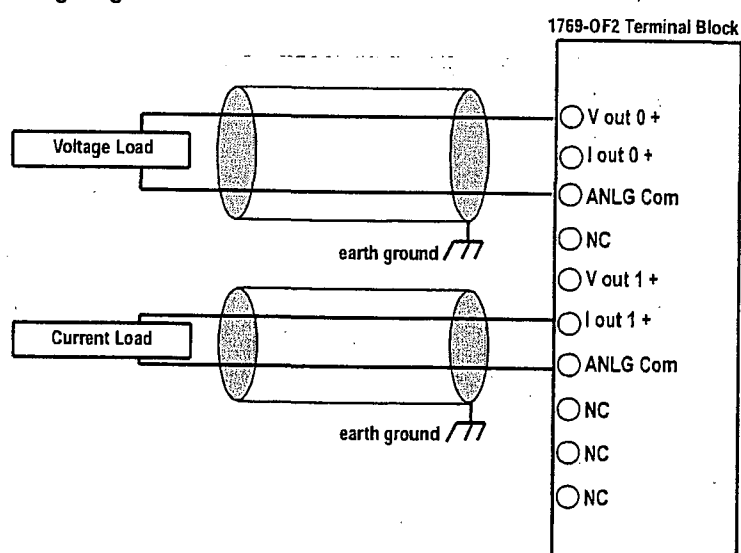
Publication 1769-6.0

## 1769-OF2 Analog Output Wiring

### Terminal Layout



### Wiring Diagram

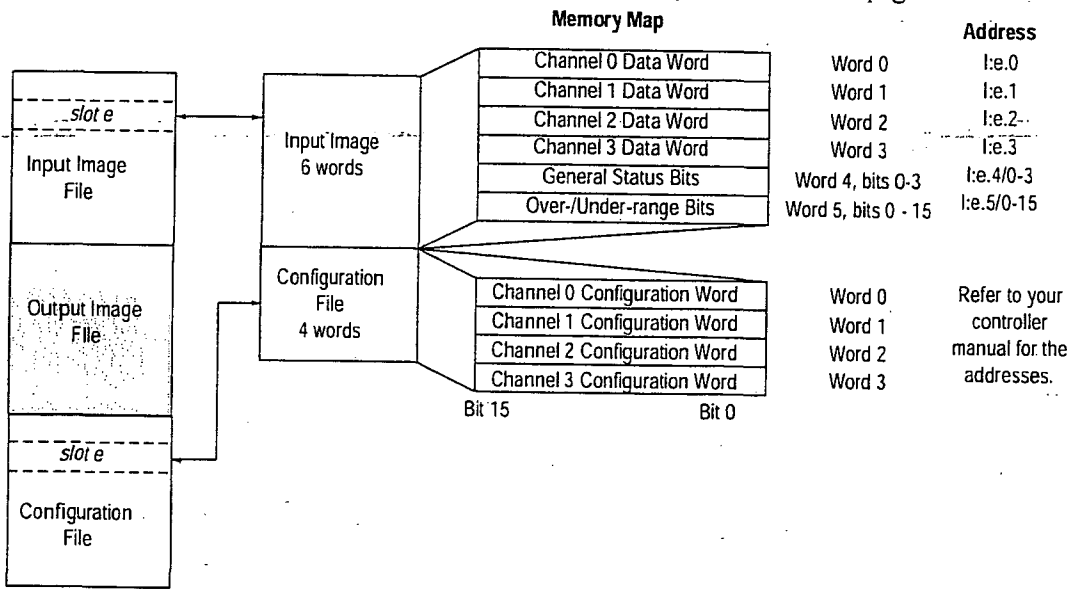


# Module Data, Status, and Channel Configuration for 1769-IF4

This chapter examines the analog input module's data table, channel status, and channel configuration word.

## Input Module Addressing

The following memory map shows the input and configuration image tables for the 1769-IF4. Detailed information on the input image table can be found in "1769-IF4 Input Data File" on page 4-2.

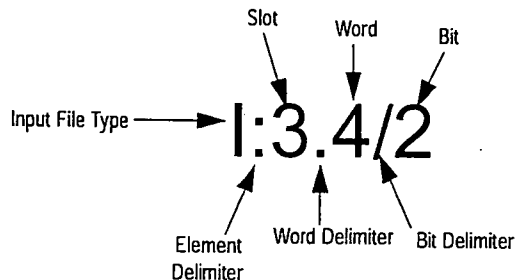


## 1769-IF4 Input Image

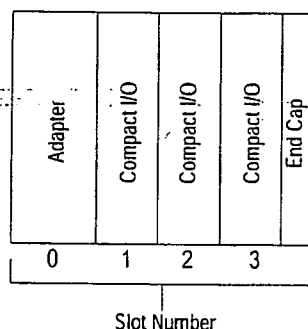
The 1769-IF4 input image file represents data words and status bits. Input words 0 through 3 hold the input data that represents the value of the analog inputs for channels 0 through 3. These data words are valid only when the channel is enabled and there are no errors. Input words 4 and 5 hold the status bits. To receive valid status information, the channel must be enabled.

## 4-2 Module Data, Status, and Channel Configuration for 1769-IF4

For example, to obtain the general status of channel 2 of the analog module located in slot 3, use address I:3.4/2.



**Note:** This addressing scheme is applicable only for the MicroLogix™ 1500 controller.



**Note:** The end cap does not use a slot address.

### 1769-IF4 Configuration File

The configuration file contains information that you use to define the way a specific channel functions. The configuration file is explained in more detail in "1769-IF4 Configuration Data File" on page 4-3.

**Note:** Not all controllers support program access to the configuration file. Refer to your controller's user manual.

### 1769-IF4 Input Data File

The input data table allows you to access analog input module read data for use in the control program, via word and bit access. The data table structure is shown in table below.

Table: 4.1 1769-IF4 Input Data Table

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	SGN		Analog Input Data Value Channel 0													
Word 1	SGN		Analog Input Data Value Channel 1													
Word 2	SGN		Analog Input Data Value Channel 2													
Word 3	SGN		Analog Input Data Value Channel 3													
Word 4	Not Used (Bits set to 0)												S3	S2	S1	S0
Word 5	U0	O0	U1	O1	U2	O2	U3	O3	Set to zero							

### 1769-IF4 Input Data Values

Words 0 through 3 contain the converted analog input data from the field device. The most significant bit (MSB) is the sign bit.

### General Status Bits (S0 - S3)

Word 4, bits 0 through 3 contain the general operational status bits for input channels 0 through 3. If set (1), these bits indicate an error associated with that channel. The over- and under-range bits for channels 0 through 3 are logically ORed to the appropriate general status bit.

### Over-Range Flag Bits (O0 - O3)

Over-range bits for channels 3 through 0 are contained in word 5, bits 8, 10, 12, and 14. They apply to all input types. When set (1), this bit indicates input signals beyond the normal operating range. However, the module continues to convert analog data to the maximum full range value. The bit is automatically reset (0) by the module when the over-range condition is cleared and the data value is within the normal operating range.

### Under-Range Flag Bits (U0 - U3)

Under-range bits for channels 3 through 0 are contained in word 5, bits 9, 11, 13, and 15. They apply to all input types. When set (1), this bit indicates input signals below the normal operating range. It may also indicate an open circuit condition, when the module is configured for the 4 - 20 mA range. However, the module continues to convert analog data to the minimum full range value. The bit is automatically reset (0) by the module when the under-range condition is cleared and the data value is within the normal operating range.

## 1769-IF4 Configuration Data File

The configuration file allows you to determine how each individual input channel will operate. Parameters such as the input type and data format are set up using this file. This data file is writable and readable. The default value of the configuration data table is all zeros. The structure of the channel configuration file is shown below.

Table: 4.2 1769-IF4 Configuration Data Table<sup>1</sup>

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Enable Channel 0	Input Data Format Select Channel 0			Input Type/Range Select Channel 0				Reserved				Input Filter Select Channel 0			
Word 1	Enable Channel 1	Input Data Format Select Channel 1			Input Type/Range Select Channel 1				Reserved				Input Filter Select Channel 1			
Word 2	Enable Channel 2	Input Data Format Select Channel 2			Input Type/Range Select Channel 2				Reserved				Input Filter Select Channel 2			
Word 3	Enable Channel 3	Input Data Format Select Channel 3			Input Type/Range Select Channel 3				Reserved				Input Filter Select Channel 3			

1. The ability to change these values using your control program is not supported by all controllers. Refer to your controller manual for details.

## 4-4

## Module Data, Status, and Channel Configuration for 1769-IF4

The configuration file is typically modified using the programming software configuration screen.

**Note:** The software configuration default is to enable each analog input channel. For improved analog input module performance, disable any *unused* channels.

Table: 4.3 Software Configuration Channel Defaults

Parameter	Default Setting
Enable Channel	Enabled
Filter Selection	60 Hz
Input Range	$\pm 10V$ dc
Data Format	Raw/Proportional

The configuration file can also be modified through the control program, if supported by the controller. The structure and bit settings are shown in "Channel Configuration" on page 4-5.

## Module Data, Status, and Channel Configuration for 1769-IF4

4-5

## Channel Configuration

Each channel configuration word consists of bit fields, the settings of which determine how the channel operates. See the table below and the descriptions that follow for valid configuration settings and their meanings. The default bit status of the configuration file is all zeros.

Table: 4.4 Bit Definitions for Channel Configuration Words 0 through 3

Bit(s)	Define	These bit settings																Indicate this
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0-3	Input Filter Select													0	0	0	0	60 Hz
														0	0	0	1	50 Hz
														0	0	1	0	Not Used
														0	0	1	1	250 Hz
														0	1	0	0	500 Hz
																		Not Used <sup>1</sup>
4-7	Reserved																	Reserved <sup>2</sup>
8-11	Input Type/Range Select					0	0	0	0									-10 to +10V dc
						0	0	0	1									0 to 5V dc
						0	0	1	0									0 to 10V dc
						0	0	1	1									4 to 20 mA
						0	1	0	0									1 to 5V dc
						0	1	0	1									0 to 20 mA
																		Not Used <sup>1</sup>
12-14	Input Data Format Select		0	0	0													Raw/Proportional Data
			0	0	1													Engineering Units
			0	1	0													Scaled for PID
			0	1	1													Percent Range
																		Not Used <sup>1</sup>
15	Enable Channel	1																Enabled
		0																Disabled

1. Any attempt to write a non-valid (not used) bit configuration into any selection field results in a module configuration error. See "Configuration Errors" on page 6-5.

2. If reserved bits are not equal to zero, a configuration error occurs.

### Enable Channel

This configuration selection allows each channel to be individually enabled.

**Note:** When a channel is not enabled (0), no voltage or current input is provided to the controller by the A/D converter.

### Input Filter Selection

The input filter selection field allows you to select the filter frequency for each channel and provides system status of the input filter setting for analog input channels 0 through 3. The filter frequency affects the noise rejection characteristics, as explained below. Select a filter frequency considering acceptable noise and step response time.

### Noise Rejection

The 1769-IF4 uses a digital filter that provides noise rejection for the input signals. The filter is programmable, allowing you to select from four filter frequencies for each channel. The digital filter provides the highest noise rejection at the selected filter frequency. A lower frequency (60 Hz versus 250 Hz) can provide better noise rejection but it increases channel update time. Transducer power supply noise, transducer circuit noise, or process variable irregularities may also be sources of normal mode noise.

Common Mode Rejection is better than 60 dB at 50 and 60 Hz, with the 50 and 60 Hz filters selected, respectively. The module performs well in the presence of common mode noise as long as the signals applied to the user plus and minus input terminals do not exceed the common mode voltage rating ( $\pm 10$  V) of the module. Improper earth ground may be a source of common mode noise.

### Channel Step Response

The selected channel filter frequency determines the channel's step response. The step response is the time required for the analog input signal to reach 100% of its expected final value. This means that if an input signal changes faster than the channel step response, a portion of that signal will be attenuated by the channel filter.

**Table: 4.5 Filter Frequency and Step Response**

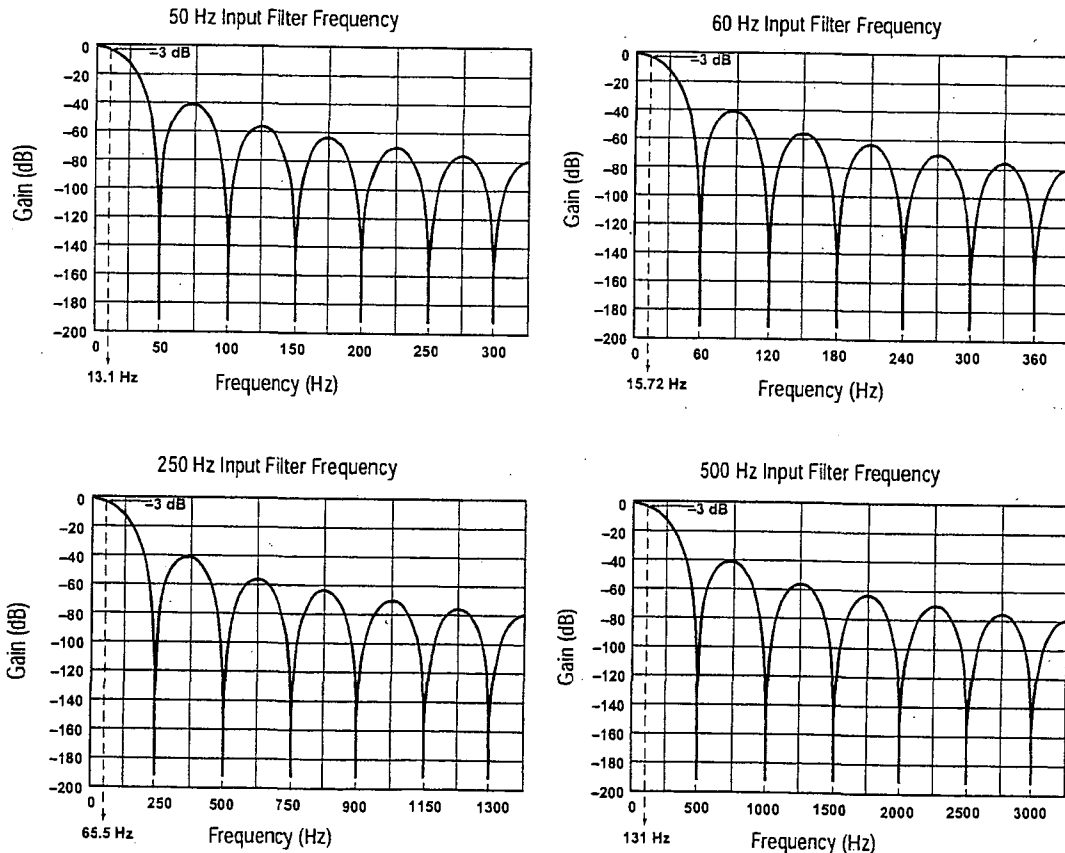
Filter Frequency	Cut-off Frequency	Step Response
50 Hz	13.1 Hz	60 ms
60 Hz	15.7 Hz	50 ms
250 Hz	65.5 Hz	12 ms
500 Hz	131 Hz	6 ms

### Channel Cut-Off Frequency

The -3 dB frequency is the filter cut-off frequency. The cut-off frequency is defined as the point on the frequency response curve where frequency components of the input signal are passed with 3 dB of attenuation. All input frequency components at or below the cut-off frequency are passed by the digital filter with less than 3 dB of attenuation. All frequency components above the cut-off frequency are increasingly attenuated as shown in the graphs below.

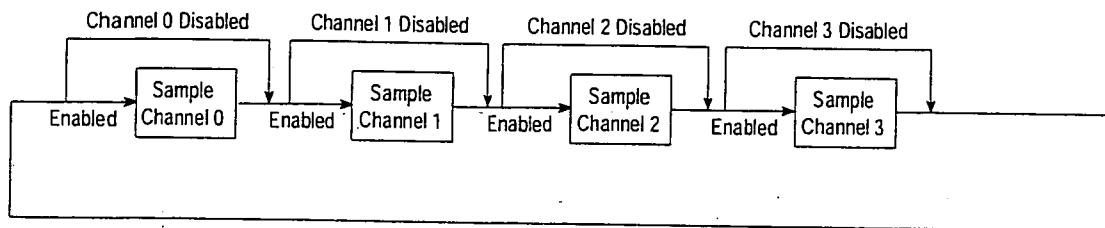
The cut-off frequency for each channel is defined by its filter frequency selection. Choose a filter frequency so that your fastest changing signal is below that of the filter's cut-off frequency. The cut-off frequency should not be confused with the update time. The cut-off frequency relates to how the digital filter attenuates frequency components of the input signal. The update time defines the rate at which an input channel is scanned and its channel data word is updated.

### Frequency Response Graphs



### Module Update Time and Scanning Process

The module update time is defined as the time required for the module to sample and convert the input signals of all enabled input channels and provide the resulting data values to the processor. Module update time can be calculated by adding the sum of all enabled channel times. Channel times include channel scan time, channel switching time, and reconfiguration time. The module sequentially samples the channels in a continuous loop as shown below.



The following table shows the channel update times. The fastest module update time occurs when only one channel is enabled with a 500 Hz filter (4 ms). If more than one channel is enabled, the update time is faster if both channels have the same configuration. See "Example 1" on page 4-9. The slowest module update time occurs when all four channels are enabled with different configurations. See "Example 2" on page 4-9.

Table: 4.6 Channel Update Time

Filter Frequency	Channel Update Time
50 Hz	22 ms
60 Hz	19 ms
250 Hz	6 ms
500 Hz	4 ms

### Channel Switching and Reconfiguration Times

The table below provides the channel switching and reconfiguration times for a channel.

Table: 4.7 Channel Switching and Reconfiguration Times

	Description	Duration			
		50 Hz	60 Hz	250 Hz	500 Hz
Channel Switching Time	The time it takes the module to switch from one channel to another.	46 ms	39 ms	14 ms	10 ms
Channel-to-Channel Reconfiguration Time	The time it takes the module to change its configuration settings for a difference in configuration between one channel and another.	116 ms	96 ms	20 ms	8 ms

### Examples of Calculating Module Update Time

#### Example 1: Two Channels Enabled with Identical Configurations

The following example calculates the 1769-IF4 module update time for two channels enabled with the same configuration and a 500 Hz filter.

$$\begin{aligned}
 \text{Module Update Time} &= \left[ \begin{array}{c} \text{Channel 0 Scan Time} \\ + \\ \text{Channel 0 Switching Time} \end{array} \right] + \left[ \begin{array}{c} \text{Channel 1 Scan Time} \\ + \\ \text{Channel 1 Switching Time} \end{array} \right] \\
 28\text{ms} &= \left[ \begin{array}{c} 4\text{ ms} \\ + \\ 10\text{ ms} \end{array} \right] + \left[ \begin{array}{c} 4\text{ ms} \\ + \\ 10\text{ ms} \end{array} \right]
 \end{aligned}$$

#### Example 2: Three Channels Enabled with Different Configurations

The following example calculates the module update time for three channels with the following configurations:

- Channel 0:  $\pm 10\text{V}$  dc with 60 Hz filter
- Channel 1:  $\pm 10\text{V}$  dc with 500 Hz filter
- Channel 2: 4 - 20 mA with 250 Hz filter

$$\begin{aligned}
 \text{Module Update Time} &= \left[ \begin{array}{c} \text{Channel 0 Reconfiguration Time} \\ + \\ \text{Channel 0 Scan Time} \\ + \\ \text{Channel 0 Switching Time} \end{array} \right] + \left[ \begin{array}{c} \text{Channel 1 Reconfiguration Time} \\ + \\ \text{Channel 1 Scan Time} \\ + \\ \text{Channel 1 Switching Time} \end{array} \right] + \left[ \begin{array}{c} \text{Channel 2 Reconfiguration Time} \\ + \\ \text{Channel 2 Scan Time} \\ + \\ \text{Channel 2 Switching Time} \end{array} \right] \\
 &= \left[ \begin{array}{c} 96\text{ ms} \\ + \\ 19\text{ ms} \\ + \\ 39\text{ ms} \end{array} \right] + \left[ \begin{array}{c} 8\text{ ms} \\ + \\ 4\text{ ms} \\ + \\ 10\text{ ms} \end{array} \right] + \left[ \begin{array}{c} 20\text{ ms} \\ + \\ 6\text{ ms} \\ + \\ 14\text{ ms} \end{array} \right] \\
 216\text{ ms} &= [154\text{ ms}] + [22\text{ ms}] + [40\text{ ms}]
 \end{aligned}$$

### Input Type/Range Selection

This selection along with proper input wiring allows you to configure each channel individually for current or voltage ranges and provides the ability to read the current range selections.

**4-10**      **Module Data, Status, and Channel Configuration for 1769-IF4**

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**Input Data Selection Formats**

This selection configures channels 0 through 3 to present analog data in any of the following formats:

- Raw/Proportional Data
- Engineering Units
- Scaled for PID
- Percent Range

**Raw/Proportional Data**

The value presented to the controller is proportional to the selected input and scaled into the maximum data range allowed by the bit resolution of the A/D converter and filter selected. The full range for a  $\pm 10\text{Vdc}$  user input is -32767 to +32767. See Table 4.8, "Valid Input Data," on page 4-11.

**Engineering Units**

The module scales the analog input data to the actual current or voltage values for the selected input range. The resolution of the engineering units is dependent on the range selected and the filter selected. See Table 4.8, "Valid Input Data," on page 4-11.

**Scaled for PID**

The value presented to the controller is a signed integer with zero representing the lower user range and 16383 representing the upper user range. Allen-Bradley controllers, such as the MicroLogix 1500, use this range in their PID equations. The amount over and under user range (full scale range -410 to 16793) is also included. See Table 4.8, "Valid Input Data," on page 4-11.

**Percent Range**

The input data is presented to the user as a percent of the user range. For example, 0V to 10V dc equals 0% to 100%. See Table 4.8, "Valid Input Data," on page 4-11.

**Note:**      The  $\pm 10\text{V dc}$  range does not support the percent user range data format.

## Module Data, Status, and Channel Configuration for 1769-IF4

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## Valid Input Data Word Formats/Ranges

The following table shows the valid formats and min./max. data ranges provided by the module.

Table: 4.8 Valid Input Data

1769-IF4 Input Range	Input Value	Example Data	Input Range Condition	Raw/ Proportional Data	Engineering Unit	Scaled for PID	Percent Full Range
				Decimal Range	Decimal Range	Decimal Range	Decimal Range
-10V to +10V dc	Over 10.5V dc	+11.0V dc	Over-range	32767 (max.)	10500 (max.)	16793 (max.)	N/A
	+10.5V dc	+ 10.5V dc	Over-range	32767 (max.)	10500 (max.)	16793 (max.)	N/A
	-10V to +10V dc	+10.0V dc	Normal	31206	10000	16383	N/A
		0.0V dc	Normal	0	0	8192	N/A
		-10.0V dc	Normal	-31206	-10000	0	N/A
	-10.5Vdc	-10.5V dc	Under-range	-32767 (min.)	-10500 (min.)	-410 (min.)	N/A
	Under -10.5V dc	-11.0V dc	Under-range	-32767 (min.)	-10500 (min.)	-410 (min.)	N/A
0V to 5V dc	Over 5.25V dc	5.5V dc	Over-range	32767 (max.)	5250 (max.)	17202 (max.)	10500 (max.)
	5.25V dc	5.25V dc	Over-range	32767 (max.)	5250 (max.)	17202 (max.)	10500 (max.)
	0.0V dc to 5.0V dc	5.0V dc	Normal	31206	5000	16383	10000
		0.0V dc	Normal	0	0	0	0
	-0.5V dc	-0.5V dc	Under-range	-3121 (min.)	-500 (min.)	-1638 (min.)	-1000 (min.)
	Under -0.5V dc	-1.0V dc	Under-range	-3121 (min.)	-500 (min.)	-1638 (min.)	-1000 (min.)
0V to 10V dc	Over 10.5V dc	11.0V dc	Over-range	32767 (max.)	10500 (max.)	17202 (max.)	10500 (max.)
	+10.5V dc	10.5V dc	Over-range	32767 (max.)	10500 (max.)	17202 (max.)	10500 (max.)
	0.0V dc to 10.0V dc	10.0V dc	Normal	31206	10000	16383	10000
		0.0V dc	Normal	0	0	0	0
	-0.5V dc	-0.5V dc	Under-range	-3120 (min.)	-500 (min.)	-1638 (min.)	-1000 (min.)
	Under -5.0V dc	-1.0V dc	Under-range	-1560 (min.)	-500 (min.)	-819 (min.)	-500 (min.)
4 mA to 20 mA	Over 21.0 mA	22.0 mA	Over-range	32767 (max.)	21000 (max.)	17407 (max.)	10625 (max.)
	21.0 mA	21.0 mA	Over-range	32767 (max.)	21000 (max.)	17407 (max.)	10625 (max.)
	4.0 mA to 20.0 mA	20.0 mA	Normal	31206	20000	16383	10000
		4.0 mA	Normal	6241	4000	0	0
	3.2 mA	3.2 mA	Under-range	4993 (min.)	3200 (min.)	-819 (min.)	-500 (min.)
	Under 3.2 mA	0.0 mA	Under-range	4993 (min.)	3200 (min.)	-819 (min.)	-500 (min.)

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**4-12**      **Module Data, Status, and Channel Configuration for 1769-IF4****Table: 4.8 Valid Input Data**

1769-IF4 Input Range	Input Value	Example Data	Input Range Condition	Raw/ Proportional Data	Engineering Unit	Scaled for PID	Percent Full Range
				Decimal Range	Decimal Range	Decimal Range	Decimal Range
1.0V to 5V dc	Over 5.25V dc	5.5V dc	Over-range	32767 (max.)	5250	17407	10625
	+5.25V dc	5.25V dc	Over-range	32767 (max.)	5250	17407	10625
	1.0V to 5.0V dc	5.0V dc	Normal	31206	5000	16383	10000
		1.0V dc	Normal	6243	1000	1	1
	0.5V dc	0.5V dc	Under-range	3121 (min.)	500	-2048	-1250
	Under 0.5V dc	0.0V dc	Under-range	3121 (min.)	500	-2048	-1250
0 mA to 20 mA	Over 21.0 mA	22.0 mA	Over-range	32767	21000	17202	10500
	21.0 mA	21.0 mA	Over-range	32767	21000	17202	10500
	0.0 mA to 20.0 mA	20.0 mA	Normal	31206	20000	16383	10000
		0.0 mA	Normal	0	0	0	0
	Under 0.0 mA	0.0 mA	Under-range	0	0	0	0

**Effective Resolution**

The effective resolution for an input channel depends upon the filter frequency selected for that channel. The following tables provide the effective resolution for the four frequencies for each of the range selections.

**Table: 4.9 50Hz / 60Hz Effective Resolution**

1769-IF4 Input Range	Raw/Proportional Data Over the Full Input Range		Engineering Units Over the Full Input Range		Scaled-For-PID Over the Full Input Range		Percent Over the Full Input Range	
	Bits and Engineering Units Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value
-10 to +10V dc	Sign +14 0.64 mV/ 2 counts	±32767 Count by 2	1.00 mV/ 1 count	±10500 Count by 1	1.22 mV/ 1 count	-410 to +16793 Count by 1	Not Applicable	Not Applicable
0 to +5V dc	Sign +13 0.64 mV/ 4 counts	-3121 to +32767 Count by 4	1.00 mV/ 1 count	-500 to +5250 Count by 1	0.92 mV/ 3 counts	-1638 to +17202 Count by 3	1.00 mV/ 2 counts	-1000 to +10500 Count by 2
0 to +10V dc	Sign +14 0.64 mV/ 2 counts	-1560 to +32767 Count by 2	1.00 mV/ 1 count	-500 to +10500 Count by 1	1.22 mV/ 2 counts	-819 to +17202 Count by 2	1.00 mV/ 1 count	-500 to +10500 Count by 1
+4 to +20 mA	Sign +14 1.28 µA/ 2 counts	+4993 to +32767 Count by 2	2.00 µA/ 2 counts	+3200 to +2100 Count by 2	1.95 µA/ 2 counts	-819 to +17407 Count by 2	1.60 µA/ 1 count	-500 to +10625 Count by 1
+1 to +5V dc	Sign +13 0.64 mV/ 4 counts	+3121 to +32767 Count by 4	1.00 mV/ 1 count	+500 to +5250 Count by 1	0.73 mV/ 3 counts	-2048 to +17407 Count by 3	0.80 mV/ 2 counts	-1250 to +10625 Count by 2
0 to +20 mA	Sign +14 1.28 µA/ 2 counts	0 to +32767 Count by 2	2.00 µA/ 2 counts	0 to +21000 Count by 2	2.44 µA/ 2 counts	0 to +17202 Count by 2	2.00 µA/ 1 count	0 to +10500 Count by 1

## Module Data, Status, and Channel Configuration for 1769-IF4

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Table: 4.10 250Hz Effective Resolution

1769-IF4 Input Range	Raw/Proportional Data Over the Full Input Range		Engineering Units Over the Full Input Range		Scaled-For-PID Over the Full Input Range		Percent Over the Full Input Range	
	Bits and Engineering Units Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value
-10 to +10V dc	Sign +11 5.13 mV/ 16 counts	±32767 Count by 16	6.00 mV/ 6 counts	±10500 Count by 6	6.10 mV/ 5 counts	-410 to +16793 Count by 5	Not Applicable	Not Applicable
0 to +5V dc	Sign +10 5.13 mV/ 32 counts	-3121 to +32767 Count by 32	6.00 mV/ 6 counts	-500 to +5250 Count by 6	5.19 mV/ 17 counts	-1638 to +17202 Count by 17	5.50 mV/ 11 counts	-1000 to +10500 Count by 11
0 to +10V dc	Sign +11 5.13 mV/ 16 counts	-1560 to +32767 Count by 16	6.00 mV/ 6 counts	-500 to +10500 Count by 6	5.49 mV/ 9 counts	-819 to +17202 Count by 9	6.00 mV/ 6 counts	-500 to +10500 Count by 6
+4 to +20 mA	Sign +11 10.25 µA/ 16 counts	+4993 to +32767 Count by 2	11.00 µA/ 11 counts	+3200 to +2100 Count by 11	10.74 µA/ 11 counts	-819 to +17407 Count by 11	11.20 µA/ 7 counts	-500 to +10625 Count by 7
+1 to +5V dc	Sign +10 5.13 mV/ 32 counts	+3121 to +32767 Count by 32	6.00 mV/ 6 counts	+500 to +5250 Count by 6	5.37 mV/ 22 counts	-2048 to +17407 Count by 22	5.20 mV/ 13 counts	-1250 to +10625 Count by 13
0 to +20 mA	Sign +11 10.25 µA/ 16 counts	0 to +32767 Count by 16	11.00 µA/ 11 counts	0 to +21000 Count by 11	10.99 µA/ 9 counts	0 to +17202 Count by 9	12.00 µA/ 6 counts	0 to +10500 Count by 6

Table: 4.11 500 Hz Effective Resolution

1769-IF4 Input Range	Raw/Proportional Data Over the Full Input Range		Engineering Units Over the Full Input Range		Scaled-For-PID Over the Full Input Range		Percent Over the Full Input Range	
	Bits and Engineering Units Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value
-10 to +10V dc	Sign +9 20.51 mV/ 64 counts	±32767 Count by 64	21.00 mV/ 21 counts	±10500 Count by 21	20.75 mV/ 17 counts	-410 to +16793 Count by 17	Not Applicable	Not Applicable
0 to +5V dc	Sign +8 20.51 mV/ 128 counts	-3121 to +32767 Count by 128	21.00 mV/ 21 counts	-500 to +5250 Count by 21	20.75 mV/ 68 counts	-1638 to +17202 Count by 68	21.00 mV/ 42 counts	-1000 to +10500 Count by 42
0 to +10V dc	Sign +9 20.51 mV/ 64 counts	-1560 to +32767 Count by 64	21.00 mV/ 21 counts	-500 to +10500 Count by 21	20.75 mV/ 34 counts	-819 to +17202 Count by 34	21.00 mV/ 21 counts	-500 to +10500 Count by 21
+4 to +20 mA	Sign +9 41.02 µA/ 64 counts	+4993 to +32767 Count by 64	42.00 µA/ 42 counts	+3200 to +2100 Count by 42	41.02 µA/ 42 counts	-819 to +17407 Count by 42	41.60 µA/ 26 counts	-500 to +10625 Count by 26
+1 to +5V dc	Sign +8 20.51 mV/ 128 counts	+3121 to +32767 Count by 128	21.00 mV/ 21 counts	+500 to +5250 Count by 21	20.75 mV/ 84 counts	-2048 to +17407 Count by 84	20.8 mV/ 52 counts	-1250 to +10625 Count by 52
0 to +20 mA	Sign +9 41.02 µA/ 64 counts	0 to +32767 Count by 64	42.00 µA/ 42 counts	0 to +21000 Count by 42	41.51 µA/ 34 counts	0 to +17202 Count by 34	42.00 µA/ 21 counts	0 to +10500 Count by 21

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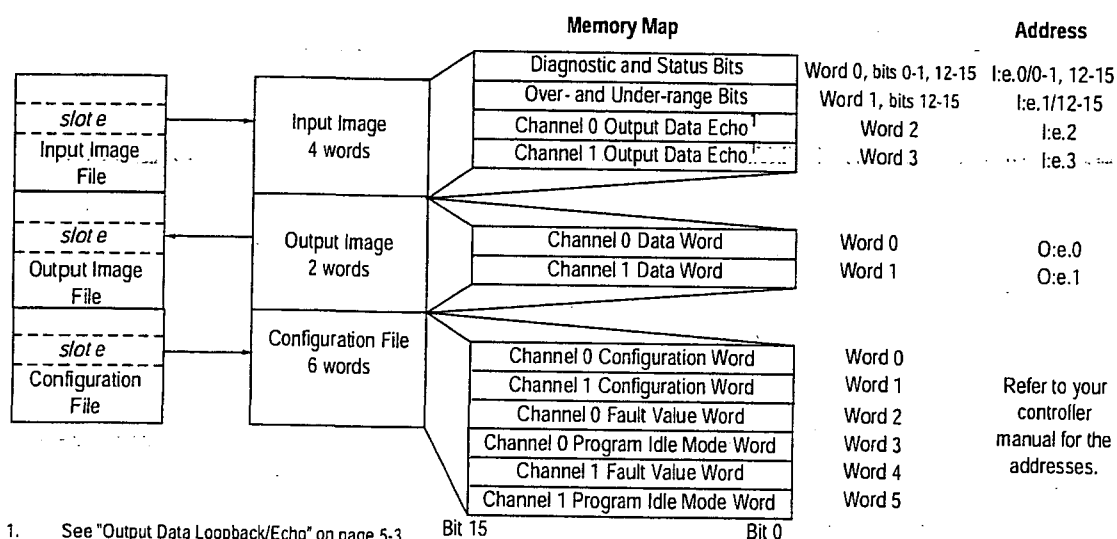
## Chapter 5

### Module Data, Status, and Channel Configuration for 1769-OF2

This chapter examines the analog output module's output data file, input data file, channel status, and channel configuration words.

#### Output Module Addressing

The following memory map shows the output, input, and configuration tables for the 1769-OF2.



#### 1769-OF2 Output Data File

The structure of the output data file is shown in the table below. Words 0 and 1 contain the converted analog output data for channels 0 and 1, respectively. The most significant bit is the sign bit.

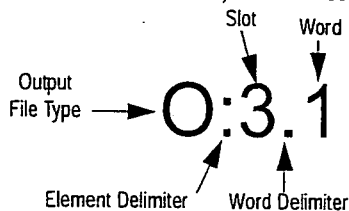
Table: 5.1 1769-OF2 Output Data Table

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	SGN	Analog Output Data Channel 0														
Word 1	SGN	Analog Output Data Channel 1														

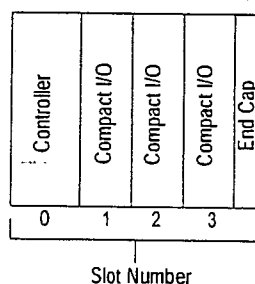
## 5-2

## Module Data, Status, and Channel Configuration for 1769-OF2

For example, to obtain the converted output data of channel 1 of an analog module located in slot 3, use address O:3.1.



**Note:** This addressing scheme is applicable only for the MicroLogix™ 1500 controller.



**Note:** The end cap does not use a slot address.

## 1769-OF2 Input Data File

This data table file provides immediate access to channel diagnostic information and analog output data at the module for use in the control program. To receive valid data, you must enable the channel. The data table structure is described below.

Table: 5.2 1769-OF2 Input Data Table

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0												
Word 0	D0	H0	D1	H1	Not Used (bits set to 0)										S1	S0												
Word 1	U0	O0	U1	O1	Bits 0 - 11 set to 0																							
Word 2	SGN	Channel 0 - Output Data Loopback/Echo																										
Word 3	SGN	Channel 1 - Output Data Loopback/Echo																										

### Diagnostic Bits (D0 - D1)

When set (1), these bits indicate a broken output wire or high load resistance (not used on voltage outputs). Bit 15 represents channel 0; bit 13 represents channel 1.

**Hold Last State Bits (H0 - H1)**

These bits indicate when channel 0 (bit 14) or channel 1 (bit 12) is in a hold last state condition. When one of these bits is set (1), the corresponding channel is in the hold state. Output data will not change until the condition which caused the hold last state to occur is removed. The bit is reset (0) for all other conditions.

**Note:** Not all controllers support the hold last state function. Refer to your controller's user manual for details.

**Over-Range Flag Bits (O0 - O1)**

Over-range bits for channels 0 and 1 are contained in word 1, bits 14 and 12. When set, the over-range bit indicates that the controller is attempting to drive the analog output above its normal operating range. However, the module continues to convert analog output data to a maximum full range value. The bit is automatically reset (0) by the module when the over-range condition is cleared (the output is within the normal operating range). The over-range bits apply to all output ranges. Refer to Table 5.6, "Valid Output Data Table," on page 5-11 to view the normal operating and over-range areas.

**Under-Range Flag Bits (U0 - U1)**

Under-range bits for channels 0 and 1 are contained in word 1, bits 15 and 13. When set (1), the under-range bit indicates that the controller is attempting to drive the analog output below its normal operating range. However, the module continues to convert analog output data to a minimum full range value. The bit is automatically reset (0) by the module when the under-range condition is cleared (the output is within the normal operating range). The under-range bits apply to all output ranges. Refer to Table 5.6, "Valid Output Data Table," on page 5-11 to view the normal operating and under-range areas.

**General Status Bits (S0 - S1)**

Word 0, bits 0 and 1 contain the general status information for output channels 0 and 1. If set (1), these bits indicate an error associated with that channel. The over-range and under-range bits and the diagnostic bit are logically ORed to this position.

**Output Data Loopback/Echo**

Words 2 and 3 provide output loopback/data echo through the input array for channels 0 and 1, respectively. The value of the data echo is the analog value currently being converted on-board the module by the D/A converter. This ensures that the logic-directed state of the output is true. Otherwise, the state of the output could vary depending on controller mode.

## 5-4

## Module Data, Status, and Channel Configuration for 1769-OF2

Under normal operating conditions, the data echo value is the same value that is being sent from the controller to the output module. Under abnormal conditions, the values may differ. For example:

1. During run mode, the control program could direct the module to a value over or under the defined full range. In that case, the module raises the over- or under-range flag and continues to convert and data echo up to the defined full range. However, upon reaching either the maximum upper or lower full range value, the module stops converting and echoes back that maximum upper or lower full range value, not the value being sent from the controller.
2. During program or fault mode with Hold Last State or User-Defined Value selected, the module echoes the hold last value or alternate value as selected by the user. For more information on the hold last and user-defined values, see "Fault Value (Channel 0 - 1)" on page 5-10 and "Program/Idle Value (Channel 0 - 1)" on page 5-10.

## 1769-OF2 Configuration Data File

The configuration file allows you to determine how each individual output channel will operate. Parameters such as the output type/range and data format are set up using this file. The configuration data file is writable and readable. The default value for the configuration data file is all zeros. The structure of the channel configuration file is explained below. Words 0 and 1 are the channel configuration words for channels 0 and 1. They are described in "Channel Configuration Words" on page 5-6. Words 2 through 5 are explained beginning on page 5-10.

Table: 5.3 1769-OF2 Configuration Data Table<sup>1</sup>

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	E	Output Data Format Select Channel 0			Output Type/Range Select Channel 0				Not Used (set to 0)				FM0	PM0	Not Used (set to 0)	PFE0
Word 1	E	Output Data Format Select Channel 1			Output Type/Range Select Channel 1				Not Used (set to 0)				FM1	PM1	Not Used (set to 0)	PFE1
Word 2	S	Fault Value - Channel 0														
Word 3	S	Program (Idle) Value - Channel 0														
Word 4	S	Fault Value - Channel 1														
Word 5	S	Program (Idle) Value - Channel 1														

1. The ability to change these values using your control program is not supported by all controllers. Refer to your controller manual for details.

## Module Data, Status, and Channel Configuration for 1769-OF2

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The configuration file is typically modified using the programming software configuration screen.

Module #2: 1769-OF2 - Analog 2 Channel Output Module

Expansion-General Configuration Analog Output Configuration

Word 0

☒ Enable

Output Range Selection: 0 to +5 VDC

Data Format: Raw/Proportional

Word 1

☒ Enable

Output Range Selection: 0 to 20 mA

Data Format: Engineering Units

OK Cancel Apply Help

**Note:** The software configuration default is to enable each output channel. To reduce module power draw and heat dissipation, disable any unused channel.

Table: 5.4 Software Configuration Default Settings

Parameter	Default Setting
Enable Channel	Enabled
Output Range Selection	$\pm 10V$ dc
Data Format	Raw/Proportional

The configuration file can also be modified through the control program, if supported by the controller. The structure and bit settings are shown in "Channel Configuration Words" on page 5-6.

## 5-6

## Module Data, Status, and Channel Configuration for 1769-OF2

### Channel Configuration Words

Both channel configuration words (0 and 1) consist of bit fields, the settings of which determine how the corresponding channel operates. See the table below and the descriptions that follow for valid configuration settings and their meanings.

**Table: 5.5 Bit Definitions for Channel Configuration Words 0 and 1**

Bit(s)	Define	These bit settings																Indicate this
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0	Program/ Idle to Fault Enable																0	Program Mode Data Applied
																	1	Fault Mode Data Applied
1	Reserved																	Reserved
2	Program/ Idle Mode														0			Program Mode Hold Last State
															1			Program Mode User-Defined Value
3	Fault Mode													0				Fault Mode Hold Last State
														1				Fault Mode User-Defined Value
4-7	Reserved																	Reserved <sup>1</sup>
8-11	Output Type/ Range Select					0	0	0	0									-10V dc to +10V dc
						0	0	0	1									0 to 5V dc
						0	0	1	0									0 to 10V dc
						0	0	1	1									4 to 20 mA
						0	1	0	0									1 to 5V dc
						0	1	0	1									0 to 20 mA
																		Not Used <sup>2</sup>
12-14	Output Data Format Select		0	0	0													Raw/ Proportional Data
			0	0	1													Engineering Units
			0	1	0													Scaled for PID
			0	1	1													Percent Range
																		Not Used <sup>2</sup>
15	Enable Channel	1																Enabled
		0																Disabled

1. If reserved bits are not equal to zero, a configuration error occurs.

2. Any attempt to write a non-valid (not used) bit configuration into any selection field results in a module configuration error. See "Configuration Errors" on page 6-5.

### Enable Channel

This configuration selection (bit 15) allows each channel to be individually enabled.

**Note:** A channel that is not enabled has zero voltage or current at its terminal.

### Output Type/Range Selection

This selection, along with proper output wiring, allows you to configure each output channel individually for current or voltage ranges, and provides the ability to read the range selection.

### Output Data Format Selection

This selection configures each channel to interpret data presented to it by the controller in any of the following formats:

- Raw/Proportional Data
- Engineering Units
- Scaled for PID
- Percent Full Range

#### Raw/Proportional Data

The control program presents the maximum raw data value allowed by the bit resolution of the D/A converter. The full range for a  $\pm 10\text{Vdc}$  user input is -32767 to +32767. See Table 5.6, "Valid Output Data Table," on page 5-11.

#### Engineering Units

The control program presents an engineering data value to the module within the current or voltage range allowed by the D/A converter. The module then scales the data to the appropriate analog output value for the selected user range. See Table 5.6, "Valid Output Data Table," on page 5-11.

#### Scaled for PID

The control program presents an integer value to the module, with zero representing the lower user range and 16383 representing the upper user range, for conversion by the D/A converter. The module then scales this data to the approximate analog output value for the selected user range. See Table 5.6, "Valid Output Data Table," on page 5-11.

**Note:** Allen-Bradley controllers, such as the MicroLogix 1500, use this range in their PID equations for controlled process outputs.

## 5-8 Module Data, Status, and Channel Configuration for 1769-OF2

### Percent Full Range

The control program presents the analog output data to the module as a percent of the full analog output range (for example, valve 50% open). The module scales this data to the appropriate analog output value for the selected user range. For example, 0 to 100% equals 0 to 10V dc. See Table 5.6, "Valid Output Data Table," on page 5-11.

**Note:** The  $\pm 10\text{V}$  dc range does not support percent full range.

### Program/Idle to Fault Enable (PFE0 - PFE1)

If a system currently in program/idle mode faults, this setting (word 0, bit 0; word 1, bit 0) determines whether the program/idle or fault mode value is applied to the output. If the selection is enabled [the bit is set (1)], the module applies the fault mode data value. If the selection is disabled [the bit is reset (0)], the module applies the program/idle mode data value. The default setting is disabled.

**Note:** Not all controllers support this function. Refer to your controller's user manual for details.

### Fault Mode (FM0 - FM1)

This configuration selection provides individual fault mode selection for analog output channels 0 (word 0, bit 3) and 1 (word 1, bit 3). When this selection is disabled [the bit is reset (0)] and the system enters the fault mode, the module *holds* the *last* output state value. This means that the analog output remains at the last converted value prior to the condition that caused the system to enter the fault mode.

**Important:** Hold last state is the default condition for the 1769-OF2 during a control system run-to-fault mode change.

**Note:** MicroLogix 1500™ does not support the analog output module's default hold last state function and resets analog outputs to zero when the system enters the fault mode.

If this selection is enabled [the bit is set (1)] and the system enters the fault mode, it commands the module to convert the *user-specified* integer value from the channel's fault value word (2 or 4) to the appropriate analog output for the range selected. If the default value, 0000, is entered, the output typically converts to the minimum value for the range selected.

For example:

- If the raw/proportional or engineering units data format is selected and zero (0000) is entered in the  $\pm 10\text{V}$  dc operating range, the resulting value would be 0V dc.
- If the raw/proportional or engineering units format is selected and zero is entered as the fault value in either a 1 to 5V dc or 4 to 20 mA range, a configuration error results.

See Table 5.6, "Valid Output Data Table," on page 5-11 for more examples.

**Note:** Not all controllers support this function. Refer to your controller's user manual for details.

#### Program/Idle Mode (PM0 - PM1)

This configuration selection provides individual program/idle mode selection for the analog channels 0 (word 0, bit 2) and 1 (word 1, bit 2). When this selection is disabled [the bit is reset (0)], the module *holds the last state*, meaning that the analog output remains at the last converted value prior to the condition that caused the control system to enter the program mode.

**Important:** Hold last state is the default condition for the 1769-OF2 during a control system run-to-program mode change.

**Note:** MicroLogix 1500™ does not support the analog output module's default hold last state function and resets analog outputs to zero when the system enters the program mode.

If this selection is enabled [the bit is set (1)] and the system enters the program mode, it commands the module to convert the *user-specified* value from the channel's program/idle value word (3 or 5) to the appropriate analog output for the range selected.

For example:

- If the default value, 0000, is used and the range selected is 0 - 20 mA, the module will output 0 mA for all data formats.
- If the raw/proportional or engineering units format is selected and zero is entered as the program/idle value in either a 1 to 5V dc or 4 to 20 mA range, a configuration error results. See Table 5.6, "Valid Output Data Table," on page 5-11 for more examples.

**Note:** Not all controllers support this function. Refer to your controller's user manual for details.

**Fault Value (Channel 0 - 1)**

Using words 2 and 4 for channels 0 and 1, you can specify the values the outputs will assume when the system enters the fault mode. The default value is 0. Valid values are dependent upon the range selected in the range selection field. If the value entered by the user is outside the normal operating range for the output range selected, the module generates a configuration error.

For example, if you select engineering units for the  $\pm 10\text{V}$  dc range and enter a fault value within the normal operating range (0 to 10000), the module will configure and operate correctly. However, if you enter a value outside the normal operating range (for example 11000), the module indicates a configuration error.

**Note:** Not all controllers support this function. Refer to your controller's user manual for details.

**Program/Idle Value (Channel 0 - 1)**

Use words 3 and 5 to set the integer values for the outputs to assume when the system enters the program mode. The values are dependent upon the range selected in the range selection field. If the value entered by the user is outside the normal operating range for the output range selected, the module generates a configuration error. The default value is 0.

**Note:** Not all controllers support this function. Refer to your controller's user manual for details.

## Module Data, Status, and Channel Configuration for 1769-OF2

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## Valid Output Data Word Formats/Ranges

The following table shows the valid formats and data ranges accepted by the module.

Table: 5.6 Valid Output Data Table

OF2 Output Range	Input Value	Example Data		Output Range State	Raw/Proportional Data		Engineering Unit		Scaled for PID		Percent Full Range	
					Decimal Range		Decimal Range		Decimal Range		Decimal Range	
		Controller Ordered	OF2 Output		Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo
±10V dc	Over 10.5V dc	+11.0V dc	+10.5V dc	Over	N/A	N/A	11000	10500	17202	16793	N/A	N/A
	+10.5V dc	+10.5V dc	+10.5V dc	Over	32767	32767	10500	10500	16793	16793	N/A	N/A
	-10V to +10V dc	+10.0V dc	+10.0V dc	Normal	31207	31207	10000	10000	16383	16383	N/A	N/A
		0.0V dc	0.0V dc	Normal	0	0	0	0	8192	8192	N/A	N/A
		-10.0V dc	-10.0V dc	Normal	-31207	-31207	-10000	-10000	0	0	N/A	N/A
	-10.5V dc	-10.5V dc	-10.5V dc	Under	-32767	-32767	-10500	-10500	-410	-410	N/A	N/A
	Under -10.5V dc	-11.0V dc	-11.0V dc	Under	N/A	N/A	-11000	-10500	-819	-410	N/A	N/A
0V to 5V dc	Over 5.25V dc	5.5V dc	+5.25V dc	Over	N/A	N/A	5500	5250	18021	17202	11000	10500
	5.25V dc	5.25V dc	+5.25V dc	Over	32767	32767	5250	5250	17202	17202	10500	10500
	0.0V dc to 5.0V dc	5.0V dc	+5.0V dc	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		0.0V dc	0.0V dc	Normal	0	0	0	0	0	0	0	0
	-0.5V dc	-0.5V dc	-0.5V dc	Under	-3121	-3121	-500	-500	-1638	-1638	-1000	-1000
	Under -0.5V dc	-1.0V dc	-0.5V dc	Under	-6241	-3121	-500	-500	-3277	-1638	-2000	-1000
0V to 10V dc	Over 10.5V dc	11.0V dc	+10.5V dc	Over	N/A	N/A	11000	10500	18021	17202	11000	10500
	+10.5V dc	+10.5V dc	+10.5V dc	Over	32767	32767	10500	10500	17202	17202	10500	10500
	0.0V dc to 10.0V dc	+10.0V dc	+10.0V dc	Normal	31207	31207	10000	10000	16383	16383	10000	10000
		0.0V dc	0.0V dc	Normal	0	0	0	0	0	0	0	0
	-0.5V dc	-0.5V dc	-0.5V dc	Under	-1560	-1560	-500	-500	-819	-819	-500	-500
	Under -5.0V dc	-1.0V dc	-0.5V dc	Under	-3121	-1560	-1000	-500	-1638	-819	-1000	-500
4 mA to 20 mA	Over 21.0 mA	+22.0 mA	+21.0 mA	Over	N/A	N/A	22000	21000	18431	17407	11250	10625
	21.0 mA	+21.0 mA	+21.0 mA	Over	32767	32767	21000	21000	17407	17407	10625	10625
	4.0 mA to 20.0 mA	+20.0 mA	+20.0 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		+4.0 mA	+4.0 mA	Normal	6241	6241	4000	4000	0	0	0	0
	3.2 mA	+3.2 mA	+3.2 mA	Under	4993	4993	3200	3200	-819	-819	-500	-500
	Under 3.2 mA	0.0 mA	+3.2 mA	Under	0	4993	0	3200	-4096	-819	-2500	-500

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## 5-12 Module Data, Status, and Channel Configuration for 1769-OF2

Table: 5.6 Valid Output Data Table

OF2 Output Range	Input Value	Example Data		Output Range State	Raw/Proportional Data		Engineering Unit		Scaled for PID		Percent Full Range	
					Decimal Range		Decimal Range		Decimal Range		Decimal Range	
		Controller Ordered	OF2 Output		Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo	Controller Ordered	OF2 Output and Echo
1.0V to 5V dc	Over 5.25V dc	+5.5V dc	+5.25V dc	Over	N/A	N/A	5500	5250	18431	17407	11250	10625
	+5.25V dc	+5.25V dc	+5.25V dc	Over	32767	32767	5250	5250	17407	17407	10625	10625
	1.0V to 5.0V dc	+5.0V dc	+5.0V dc	Normal	31207	31207	5000	5000	16383	16383	10000	10000
		+1.0V dc	+1.0V dc	Normal	6241	6241	1000	1000	0	0	0	0
	0.5V dc	+0.5V dc	+0.5V dc	Under	3121	3121	500	500	-2048	-2048	-1250	-1250
0 mA to 20 mA	Under 0.5V dc	0.0V dc	0.0V dc	Under	0	3121	0	500	-4096	-2048	-2500	-1250
	Over 21.0 mA	+22.0 mA	+21.0 mA	Over	N/A	N/A	22000	21000	18201	17202	11000	10500
	21.0 mA	21.0 mA	+21.0 mA	Over	32767	32767	21000	21000	17202	17202	10500	10500
	0.0 mA to 20.0 mA	20.0 mA	+20.0 mA	Normal	31207	31207	20000	20000	16383	16383	10000	10000
		0.0 mA	0.0 mA	Normal	0	0	0	0	0	0	0	0
	Under 0.0 mA	-1.0 mA	0.0 mA	Under	-1560	0	0	-1000	-819	0	-500	0

**Module Resolution**

The resolution of an analog output channel depends on the output type/range and data format selected. Table 5.7 provides detailed resolution information for the 1769-OF2.

Table: 5.7 Output Resolution

1769-OF2 Output Range	Raw/Proportional Data Over the Full Input Range		Engineering Units Over the Full Input Range		Scaled-For-PID Over the Full Input Range		Percent Over the Full Input Range	
	Bits and Engineering Units Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value	Resolution	Decimal Range and Count Value
-10 to +10V dc	Sign +14 0.64 mV/ 2 counts	±32767 Count by 2	2.00 mV/ 2 counts	±10500 Count by 2	2.44 mV/ 2 counts	-410 to +16793 Count by 2	Not Applicable	Not Applicable
0 to +5V dc	Sign +13 0.64 mV/ 4 counts	-3121 to +32767 Count by 4	2.00 mV/ 2 counts	-500 to +5250 Count by 2	0.92 mV/ 3 counts	-1638 to +17202 Count by 3	1.00 mV/ 2 counts	-1000 to +10500 Count by 2
0 to +10V dc	Sign +14 0.64 mV/ 2 counts	-1560 to +32767 Count by 2	2.00 mV/ 2 counts	-500 to +10500 Count by 2	1.22 mV/ 2 counts	-819 to +17202 Count by 2	2.00 mV/ 2 counts	-500 to +10500 Count by 2
+4 to +20 mA	Sign +14 1.28 µA/ 2 counts	+4993 to +32767 Count by 2	2.00 µA/ 2 counts	+3200 to +2100 Count by 2	1.95 µA/ 2 counts	-819 to +17407 Count by 2	3.20 µA/ 2 counts	-500 to +10625 Count by 2
+1 to +5V dc	Sign +13 0.64 mV/ 4 counts	+3121 to +32767 Count by 4	2.00 mV/ 2 counts	+500 to +5250 Count by 2	0.73 mV/ 3 counts	-2048 to +17407 Count by 3	0.80 mV/ 2 counts	-1250 to +10625 Count by 2
0 to +20 mA	Sign +14 1.28 µA/ 2 counts	0 to +32767 Count by 2	2.00 µA/ 2 counts	0 to +21000 Count by 2	2.44 µA/ 2 counts	0 to +17202 Count by 2	4.00 µA/ 2 counts	0 to +10500 Count by 2

## Chapter 6

### Module Diagnostics and Troubleshooting

This chapter describes troubleshooting the analog input and output modules. This chapter contains information on:

- safety considerations when troubleshooting
- module vs. channel operation
- the module's diagnostic features
- critical vs. non-critical errors
- module condition data

#### Safety Considerations

Safety considerations are an important element of proper troubleshooting procedures. Actively thinking about the safety of yourself and others, as well as the condition of your equipment, is of primary importance.

The following sections describe several safety concerns you should be aware of when troubleshooting your control system.



**ATTENTION:** Never reach into a machine to actuate a switch because unexpected motion can occur and cause injury.

**ATTENTION:** Remove all electrical power at the main power disconnect switches before checking electrical connections or inputs/outputs causing machine motion.

#### Indicator Lights

When the green LED on the analog module is illuminated, it indicates that power is applied to the module.

#### Activating Devices When Troubleshooting

When troubleshooting, never reach into the machine to actuate a device. Unexpected machine motion could occur.

#### Stand Clear of the Machine

When troubleshooting any system problem, have all personnel remain clear of the machine. The problem could be intermittent, and sudden unexpected machine motion could occur. Have someone ready to operate an emergency stop switch in case it becomes necessary to shut off power to the machine.

**6-2**      **Module Diagnostics and Troubleshooting**

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**Program Alteration**

There are several possible causes of alteration to the user program, including extreme environmental conditions, Electromagnetic Interference (EMI), improper grounding, improper wiring connections, and unauthorized tampering. If you suspect a program has been altered, check it against a previously saved program on an EEPROM or UVPROM memory module.

**Safety Circuits**

Circuits installed on the machine for safety reasons, like over travel limit switches, stop push buttons, and interlocks, should always be hard-wired to the master control relay. These devices must be wired in series so that when any one device opens, the master control relay is de-energized, thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could result.

**Module Operation vs.  
Channel Operation**

The module performs operations at two levels:

- module level
- channel level

Module-level operations include functions such as power-up, configuration, and communication with a bus master, such as a MicroLogix 1500 controller.

Channel-level operations describe channel related functions, such as data conversion and over- or under-range detection.

Internal diagnostics are performed at both levels of operation. When detected, module error conditions are immediately indicated by the module status LED. Both module hardware and channel configuration error conditions are reported to the controller. Channel over-range or under-range conditions are reported in the module's input data table. Module hardware errors are typically reported in the controller's I/O status file. Refer to your controller manual for details.

When a fault condition is detected, the analog outputs are reset to zero. The data in the output data file is retained during the fault. Once the fault condition is corrected and the major fault bit in the controller is cleared, the retained data is sent to the analog output channels.

## Power-up Diagnostics

At module power-up, a series of internal diagnostic tests are performed. These diagnostic tests must be successfully completed or the module status LED remains off and a module error results and is reported to the controller.

Table: 6.1 Module Status LED State Table

If module status LED is:	Indicated condition:	Corrective action:
On	Proper Operation	No action required.
Off	Module Fault	Cycle power. If condition persists, replace the module. Call your local distributor or Allen-Bradley for assistance.

## Channel Diagnostics

When an input or output module channel is enabled, the module performs a diagnostic check to see that the channel has been properly configured. In addition, the channel is tested on every scan for configuration errors, over-range and under-range, open-circuit (input module in 4 to 20 mA range only) and output wire broken/high load resistance (output module only) conditions.

### Out-of-Range Detection (Input and Output Modules)

For input modules, whenever the data received at the channel word is out of the defined operating range, an over-range or under-range error is indicated in input data word 5, bits 8 to 15.

For output modules, whenever the controller is driving data over or under the defined operating range, an over-range or under-range error is indicated in the input data word 1, bits 12 to 15.

### Open-Circuit Detection (Input Module Only)

An open-circuit test is performed on all enabled channels configured for 4 to 20 mA inputs. Whenever an open-circuit condition occurs, the under-range bit for that channel is set in input data word 5.

Possible causes of an open circuit include:

- the sensing device may be broken
- a wire may be loose or cut
- the sensing device may not be installed on the configured channel

### Output Wire Broken/High Load Resistance (Output Module Only)

A check is performed on all enabled channels to determine if an output wire is broken, or if the load resistance is high, in the case of current mode outputs. Whenever one of these conditions is present, the diagnostic bit for that channel is set in the input data word 0, bits 13 or 15.

## Non-critical vs. Critical Module Errors

Non-critical module errors are typically recoverable. Channel errors (over-range or under-range errors) are non-critical. Non-critical error conditions are indicated in the module input data table. Non-critical configuration errors are indicated by the extended error code. See Table 6.4, "Extended Error Codes," on page 6-6.

Critical module errors are conditions that prevent normal or recoverable operation of the system. When these types of errors occur, the system typically leaves the run or program mode of operation until the error can be dealt with. Critical module errors are indicated in Table 6.4, "Extended Error Codes," on page 6-6.

## Module Error Definition Table

Analog module errors are expressed in two fields as four-digit Hex format with the most significant digit as "don't care" and irrelevant. The two fields are "Module Error" and "Extended Error Information". The structure of the module error data is shown below.

Table: 6.2 Module Error Table

"Don't Care" Bits				Module Error			Extended Error Information								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hex Digit 4				Hex Digit 3			Hex Digit 2				Hex Digit 1				

## Module Error Field

The purpose of the module error field is to classify module errors into three distinct groups, as described in the table below. The type of error determines what kind of information exists in the extended error information field. These types of module errors are typically reported in the controller's I/O status file. Refer to your controller manual for details.

Table: 6.3 Module Error Types

Error Type	Module Error Field Value (Hex)	Description
No Errors	0	No error is present. The extended error field holds no additional information.
Hardware Errors	2	General and specific hardware error codes are specified in the extended error information field.
Configuration Errors	4	Module-specific error codes are indicated in the extended error field. These error codes correspond to options that you can change directly. For example, the input range or input filter selection.

### Extended Error Information Field

Check the extended error information field when a non-zero value is present in the module error field. Depending upon the value in the module error field, the extended error information field can contain error codes that are module-specific or common to all 1769 analog modules.

**Note:** If no errors are present in the module error field, the extended error information field will be set to zero.

### Hardware Errors

General or module-specific hardware errors are indicated by module error code 2. See Table 6.4, "Extended Error Codes," on page 6-6.

### Configuration Errors

If you set the fields in the configuration file to invalid or unsupported values, the module ignores the invalid configuration, generates a non-critical error, and keeps operating with the previous configuration.

Each type of analog module has different features and different error codes. Table 6.4, "Extended Error Codes," on page 6-6 lists the possible module-specific configuration error codes defined for the modules.

## Error Codes

The table below explains the extended error code.

Table: 6.4 Extended Error Codes

Error Type	Hex Equivalent <sup>1</sup>	Module Error Code	Extended Error Information Code	Error Description
		Binary	Binary	
No Error	X000	000	0 0000 0000	No Error
General Common Hardware Error	X200	001	0 0000 0000	General hardware error; no additional information
	X201	001	0 0000 0001	Power-up reset state
Hardware-Specific Error	X210	001	0 0001 0000	General hardware error
	X211	001	0 0001 0001	Microprocessor hardware error
1769-IF4 Specific Configuration Error	X400	010	0 0000 0000	General configuration error; no additional information
	X401	010	0 0000 0001	invalid input range selected (channel 0)
	X402	010	0 0000 0010	invalid input range selected (channel 1)
	X403	010	0 0000 0011	invalid input range selected (channel 2)
	X404	010	0 0000 0100	invalid input range selected (channel 3)
	X405	010	0 0000 0101	invalid input filter selected (channel 0)
	X406	010	0 0000 0110	invalid input filter selected (channel 1)
	X407	010	0 0000 0111	invalid input filter selected (channel 2)
	X408	010	0 0000 1000	invalid input filter selected (channel 3)
	X409	010	0 0000 1001	invalid input format selected (channel 0)
	X40A	010	0 0000 1010	invalid input format selected (channel 1)
	X40B	010	0 0000 1011	invalid input format selected (channel 2)
	X40C	010	0 0000 1100	invalid input format selected (channel 3)
1769-OF2 Specific Configuration Error	X400	010	0 0000 0000	General configuration error; no additional information
	X401	010	0 0000 0001	invalid output range selected (channel 0)
	X402	010	0 0000 0010	invalid output range selected (channel 1)
	X403	010	0 0000 0010	invalid output data format selected (channel 0)
	X404	010	0 0000 0100	invalid output data format selected (channel 1)
	X405	010	0 0000 0101	invalid fault value entered for data format selected (channel 0)
	X406	010	0 0000 0110	invalid fault value entered for data format selected (channel 1)
	X407	010	0 0000 0111	invalid program value entered for data format selected (channel 0)
	X408	010	0 0000 1000	invalid program value entered for data format selected (channel 1)

1. X represents the "Don't Care" digit.

## Contacting Allen-Bradley

If you need to contact Allen-Bradley for assistance, please have the following information available when you call:

- a clear statement of the problem, including a description of what the system is actually doing. Note the LED state; also note input and output image words for the module.
- a list of remedies you have already tried
- processor type and firmware number (See the label on the processor.)
- hardware types in the system, including all I/O modules
- fault code if the processor is faulted

## Appendix A

### Specifications

#### General Specifications for 1769-IF4 and 1769-OF2

Specification	Value
Dimensions	118 mm (height) x 87 mm (depth) x 35 mm (width) height including mounting tabs is 138 mm 4.65 in. (height) x 3.43 in (depth) x 1.38 in (width) height including mounting tabs is 5.43 in.
Approximate Shipping Weight (with carton)	300g (0.65 lbs.)
Storage Temperature	-40°C to +85°C (-40°F to +185°F)
Operating Temperature	0°C to +60°C (32°F to +140°F)
Operating Humidity	5% to 95% non-condensing
Operating Altitude	2000 meters (6561 feet)
Vibration	Operating: 10 to 500 Hz, 5G, 0.015 in. peak-to-peak Relay Operation: 2G
Shock	Operating: 30G, 11ms panel mounted (20G, 11ms DIN rail mounted) Relay Operation: 7.5G panel mounted (5G DIN rail mounted) Non-Operating: 40G panel mounted (30G DIN rail mounted)
Power Supply Distance Rating	8 (The module may not be more than 8 modules away from a system power supply.)
Recommended Cable	Belden™ 8761 (shielded)
Maximum Cable Length	1769-IF4: See "Effect of Transducer/Sensor and Cable Length Impedance on Voltage Input Accuracy" on page 3-10. 1769-OF2: See "Effect of Device and Cable Output Impedance on Output Module Accuracy" on page 3-11.
Agency Certification	<ul style="list-style-type: none"> <li>• C-UL certified (under CSA C22.2 No. 142)</li> <li>• UL 508 listed</li> <li>• CE compliant for all applicable directives</li> </ul>
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 No. 213)
Radiated and Conducted Emissions	EN50081-2 Class A
Electrical /EMC:	<i>The module has passed testing at the following levels:</i>
• ESD Immunity (IEC1000-4-2)	• 4k V contact, 8kV air, 4k V indirect
• Radiated Immunity (IEC1000-4-3)	• 10 V/m , 80 to 1000 MHz, 80% amplitude modulation, +900 MHz keyed carrier
• Fast Transient Burst (IEC1000-4-4)	• 2 kV, 5kHz
• Surge Immunity (IEC1000-4-5)	• 2 kV common mode, 1kV differential mode
• Conducted Immunity (IEC1000-4-6)	• 10V, 0.15 to 80MHz <sup>1</sup>

1. Conducted Immunity frequency range may be 150 kHz to 30 MHz if the Radiated Immunity frequency range is 30 MHz to 1000 MHz.

## A-2

## 1769-IF4 Input Specifications

Specification	1769-IF4
Analog Normal Operating Ranges	Voltage: $\pm 10\text{V dc}$ , 0 to 10V dc, 0 to 5V dc, 1 to 5V dc Current: 0 to 20 mA, 4 to 20 mA
Full Scale <sup>1</sup> Analog Ranges	Voltage: $\pm 10.5\text{V dc}$ , -0.5 to 10.5V dc, -0.5 to 5.25V dc, 0.5 to 5.25V dc Current: 0 to 21 mA, 3.2 to 21 mA
Number of Inputs	4 differential or single-ended
Bus Current Draw (max.)	120 mA at 5V dc 150 mA at 24V dc
Heat Dissipation	3.99 Total Watts (The Watts per point, plus the minimum Watts, with all points energized.)
Converter Type	Delta Sigma
Response Speed per Channel	Input filter and configuration dependent. See "Channel Step Response" on page 4-6.
Resolution (max.)	14 bits (unipolar) 14 bits plus sign (bipolar) See "Effective Resolution" on page 4-12.
Rated Working Voltage <sup>2</sup>	50V ac/50V dc
Common Mode Voltage Range <sup>3</sup>	$\pm 10\text{V}$ maximum per channel
Common Mode Rejection	greater than 60 dB at 50 and 60 Hz with the 50 or 60 Hz filter selected, respectively
Normal Mode Rejection Ratio	-50 dB at 50/60 Hz
Input Impedance	Voltage Terminal: 220K $\Omega$ (typical) Current Terminal: 250 $\Omega$
Overall Accuracy <sup>4</sup>	Voltage Terminal: $\pm 0.2\%$ full scale at 25°C Current Terminal: $\pm 0.35\%$ full scale at 25°C
Accuracy Drift with Temperature	Voltage Terminal: $\pm 0.003\%$ per °C Current Terminal: $\pm 0.0045\%$ per °C
Calibration	The module performs autocalibration on channel enable and on configuration change between channels.

1. The over- or under-range flag will come on when the normal operating range (over/under) is exceeded. The module will continue to convert the analog input up to the maximum full scale range.
2. Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential (for example, 30V dc input signal and 20V dc potential above ground).
3. For proper operation, both the plus and minus input terminals must be within  $\pm 10\text{V dc}$  of analog common.
4. Includes offset, gain, non-linearity and repeatability error terms.

## 1769-IF4 Input Specifications (continued)

Specification	1769-IF4
Non-linearity (in percent full scale)	$\pm 0.03\%$
Repeatability <sup>1</sup>	$\pm 0.03\%$
Module Error over Full Temperature Range (0 to +60°C [+32°F to +140°F])	Voltage: $\pm 0.3\%$ Current: $\pm 0.5\%$
Input Channel Configuration	via configuration software screen or the user program (by writing a unique bit pattern into the module's configuration file). Refer to your controller manual to determine if user program configuration is supported.
Module OK LED	On: module has power, has passed internal diagnostics, and is communicating over the bus. Off: Any of the above is not true.
Channel Diagnostics	Over or under range by bit reporting
Maximum Overload at Input Terminals	Voltage Terminal: $\pm 30\text{V}$ continuous, 0.1 mA Current Terminal: $\pm 32\text{ mA}$ continuous, $\pm 7.6\text{ V}$
Input Group to Backplane Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 s or 1697V dc for 1 s. 50V ac/50V dc working voltage (IEC Class 2 reinforced insulation)
Vendor I.D. Code	1
Product Type Code	10
Product Code	35

1. Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal.

A-4

## 1769-OF2 Output Specifications

Specification	1769-OF2
Analog Ranges	Voltage: $\pm 10\text{V dc}$ , 0 to 10V dc, 0 to 5V dc, 1 to 5V dc Current: 0 to 20 mA, 4 to 20 mA
Full Scale Analog Ranges	Voltage: $\pm 10.5\text{V dc}$ , -0.5 to 10.5V dc, -0.5 to 5.25V dc, 0.5 to 5.25V dc Current: 0 - 21 mA, 3.2 - 21 mA
Number of Outputs	2 single-ended
Bus Current Draw (max.)	120 mA at 5V dc 200 mA at 24V dc
Heat Dissipation	4.77 Total Watts ( <i>The Watts per point, plus the minimum Watts, with all points energized.</i> )
Converter Type	R-2R Ladder
Analog Data Format	14-bit, two's complement. The Most Significant Bit is the sign bit.
Digital Resolution Across Full Range	14 bits (unipolar) 14 bits plus sign (bipolar) See "Module Resolution" on page 5-13.
Conversion Rate (all channels) max.	2.5 ms
Step Response to 63% <sup>1</sup>	2.9 ms
Current Load on Voltage Output	5 mA max.
Resistive Load on Current Output	0 to 500 $\Omega$ (includes wire resistance)
Load Range on Voltage Output	>1 k $\Omega$ at 5V dc >2 k $\Omega$ at 10V dc
Max. Inductive Load (Current Outputs)	0.1 mH
Max. Capacitive Load (Voltage Outputs)	1 $\mu\text{F}$
Overall Accuracy <sup>2</sup>	Voltage Terminal: $\pm 0.5\%$ full scale at 25°C Current Terminal: $\pm 0.35\%$ full scale at 25°C
Accuracy Drift with Temperature	Voltage Terminal: $\pm 0.0086\%$ FS per °C Current Terminal: $\pm 0.0058\%$ FS per °C
Output Ripple; range 0 - 50 kHz (referred to output range)	$\pm 0.05\%$
Calibration	None required (guaranteed by hardware design).

1. Step response is the period of time between when the D/A converter was instructed to go from minimum to full range until the device is at 63% of full range. Time applies to one or both channels.

2. Includes offset, gain, non-linearity and repeatability error terms.

## 1769-OF2 Output Specifications (continued)

Specification	1769-OF2
Non-linearity (in percent full scale)	±0.05%
Repeatability <sup>1</sup> (in percent full scale)	±0.05%
Output Error Over Full Temperature Range (0 to 60°C [32 to +140°F])	Voltage: ±0.8% Current: ±0.55%
Output Impedance	15 Ω (typical)
Open and Short-Circuit Protection	Yes
Maximum Short-Circuit Current	21 mA
Output Overvoltage Protection	Yes
Time to Detect Open Wire Condition (Current Mode)	10 ms typical 13.5 ms maximum
Output Response at Power Up and Power Down	±0.5 V spike for <5 ms
Rated Working Voltage <sup>2</sup>	50V ac/50V dc
Module OK LED	On: module has power, has passed internal diagnostics, and is communicating over the bus. Off: Any of the above is not true.
Channel Diagnostics	Over or under range by bit reporting output wire broken or load resistance high by bit reporting (current mode only)
Output Group to Backplane Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 s or 1697V dc for 1 s. 50V ac/50V dc working voltage (IEC Class 2 reinforced insulation)
Vendor I.D. Code	1
Product Type Code	10
Product Code	32

1. Repeatability is the ability of the output module to reproduce output readings when the same controller value is applied to it consecutively, under the same conditions and in the same direction.

2. Rated working voltage is the maximum continuous voltage that can be applied at the input terminal, including the input signal and the value that floats above ground potential (for example, 30V dc input signal and 20V dc potential above ground).

## Appendix **B**

### Two's Complement Binary Numbers

The processor memory stores 16-bit binary numbers. Two's complement binary is used when performing mathematical calculations internal to the processor. Analog input values from the analog modules are returned to the processor in 16-bit two's complement binary format. For positive numbers, the binary notation and two's complement binary notation are identical.

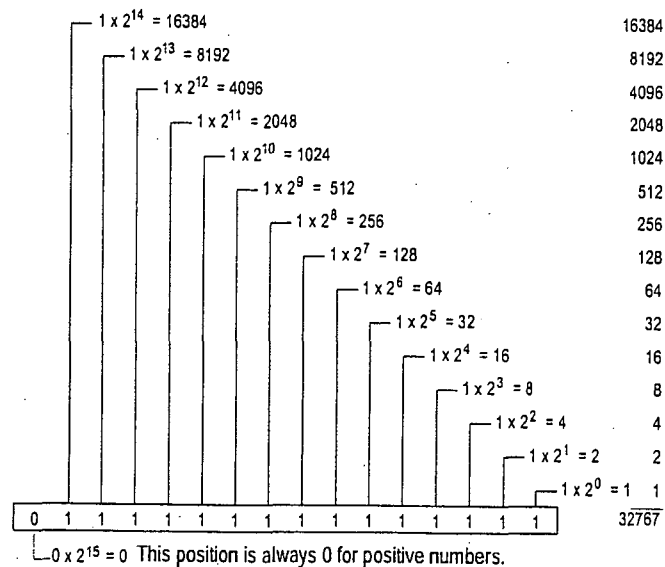
As indicated in the figure on the next page, each position in the number has a decimal value, beginning at the right with  $2^0$  and ending at the left with  $2^{15}$ . Each position can be 0 or 1 in the processor memory. A 0 indicates a value of 0; a 1 indicates the decimal value of the position. The equivalent decimal value of the binary number is the sum of the position values.

#### Positive Decimal Values

The far left position is always 0 for positive values. As indicated in the figure below, this limits the maximum positive decimal value to 32767 (all positions are 1 except the far left position). For example:

$$0000\ 1001\ 0000\ 1110 = 2^{11} + 2^8 + 2^3 + 2^2 + 2^1 = 2048 + 256 + 8 + 4 + 2 = 2318$$

$$0010\ 0011\ 0010\ 1000 = 2^{13} + 2^9 + 2^8 + 2^5 + 2^3 = 8192 + 512 + 256 + 32 + 8 = 9000$$



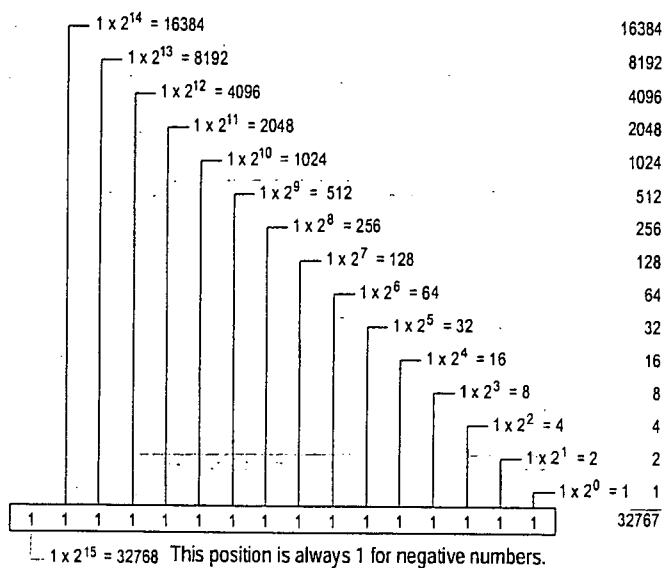
## B-2

**Negative Decimal Values**

In two's complement notation, the far left position is always 1 for negative values. The equivalent decimal value of the binary number is obtained by subtracting the value of the far left position, 32768, from the sum of the values of the other positions. In the figure below (all positions are 1), the value is  $32767 - 32768 = -1$ . For example:

$$1111\ 1000\ 0010\ 0011 = (2^{14} + 2^{13} + 2^{12} + 2^{11} + 2^5 + 2^1 + 2^0) - 2^{15} =$$

$$(16384 + 8192 + 4096 + 2048 + 32 + 2 + 1) - 32768 = 30755 - 32768 = -2013$$



## Glossary

The following terms and abbreviations are used throughout this manual. For definitions of terms not listed here refer to *Allen-Bradley's Industrial Automation Glossary*, Publication AG-7.1.

**A/D Converter**— Refers to the analog to digital converter inherent to the module. The converter produces a digital value whose magnitude is proportional to the magnitude of an analog input signal.

**alternate last state** — A configuration selection that instructs the module to convert a user-specified value from the channel fault or program/idle word to the output value when the module enters the fault or program mode.

**analog input module** — A module that contains circuits that convert analog voltage or current input signals to digital values that can be manipulated by the processor.

**attenuation** — The reduction in the magnitude of a signal as it passes through a system.

**bus connector** — A 16-pin male and female connector that provides electrical interconnection between the modules.

**channel** — Refers to analog input or output interfaces available on the module's terminal block. Each channel is configured for connection to a variable voltage or current input or output device, and has its own data and diagnostic status words.

**channel update time** — The time required for the module to sample and convert the input signals of one enabled input channel and update the channel data word.

**common mode rejection** — For analog inputs, the maximum level to which a common mode input voltage appears in the numerical value read by the processor, expressed in dB.

**common mode rejection ratio** — The ratio of a device's differential voltage gain to common mode voltage gain. Expressed in dB, CMRR is a comparative measure of a device's ability to reject interference caused by a voltage common to its input terminals relative to ground.  

$$CMRR = 20 \log_{10} (V_1/V_2)$$

**common mode voltage** — For analog inputs, the voltage difference between the negative terminal and analog common during normal differential operation.

## Glossary-2

---

**common mode voltage range** – For analog inputs, the largest voltage difference allowed between either the positive or negative terminal and analog common during normal differential operation.

**configuration word** – Contains the channel configuration information needed by the module to configure and operate each channel.

**D/A Converter**– Refers to the digital to analog converter inherent to the output module. The converter produces an analog dc voltage or current signal whose instantaneous magnitude is proportional to the magnitude of a digital value.

**dB** – (decibel) A logarithmic measure of the ratio of two signal levels.

**data echo** – The analog value currently being converted by the D/A converter and shown in words 2 and 3 of the output module's input data file. Under normal operating conditions, the data echo value is the same value that is being sent from the bus master to the output module.

**data word** – A 16-bit integer that represents the value of the analog input or output channel. The channel data word is valid only when the channel is enabled and there are no channel errors. When the channel is disabled the channel data word is cleared (0).

**differential operation** – The difference in voltage between a channel's positive terminal and negative terminal.

**digital filter** – A low-pass filter incorporated into the A/D converter. The digital filter provides very steep roll-off above its cut-off frequency, which provides high frequency noise rejection.

**filter** – A device that passes a signal or range of signals and eliminates all others.

**filter frequency** – (-3 dB frequency) The user-selectable frequency.

**full scale** – The magnitude of voltage or current over which normal operation is permitted.

**full scale error** – (gain error) The difference in slope between the actual and ideal analog transfer functions.

**full scale range** – (FSR) The difference between the maximum and minimum specified analog input values.

### Glossary-3

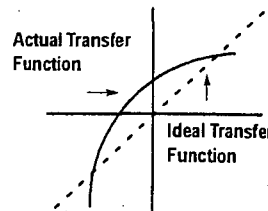
**hold last state** – A configuration selection that instructs the module to keep the outputs at the last converted value prior to the condition that caused the control system to enter the fault or program mode.

**input image** – The input from the module to the controller. The input image contains the module data words and status bits.

**LSB** – (Least Significant Bit) The bit that represents the smallest value within a string of bits. For analog modules, 16-bit, two's complement binary codes are used in the I/O image in the card.

For analog inputs, the LSB is defined as the rightmost bit, bit 0, of the 16-bit field. For analog outputs, the three rightmost bits are not significant, and the LSB is defined as the third bit from the right, bit 2, of the 16-bit field.

**linearity error** – An analog input or output is composed of a series of voltage or current values corresponding to digital codes. For an ideal analog input or output, the values lie in a straight line spaced by a voltage or current corresponding to 1 LSB. Any deviation of the converted input or actual output from this line is the linearity error of the input or output. The linearity is expressed in percent of full scale input or output. See the variation from the straight line due to linearity error (exaggerated) in the example below.



**number of significant bits** – The power of two that represents the total number of completely different digital codes an analog signal can be converted into or generated from.

**module scan time** – same as *module update time*

**module update time** – For input modules, the time required for the module to sample and convert the input signals of all enabled input channels and make the resulting data values available to the processor. For output modules, the time required for the module to receive the digital code from the processor, convert it to the analog output signal, and send it to the output channel.

## Glossary-4

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**multiplexer** – An switching system that allows several signals to share a common A/D or D/A converter.

**normal mode rejection** – (differential mode rejection) A logarithmic measure, in dB, of a device's ability to reject noise signals between or among circuit signal conductors.

**normal operating range** – Input or output signals are within the configured range. See page 1-2 for a list of input and output types/ranges.

**overall accuracy** – The worst-case deviation of the output voltage or current from the ideal over the full output range is the overall accuracy. For inputs, the worst-case deviation of the digital representation of the input signal from the ideal over the full input range is the overall accuracy. this is expressed in percent of full scale.

Gain error, offset error, and linearity error all contribute to input and output channel accuracy.

**output accuracy** – The difference between the actual analog output value and what is expected, when a given digital code is applied to the d/a converter. Expressed as a  $\pm$  percent of full scale. The error will include gain, offset and drift elements, and is defined at 25°C, and also over the full operating temperature range (0 to 60°C).

**output image** – The output from the controller to the output module. The output image contains the analog output data.

**analog output module** – An I/O module that contains circuits that output an analog dc voltage or current signal proportional to a digital value transferred to the module from the processor.

**repeatability** – The closeness of agreement among repeated measurements of the same variable under the same conditions.

**resolution** – The smallest detectable change in a measurement, typically expressed in engineering units (e.g. 1 mV) or as a number of bits. For example a 12-bit system has 4096 possible output states. It can therefore measure 1 part in 4096.

**status word** – Contains status information about the channel's current configuration and operational state. You can use this information in your ladder program to determine whether the channel data word is valid.

---

## Glossary-5

**step response time** – For inputs, this is the time required for the channel data word signal to reach a specified percentage of its expected final value, given a large step change in the input signal.

**update time** – see “module update time”

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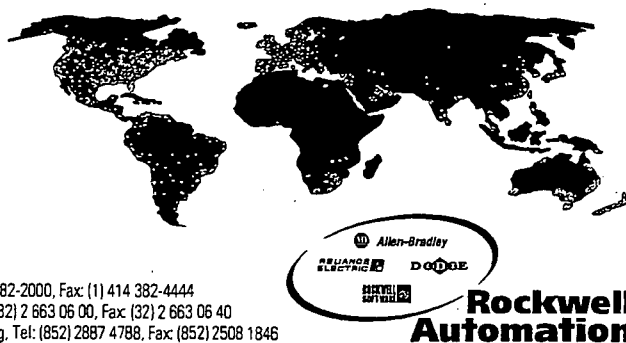
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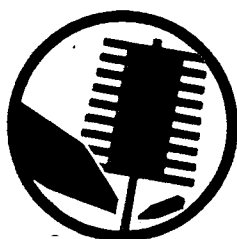
**Publication 1769-6.0 — May 1999**



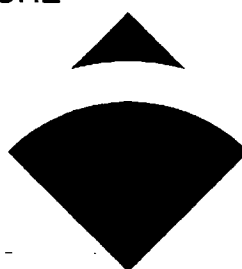
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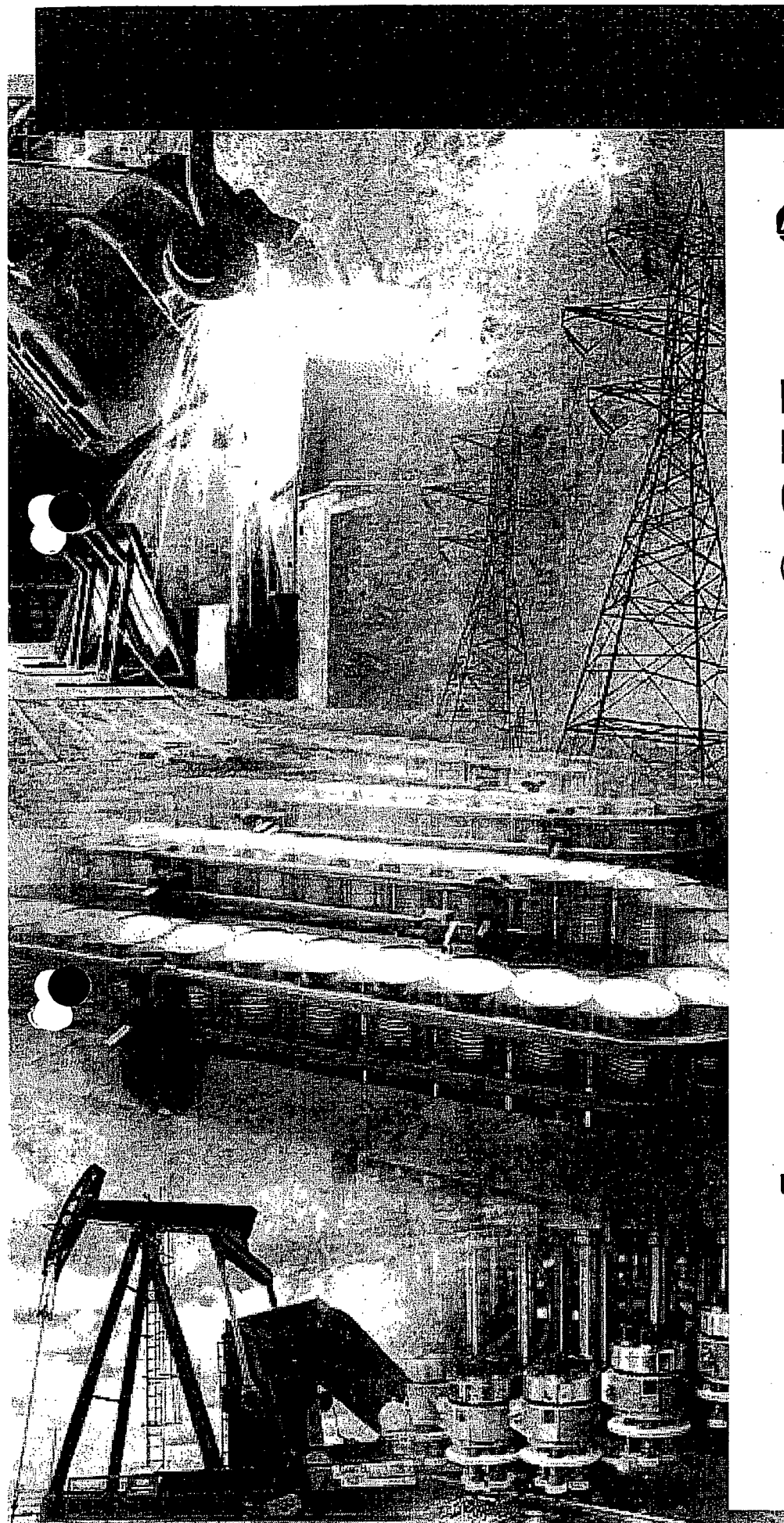
**OBAYASHI**

## **PART 3**

### **Section 26**

### **Electrical**

# **Allen Bradley MicroLogix 1500 Programmable Controllers User Manual**



**Allen-Bradley**

## **MicroLogix™ 1500 Programmable Controllers**

**(Bulletin 1764)**

**User Manual**

**Rockwell  
Automation**

## 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, Rockwell International Corporation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Rockwell Automation publication SGI-1.1, *Safety Guidelines for the Application, Installation and Maintenance of Solid-State Control* (available from your local Rockwell Automation 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.

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Modbus is a trademark of Schneider Automation Incorporated.

DeviceNet is a trademark of Open DeviceNet Vendor Association (ODVA).

## Preface

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Read this preface to familiarize yourself with the rest of the manual. It provides information concerning:

- who should use this manual
- the purpose of this manual
- related documentation
- conventions used in this manual
- Rockwell Automation support

### Who Should Use this Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use MicroLogix 1500 controllers.

You should have a basic understanding of electrical circuitry and familiarity with relay logic. If you do not, obtain the proper training before using this product.

### Purpose of this Manual

This manual is a reference guide for MicroLogix 1500 controllers. It describes the procedures you use to install, wire, and troubleshoot your controller. This manual:

- explains how to install and wire your controllers
- gives you an overview of the MicroLogix 1500 controller system

Refer to publication 1762-RM001B-US-P, *MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual* for the MicroLogix 1200 and 1500 instruction set and for application examples to show the instruction set in use. Refer to your programming software user documentation for more information on programming your MicroLogix 1500 controller.

## Related Documentation

The following documents contain additional information concerning Rockwell Automation products. To obtain a copy, contact your local Rockwell Automation office or distributor.

For	Read this Document	Document Number
Information on understanding and applying micro controllers.	MicroMentor	1761-MMB
Information on the MicroLogix 1500 Controllers instruction set	MicroLogix 1200 and 1500 Programmable Controllers Instruction Set Reference Manual	1762-RM001B-US-P
Information on mounting and wiring the MicroLogix 1500 Base Units, including a mounting template for easy installation	MicroLogix 1500 Programmable Controllers Base Unit Installation Instructions	1764-IN001A-ML-P
A description on how to install and connect an AIC+. This manual also contains information on network wiring.	Advanced Interface Converter (AIC+) User Manual	1761-6.4
Information on how to install, configure, and commission a DNI	DeviceNet™ Interface User Manual	1761-6.5
Information on DF1 open protocol.	DF1 Protocol and Command Set Reference Manual	1770-6.5.16
In-depth information on grounding and wiring Allen-Bradley programmable controllers	Allen-Bradley Programmable Controller Grounding and Wiring Guidelines	1770-4.1
A description of important differences between solid-state programmable controller products and hard-wired electromechanical devices	Application Considerations for Solid-State Controls	SGI-1.1
An article on wire sizes and types for grounding electrical equipment	National Electrical Code - Published by the National Fire Protection Association of Boston, MA.	
A complete listing of current documentation, including ordering instructions. Also indicates whether the documents are available on CD-ROM or in multi-languages.	Allen-Bradley Publication Index	SD499
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary	AG-7.1

## Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists such as this one provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.

## Rockwell Automation Support

Rockwell Automation offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Rockwell Automation representatives in every major country in the world.

### Local Product Support

Contact your local Rockwell Automation representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

### Technical Product Assistance

If you need to contact Rockwell Automation for technical assistance, please review the *Troubleshooting* appendix on page C-1 in this manual first. Then call your local Rockwell Automation representative.

### Your Questions or Comments on this Manual

If you find a problem with this manual, or you have any suggestions for how this manual could be made more useful to you, please contact us at the address below:

Rockwell Automation  
Control and Information Group  
Technical Communication, Dept. A602V  
P.O. Box 2086  
Milwaukee, WI 53201-2086

or visit our internet page at:

<http://www.ab.com/micrologix> or <http://www.rockwellautomation.com>



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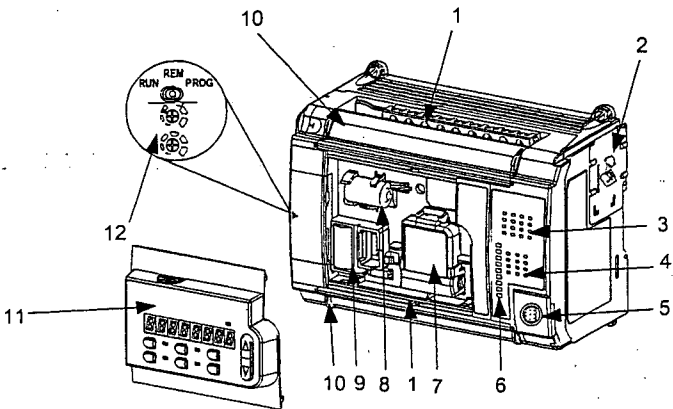
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Hardware Overview

Hardware Features

The MicroLogix 1500 programmable controller contains a power supply, input circuits, output circuits, and a processor. The controller is available in 24 I/O and 28 I/O configurations.

The hardware features of the controller are:



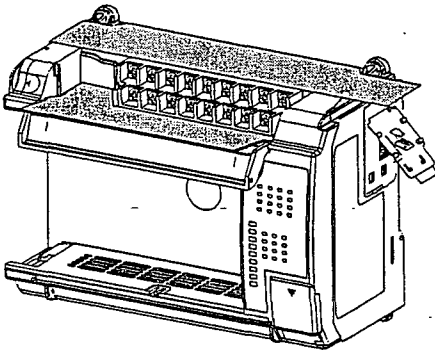
Feature	Description	Feature	Description
1	Removable Terminal Blocks	7	Memory Module/Real-Time Clock <sup>(1)</sup>
2	Interface to Expansion I/O, Removable ESD Barrier	8	Replacement Battery <sup>(1)</sup>
3	Input LEDs	9	Battery
4	Output LEDs	10	Terminal Doors and Label
5	Communication Port	11	Data Access Tool <sup>(1)</sup>
6	Status LEDs	12	Mode Switch, Trim Pots

(1) Optional.

MicroLogix 1500  
Component Descriptions

A controller is composed of a standard processor (1764-LSP or enhanced 1764-LRP with RS-232 port) and one of the base units listed below. The FET transistor outputs are available on the 1764-28BXB base only.

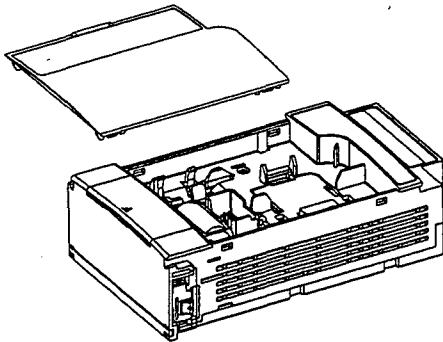
Base Units



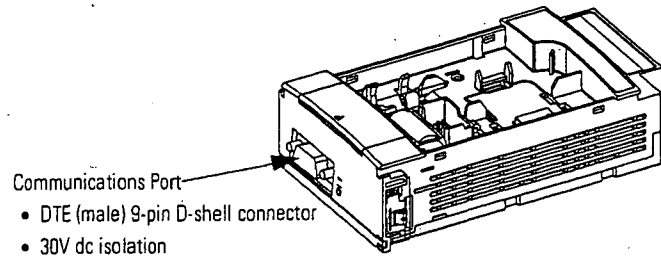
Catalog Number	Base Unit I/O and Power Supply
1764-24AWA	Twelve 120V ac inputs, twelve relay outputs and 120/240V ac power supply
1764-24BWA	Twelve 24V dc inputs, twelve relay outputs and 120/240V ac power supply
1764-28BXB	Sixteen 24V dc inputs, six FET and six relay outputs and 24V dc power supply

Processors

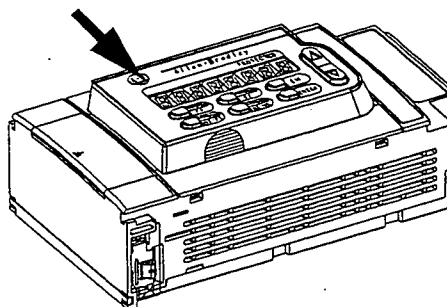
*Processor (Catalog Number 1764-LSP)*



*Processor (Catalog Number 1764-LRP)*

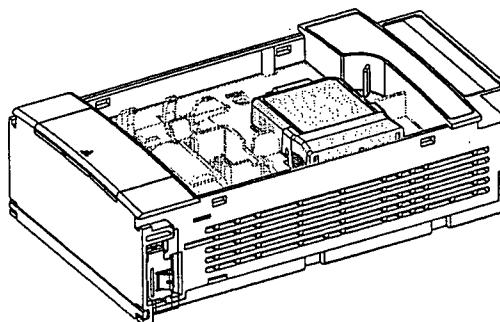


### Data Access Tool (Catalog Number 1764-DAT)



1764-DAT  
mounted on  
1764-LSP  
processor.

### Memory Modules/Real-Time Clock



Memory module  
mounted on  
1764-LSP  
processor.

The following memory modules and real-time clock modules are available:

Catalog Number	Function	Memory Size
1764-RTC	Real-Time Clock	not applicable
1764-MM1	Memory Module	8K
1764-MM2 <sup>(1)</sup>	Memory Module	16K
1764-MM1RTC	Memory Module and Real-Time Clock	8K
1764-MM2RTC	Memory Module and Real-Time Clock	16K

(1) For larger 1764-LRP programs, use the 1764-MM2 or 1764-MM2RTC.

### Cables

Use only the following communication cables in Class I, Division 2 hazardous locations.

**Table 1.1 Cables for Use in Class I, Division 2 Hazardous Environment**

1761-CBL-PM02 Series C or later	2707-NC8 Series B or later
1761-CBL-HM02 Series C or later	2707-NC9 Series B or later
1761-CBL-AM00 Series C or later	2707-NC10 Series B or later
1761-CBL-AP00 Series C or later	2707-NC11 Series B or later

## Programming

Programming the MicroLogix 1500 programmable controller is done using RSLogix™ 500, Rev. 4.0 or later. Communication cables are not included with the software.

## Communication Options

The MicroLogix 1500 can be connected to a personal computer. It can also be connected to the DH-485 network using an Advanced Interface Converter (catalog number 1761-NET-AIC) and to the DeviceNet™ network using a DeviceNet Interface (catalog number 1761-NET-DNI). The controller can also be connected to Modbus™ SCADA networks as an RTU slave. See Communication Connections on page 4-1 for more information on connecting to the available communication options.

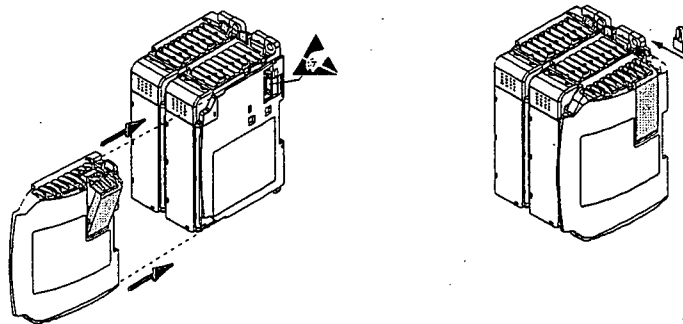
The 1764-LRP processor provides an additional communication port. Each of the communications ports can be independently configured for any supported communication protocol. (Channel 0 is on the base unit and Channel 1 is on the 1764-LRP processor.)

## Compact™ Expansion I/O

Compact expansion I/O (Bulletin 1769) can be connected to the MicroLogix 1500 Controller. A maximum of eight I/O modules may be connected. See System Loading and Heat Dissipation on page F-1 for more information on system configurations.

## End Cap

An end cap terminator (catalog number 1769-ECR or 1769-ECL) must be used at the end of the group of I/O modules attached to the MicroLogix 1500 Controller. The end cap terminator is not provided with the base or processor units. It is required when using expansion I/O.



This illustration shows the right end cap (1769-ECR). The left end cap (1769-ECL) is shown on page 1-7.

## Expansion Power Supply and Cables

With Operating System Revision Number (FRN) 3 or higher, you can connect an additional bank of I/O to your controller. Using an expansion power supply increases the system's capacity for adding expansion I/O modules (such as the 1769-IF4 and 1769-OF2 analog modules). The additional I/O bank is connected to the controller via a specially designed cable. The additional I/O bank must include a power supply and an end cap.

**NOTE**

The maximum number of expansion I/O modules per controller is 8. See System Guidelines on page 1-6 for system limitations and illustrations of expansion I/O banks.

To use an additional bank of I/O, you must have.

Product	Catalog Number
MicroLogix 1500 Processor	1764-LSP, Series A, Revision C or higher 1764-LSP, Series B, Revision A or higher 1764-LRP, Series B, Revision A or higher
Operating System Version	Firmware Revision Number (FRN) 3 or higher
Programming Software	RSLogix 500, Version 3.01.09 or higher, RSLinx, Version 2.10.118 or higher <i>For 1764-LSP and 1764-LRP Series B Processors, use RSLogix 500, Version 4.00.00 or higher.</i>
1 Power Supply	1769-PA2 1769-PB2
1 Cable	1769-CRL1, 1769-CRL3 1769-CRR1, 1769-CRR3
1 End Cap	1769-ECL 1769-ECR

You can check the FRN by looking at word S:59 (Operating System FRN) in the Status File.

**IMPORTANT**

If your processor is at an older revision, you *must* upgrade the operating system to FRN 3 or higher to use an expansion cable and power supply. On the Internet, go to <http://www.ab.com/micrologix> to download the operating system upgrade. Navigate to MicroLogix 1500; go to Tools and Tips.

## Adding an I/O Bank

### *System Guidelines*

A maximum of one 1769 Expansion Cable can be used in a MicroLogix 1500 system, allowing for two banks of I/O modules (one connected directly to the controller, and the other connected via the cable). Each I/O bank requires its own power supply (Bank 1 uses the controller's embedded power supply).

---

**ATTENTION****ATTENTION: LIMIT OF ONE EXPANSION POWER SUPPLY**

The expansion power supply cannot be connected directly to the controller. It must be connected using one of the expansion cables. Only one power supply (embedded or expansion) may be used on an I/O bank. Exceeding these limitations may damage the power supply and result in unexpected operation.

---

---

**ATTENTION****ATTENTION: REMOVE POWER**

Remove system power before making or breaking cable connections. When you remove or insert a cable connector with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing unintended machine operation
- causing an explosion in a hazardous environment

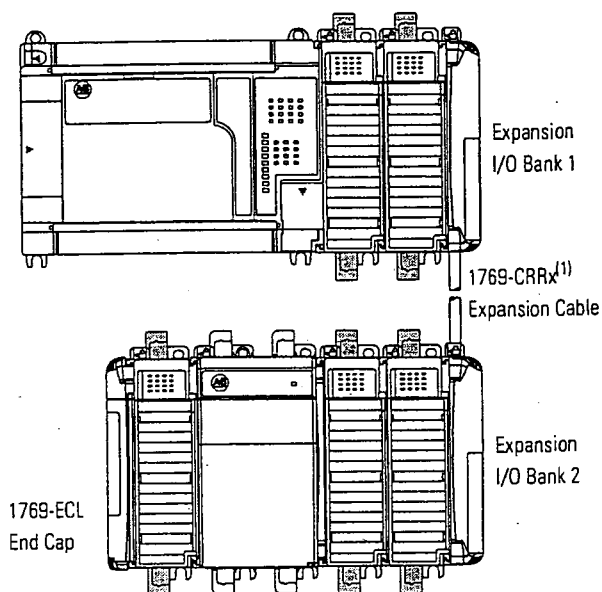
Electrical arcing causes excessive wear to contacts on both the module and its mating connector.

Refer to your power supply and I/O module's documentation for instructions on how to set up your system.

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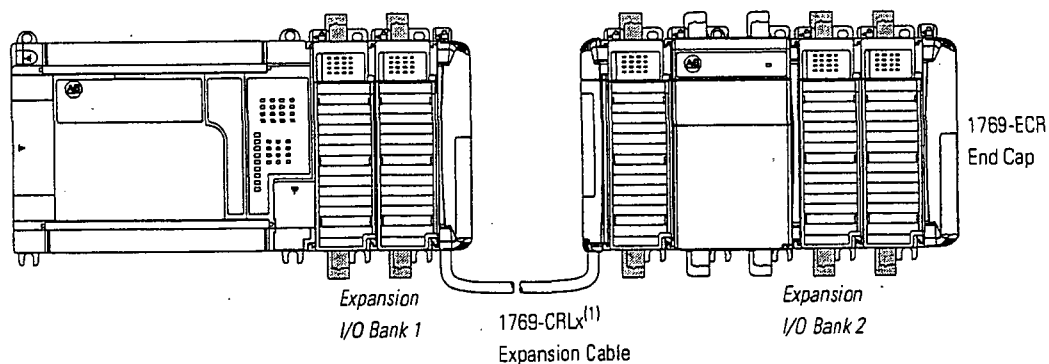
The following illustrations show a MicroLogix 1500 with an expansion I/O bank.

### Vertical Orientation



- (1) The x in this catalog number can be either a 1 or a 3 representing the length of the cable:  
1 = 1 foot (305 mm) and 3 = 3.28 feet (1 meter).

### Horizontal Orientation

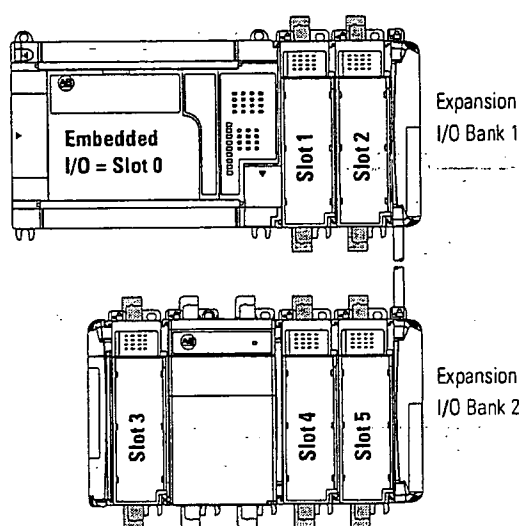


- (1) The x in this catalog number can be either a 1 or a 3 representing the length of the cable:  
1 = 1 foot (305 mm) and 3 = 3.28 feet (1 meter).

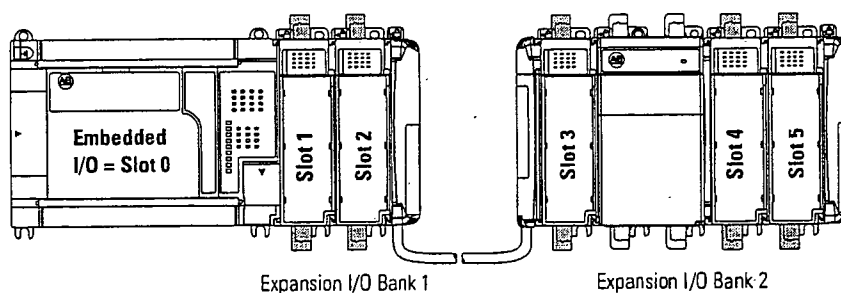
## Addressing Expansion I/O

The expansion I/O is addressed as slots 1 through 8 (the controller's embedded I/O is addressed as slot 0). Power supplies and cables are not counted as slots. Modules are counted from left to right on each bank as shown in the illustrations below. For more information on addressing, refer to the *MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual*, publication 1762-RM001B-US-P.

### Vertical Orientation



### Horizontal Orientation



## Expansion I/O Power Failure

Expansion I/O errors represent failures of the I/O bus or the modules themselves. The error codes are listed in the *MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual*, publication 1762-RM001B-US-P.

## Chapter 2

### Installing Your Controller

This chapter shows you how to install your controller system. The only tools you require are a Flat or Phillips head screwdriver and drill. Topics include:

- agency certifications
- compliance to European Union Directives
- using in hazardous locations
- master control relay
- power considerations
- preventing excessive heat
- controller spacing
- mounting the controller

#### Agency Certifications

- UL 508
- C-UL under CSA C22.2 no. 142
- Class I, Division 2, Groups A, B, C, D  
(UL 1604, C-UL under CSA C22.2 no. 213)
- CE compliant for all applicable directives

#### Compliance to European Union Directives

This product has the CE mark and 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 Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and 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.

## 2-2 Installing Your Controller

## 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 following Allen-Bradley publications:

- *Industrial Automation Wiring and Grounding Guidelines for Noise Immunity*, publication 1770-4.1
- *Guidelines for Handling Lithium Batteries*, publication AG-5.4
- *Automation Systems Catalog*, publication B111

## Installation Considerations

Most applications require installation in an industrial enclosure (Pollution Degree 2<sup>(1)</sup>) to reduce the effects of electrical interference (Over Voltage Category II<sup>(2)</sup>) and environmental exposure. Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives. For more information on proper grounding guidelines, see the *Industrial Automation Wiring and Grounding Guidelines* publication 1770-4.1.

### ATTENTION



Vertical mounting of the controller is not recommended due to heat build-up considerations.

### ATTENTION



Be careful of metal chips when drilling mounting holes for your controller or other equipment within the enclosure or panel. Drilled fragments that fall into the base or processor unit could cause damage. Do not drill holes above a mounted controller if the protective debris strips are removed or the processor is installed.

<sup>(1)</sup> Pollution Degree 2 is an environment where normally only non-conductive pollution occurs except that occasionally temporary conductivity caused by condensation shall be expected.

<sup>(2)</sup> Overvoltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the products insulation.

## Safety Considerations

Safety considerations are an important element of proper system installation. Actively thinking about the safety of yourself and others, as well as the condition of your equipment, is of primary importance. We recommend reviewing the following safety considerations.

### Hazardous Location Considerations

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. The following WARNING statement applies to use in hazardous locations.

#### WARNING



#### EXPLOSION HAZARD

- Substitution of components may impair suitability for Class I, Division 2.
- Do not replace components or disconnect equipment unless power has been switched off.
- Do not connect or disconnect components unless power has been switched off.
- This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
- All wiring must comply with N.E.C. article 501-4(b).

#### WARNING



When installing any peripheral device (for example, push buttons, lamps) into a hazardous environment, ensure that they are Class I, Division 2 certified, or determined to be safe for the environment.

Use only the following communication cables in Class I, Division 2 hazardous locations.

**Table 2.1 Cables for Use in Class I, Division 2 Hazardous Environment**

1761-CBL-PM02 Series C or later	2707-NC8 Series B or later
1761-CBL-HM02 Series C or later	2707-NC9 Series B or later
1761-CBL-AM00 Series C or later	2707-NC10 Series B or later
1761-CBL-AP00 Series C or later	2707-NC11 Series B or later

## Disconnecting Main Power

### WARNING



Explosion Hazard - Do not replace components or disconnect equipment unless power has been switched off.

---

The main power disconnect switch should be located where operators and maintenance personnel have quick and easy access to it. In addition to disconnecting electrical power, all other sources of power (pneumatic and hydraulic) should be de-energized before working on a machine or process controlled by a controller.

## Safety Circuits

### WARNING



Explosion Hazard - Do not connect or disconnect connectors while circuit is live.

---

Circuits installed on the machine for safety reasons, like overtravel limit switches, stop push buttons, and interlocks, should always be hard-wired directly to the master control relay. These devices must be wired in series so that when any one device opens, the master control relay is de-energized, thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could result.

## Power Distribution

There are some points about power distribution that you should know:

- The master control relay must be able to inhibit all machine motion by removing power to the machine I/O devices when the relay is de-energized. It is recommended that the controller remain powered even when the master control relay is de-energized.
- If you are using a dc power supply, interrupt the load side rather than the ac line power. This avoids the additional delay of power supply turn-off. The dc power supply should be powered directly from the fused secondary of the transformer. Power to the dc input and output circuits should be connected through a set of master control relay contacts.

## Periodic Tests of Master Control Relay Circuit

Any part can fail, including the switches in a master control relay circuit. The failure of one of these switches would most likely cause an open circuit, which would be a safe power-off failure. However, if one of these switches shorts out, it no longer provides any safety protection. These switches should be tested periodically to assure they will stop machine motion when needed.

## Power Considerations

The following explains power considerations for the micro controllers.

### Isolation Transformers

You may want to use an isolation transformer in the ac line to the controller. This type of transformer provides isolation from your power distribution system to reduce the electrical noise that enters the controller and is often used as a step-down transformer to reduce line voltage. Any transformer used with the controller must have a sufficient power rating for its load. The power rating is expressed in volt-amperes (VA).

### Power Supply Inrush

During power-up, the MicroLogix 1500 power supply allows a brief inrush current to charge internal capacitors. Many power lines and control transformers can supply inrush current for a brief time. If the power source cannot supply this inrush current, the source voltage may sag momentarily.

The only effect of limited inrush current and voltage sag on the MicroLogix 1500 is that the power supply capacitors charge more slowly. However, the effect of a voltage sag on other equipment should be considered. For example, a deep voltage sag may reset a computer connected to the same power source. The following considerations determine whether the power source must be required to supply high inrush current:

- The power-up sequence of devices in a system.
- The amount of the power source voltage sag if the inrush current cannot be supplied.
- The effect of voltage sag on other equipment in the system.

If the entire system is powered-up at the same time, a brief sag in the power source voltage typically will not affect any equipment.

## Loss of Power Source

The power supply is designed to withstand brief power losses without affecting the operation of the system. The time the system is operational during power loss is called "program scan hold-up time after loss of power." The duration of the power supply hold-up time depends on the type and state of the I/O, but is typically between 10 milliseconds and 3 seconds. When the duration of power loss reaches this limit, the power supply signals the processor that it can no longer provide adequate dc power to the system. This is referred to as a power supply shutdown. The processor then performs an orderly shutdown of the controller.

## Input States on Power Down

The power supply hold-up time as described above is generally longer than the turn-on and turn-off times of the inputs. Because of this, the input state change from "On" to "Off" that occurs when power is removed may be recorded by the processor before the power supply shuts down the system. Understanding this concept is important. The user program should be written to take this effect into account.

## Other Types of Line Conditions

Occasionally the power source to the system can be temporarily interrupted. It is also possible that the voltage level may drop substantially below the normal line voltage range for a period of time. Both of these conditions are considered to be a loss of power for the system.

## Preventing Excessive Heat

For most applications, normal convective cooling keeps the controller within the specified operating range. Ensure that the specified temperature range is maintained. Proper spacing of components within an enclosure is usually sufficient for heat dissipation.

In some applications, a substantial amount of heat is produced by other equipment inside or outside the enclosure. In this case, place blower fans inside the enclosure to assist in air circulation and to reduce "hot spots" near the controller.

Additional cooling provisions might be necessary when high ambient temperatures are encountered.

### NOTE

Do not bring in unfiltered outside air. Place the controller in an enclosure to protect it from a corrosive atmosphere. Harmful contaminants or dirt could cause improper operation or damage to components. In extreme cases, you may need to use air conditioning to protect against heat build-up within the enclosure.

## Master Control Relay

A hard-wired master control relay (MCR) provides a reliable means for emergency machine shutdown. Since the master control relay allows the placement of several emergency-stop switches in different locations, its installation is important from a safety standpoint. Overtravel limit switches or mushroom-head push buttons are wired in series so that when any of them opens, the master control relay is de-energized. This removes power to input and output device circuits. Refer to the figures on pages 2-9 and 2-10.

---

**ATTENTION**

Never alter these circuits to defeat their function since serious injury and/or machine damage could result.

---

**NOTE**

If you are using an external dc power supply, interrupt the dc output side rather than the ac line side of the supply to avoid the additional delay of power supply turn-off.

The ac line of the dc output power supply should be fused.

Connect a set of master control relays in series with the dc power supplying the input and output circuits.

Place the main power disconnect switch where operators and maintenance personnel have quick and easy access to it. If you mount a disconnect switch inside the controller enclosure, place the switch operating handle on the outside of the enclosure, so that you can disconnect power without opening the enclosure.

Whenever any of the emergency-stop switches are opened, power to input and output devices should be removed.

When you use the master control relay to remove power from the external I/O circuits, power continues to be provided to the controller's power supply so that diagnostic indicators on the processor can still be observed.

The master control relay is not a substitute for a disconnect to the controller. It is intended for any situation where the operator must quickly de-energize I/O devices only. When inspecting or installing terminal connections, replacing output fuses, or working on equipment within the enclosure, use the disconnect to shut off power to the rest of the system.

**NOTE**

Do not control the master control relay with the controller. Provide the operator with the safety of a direct connection between an emergency-stop switch and the master control relay.

## Using Emergency-Stop Switches

When using emergency-stop switches, adhere to the following points:

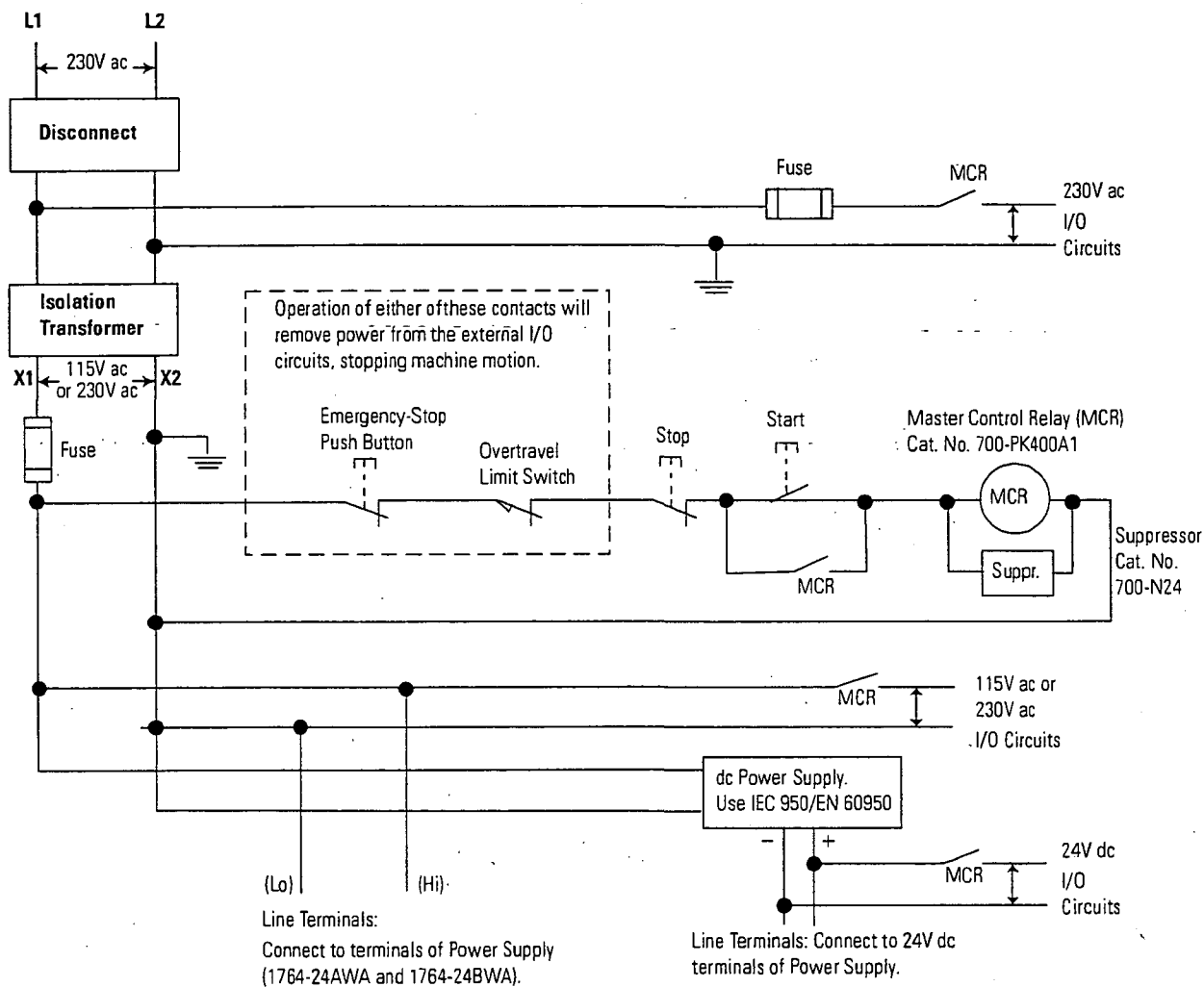
- Do not program emergency-stop switches in the controller program. Any emergency-stop switch should turn off all machine power by turning off the master control relay.
- Observe all applicable local codes concerning the placement and labeling of emergency-stop switches.
- Install emergency-stop switches and the master control relay in your system. Make certain that relay contacts have a sufficient rating for your application. Emergency-stop switches must be easy to reach.
- In the following illustration, input and output circuits are shown with MCR protection. However, in most applications, only output circuits require MCR protection.

The following illustrations show the Master Control Relay wired in a grounded system.

**NOTE**

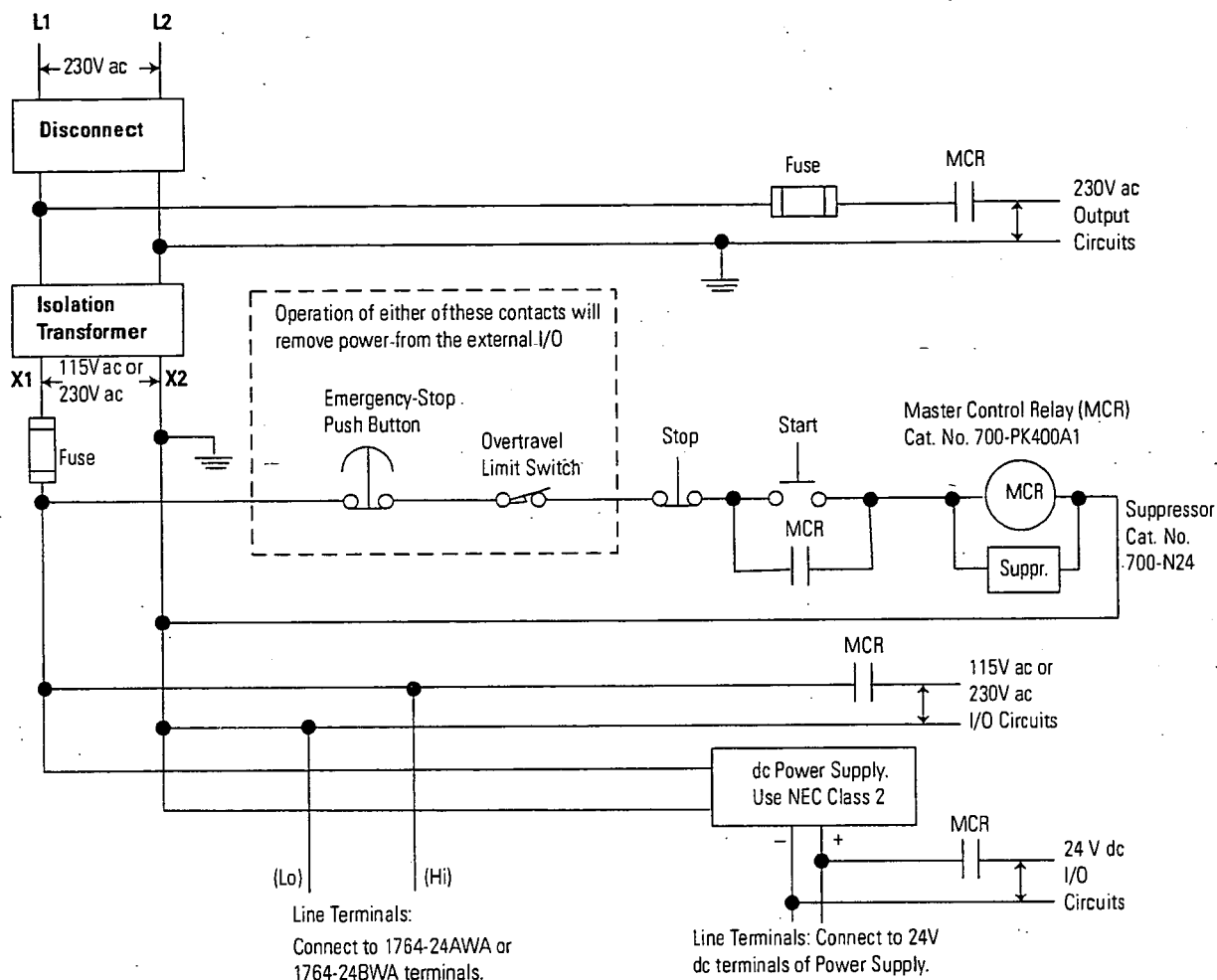
In most applications input circuits do not require MCR protection; however, if you need to remove power from all field devices, you must include MCR contacts in series with input power wiring.

## Schematic (Using IEC Symbols)

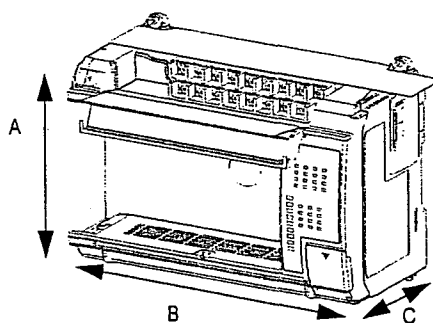


## 2-10 Installing Your Controller

## Schematic (Using ANSI/CSA Symbols)



## Base Unit Mounting Dimensions

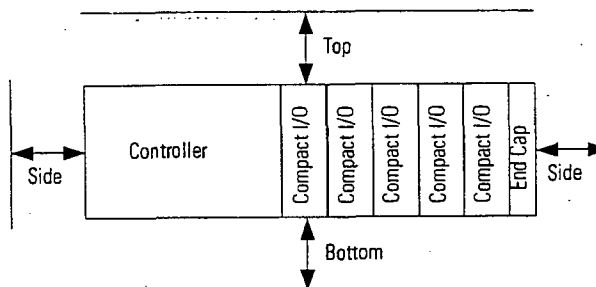


Dimension <sup>(1)</sup>	1764-24AWA	1764-24BWA	1764-28BXB
Height (A)	DIN latch open: 138 mm (5.43 in.), DIN latch closed: 118 mm (4.65 in.)		
Width (B)	168 mm (6.62 in.)		
Depth (C)	87 mm (3.43 in.)		

(1) See Controller Dimensions on page A-7 for more dimensional information.

## Controller Spacing

The base unit is designed to be mounted horizontally, with the Compact™ expansion I/O extending to the right of the base unit. Allow 50 mm (2 in.) minimum of space on all sides for adequate ventilation, as shown below.

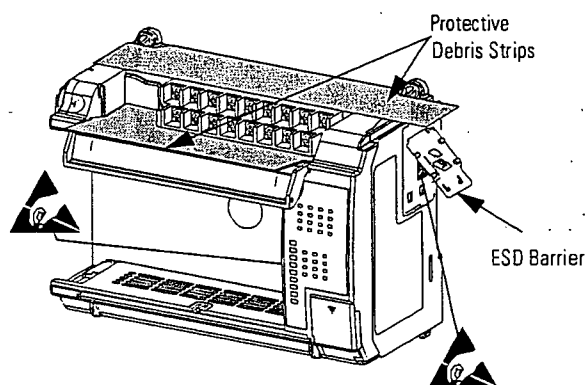


## 2-12 Installing Your Controller

## Mounting the Controller

**ATTENTION**

Do not remove protective debris strips until after the base and all other equipment in the panel near the base is mounted and wiring is complete. The debris strips are there to prevent drill fragments, wire strands and other dirt from getting into the controller. Once wiring is complete, remove protective debris strips and install processor unit. Failure to remove strips before operating can cause overheating.

**ATTENTION**

Be careful of metal chips when drilling mounting holes for your controller or other equipment within the enclosure or panel. Drilled fragments that fall into the controller could cause damage. Do not drill holes above a mounted controller if the protective debris strips have been removed.

**ATTENTION**

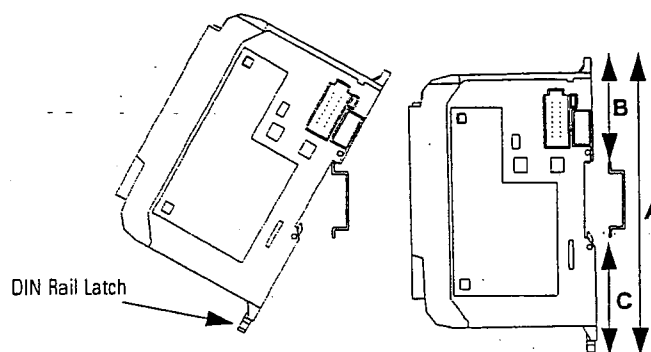
Electrostatic discharge can damage semiconductor devices inside the base unit. Do not touch the connector pins or other sensitive areas.

**NOTE**

If additional I/O modules are required for the application, remove the ESD barrier to install expansion I/O modules. A maximum of 8 I/O modules may be connected to the base. The I/O module's current requirements and power consumption may further limit the number of modules connected to the base. See System Loading and Heat Dissipation on page F-1. An end cap terminator (catalog number 1769-ECR or 1769-ECL) is required at the end of the group of I/O modules attached to the base.

## Using a DIN Rail

The base unit and expansion I/O DIN rail latches lock in the open position so that an entire system can be easily attached to or removed from the DIN rail. The maximum extension of the latch is 15 mm (0.67 in.) in the open position. A flat-blade screw driver is required for removal of the base unit. The base can be mounted to EN50022-35x7.5 or EN50022-35x15 DIN rails. DIN rail mounting dimensions are shown below.



Dimension	Height
A	DIN latch open: 138 mm (5.43 in.), DIN latch closed: 118 mm (4.65 in.)
B	47.6 mm (1.875 in.)
C	47.6 mm (1.875 in) DIN latch closed 54.7 mm (2.16 in.) DIN latch open

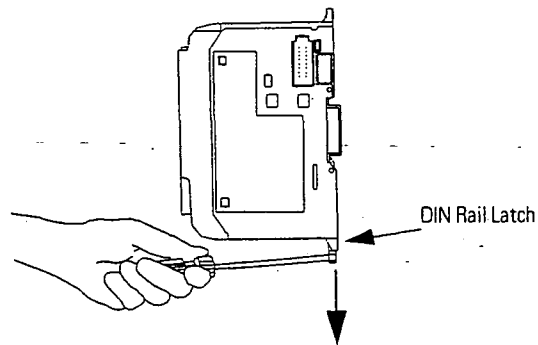
To install your base unit on the DIN rail:

1. Mount your DIN rail. (Make sure that the placement of the base unit on the DIN rail meets the recommended spacing requirements, see Controller Spacing on page 2-11. Refer to the mounting template from the inside back cover of the *MicroLogix 1500 Programmable Controller Base Units Installation Instructions*, publication 1764-5.1.
2. Hook the top slot over the DIN rail.
3. While pressing the base unit down against the top of the rail, snap the bottom of the base unit into position. Ensure DIN latches are in the up (secured) position.
4. Leave the protective debris strip attached until you are finished wiring the base unit and any other devices.

**2-14** Installing Your Controller

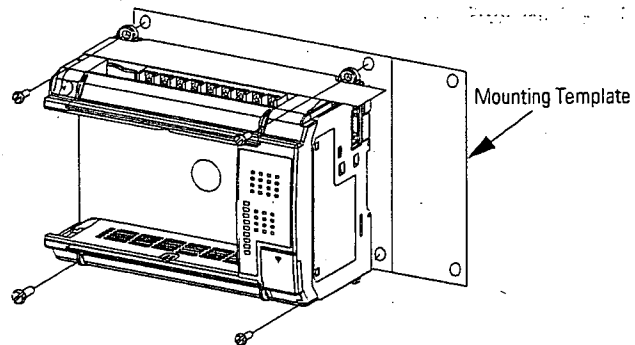
To remove your base unit from the DIN rail:

1. Place a flat-blade screwdriver in the DIN rail latch at the bottom of the base unit.
2. Holding the base unit, pry downward on the latch until the latch locks in the open position. Repeat this procedure with the second latch. This releases the base unit from the DIN rail.



### Base Unit Panel Mounting

Mount to panel using #8 or M4 screws.



To install your base unit using mounting screws:

1. Remove the mounting template from the inside back cover of the *MicroLogix 1500 Programmable Controller Base Units Installation Instruction*, publication 1764-5.1.
2. Secure the template to the mounting surface. (Make sure your base unit is spaced properly, see Controller Spacing on page 2-11).
3. Drill holes through the template.
4. Remove the mounting template.
5. Mount the base unit.
6. Leave the protective debris strips attached until you are finished wiring the base unit and any other devices.

## Installing Controller Components

### Prevent Electrostatic Discharge

**ATTENTION**

Electrostatic discharge can damage integrated circuits or semiconductors if you touch bus connector pins. Follow these guidelines when you handle any module:

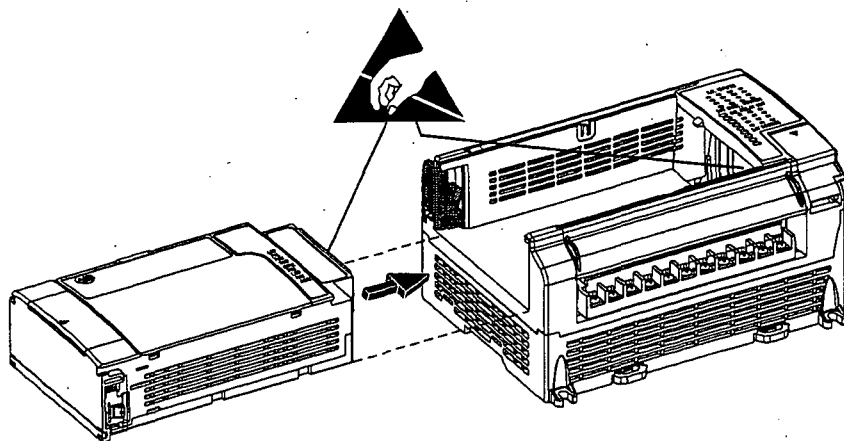
- Touch a grounded object to discharge static potential.
- Wear an approved wrist-strap grounding device.
- Do not touch the bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.

When not in use, keep the module in its static-shield bag.

**ATTENTION**

Be sure the base unit is free of all metal fragments before removing protective debris strips and installing the processor unit. Failure to remove strips before operating can cause overheating.

### Processor



1. Be sure base unit power is off.
2. Slide the processor into the base unit using the guide rails for alignment.
3. Push until a click is heard.

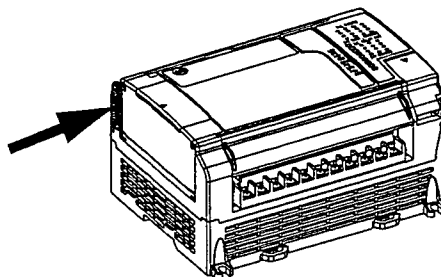
**IMPORTANT**

It is critical that the processor is fully engaged and locked into place.

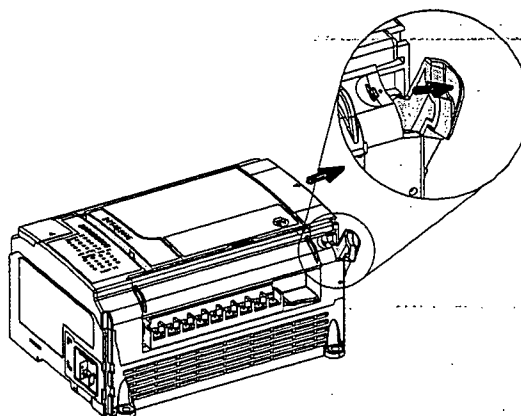
**2-16** Installing Your Controller

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4. Make sure the actuator is pushed closed.

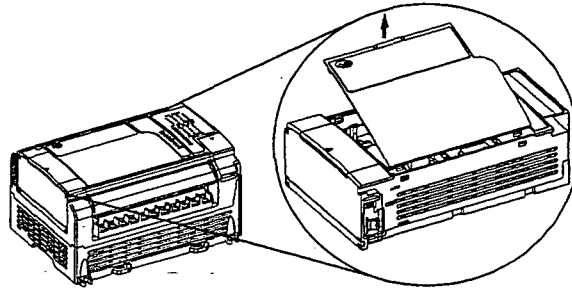


5. To remove the processor from the base unit, make sure base unit power is off. Push the actuator to the open position until the processor is ejected slightly. Once the processor has been ejected, it can be removed from the base unit.

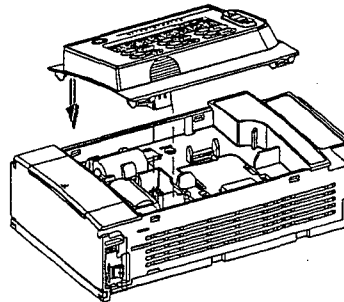


### Data Access Tool (DAT)

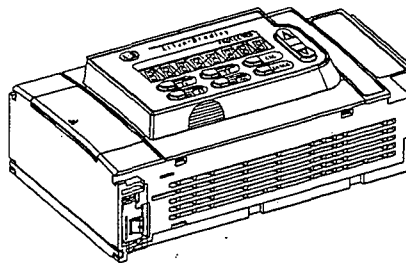
1. Remove cover from processor.



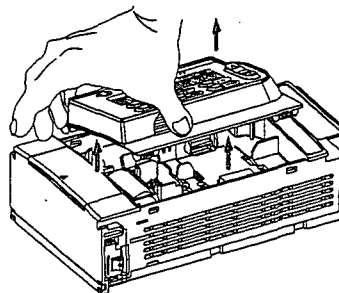
2. Holding the DAT in the proper orientation (as shown), place the DAT onto processor. Align DAT port on the processor with the plug on the DAT.



3. Firmly seat DAT on processor; make sure it seats into place.

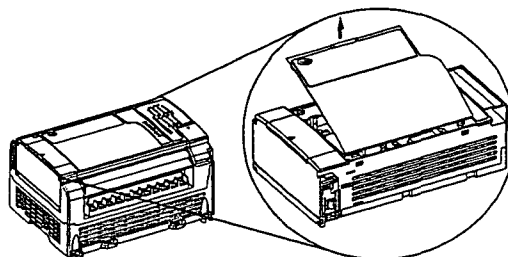


4. To remove DAT, grasp using finger areas and pull upward.

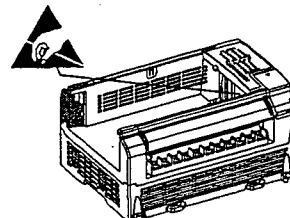
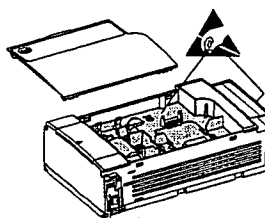


**2-18** Installing Your Controller**Memory Module/Real-Time Clock**

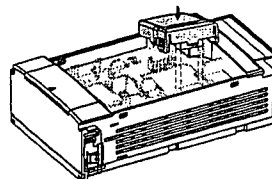
1. Remove the cover (or DAT if installed) from the processor as shown below.

**ATTENTION**

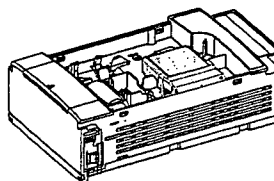
Electrostatic discharge can damage semiconductor devices inside the base and processor units. Do not touch the connector pins or other sensitive areas.



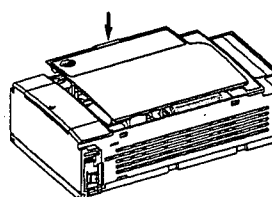
2. Align connector on the memory module with the connector pins on the processor.



3. Firmly seat the memory module in the processor making sure the locking tabs click into place.



4. Replace the cover (or DAT if used).



## Compact I/O

### Attach and Lock Module (Module-to-Controller or Module-to-Module)

A Compact I/O module can be attached to the controller or an adjacent I/O module before or after mounting to the panel or DIN rail. The module can be detached and replaced while the system is mounted to a panel or DIN rail.

---

**ATTENTION**

Remove power before removing or inserting an I/O module. When you remove or insert a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:

- sending an erroneous signal to your system's field devices, causing the controller to fault
- causing an explosion in a hazardous environment

Electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance, reducing product reliability.

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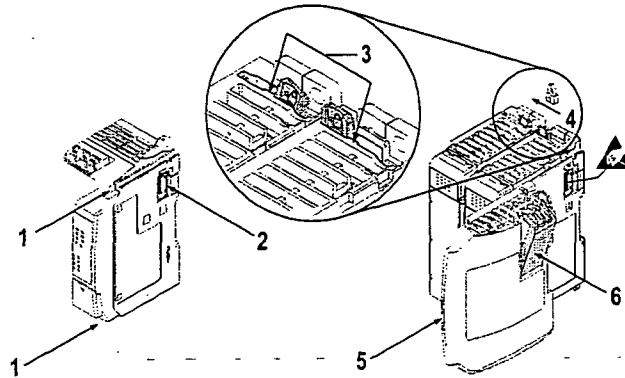
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**ATTENTION**

When attaching I/O modules, it is very important that they are securely locked together to ensure proper electrical connection.

---

## 2-20 Installing Your Controller



To attach and lock modules:

**NOTE**

Remove ESD barrier when attaching I/O modules to a MicroLogix 1500 base unit.

1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.
3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screw driver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.

**ATTENTION**

When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.

7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end cap bus terminator (6).

**IMPORTANT**

A 1769-ECR right end cap (or a 1769-ECL left end cap if I/O bank is located below the controller) must be used to terminate the end of the serial communication bus.

See Controller Dimensions on page A-7 for mounting dimensions.

## Chapter 3

# Wiring Your Controller

This chapter describes how to wire your controller. Topics include:

- wiring requirements
- using surge suppressors
- grounding guidelines
- sinking and sourcing circuits
- wiring diagrams, input voltage ranges, and output voltage ranges
- minimizing noise

## Wiring Requirements

Wire Type		Wire Size <sup>(1)</sup>	Wiring Torque
Solid	Cu-90°C (194°F)	#14 to #22 AWG	1.13 Nm (10 in-lb) rated
Stranded	Cu-90°C (194°F)	#14 to #22 AWG	1.3 Nm (12 in-lb) maximum

(1) Two wires maximum per terminal screw.

### ATTENTION



Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, be sure the base unit is free of all metal fragments before removing protective debris strips and installing the processor unit. Failure to remove strips before operating can cause overheating.

## Wiring Recommendation

### ATTENTION



Before you install and wire any device, disconnect power to the controller system.

## 3-2 Wiring Your Controller

**ATTENTION**

Calculate the maximum possible current in each power and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size. Current above the maximum ratings may cause wiring to overheat, which can cause damage.

*United States Only:* If the controller is installed within a potentially hazardous environment, all wiring must comply with the requirements stated in the National Electrical Code 501-4 (b).

- Allow for at least 50 mm. (2 in.) between I/O wiring ducts or terminal strips and the controller.
- Route incoming power to the controller by a path separate from the device wiring. Where paths must cross, their intersection should be perpendicular.

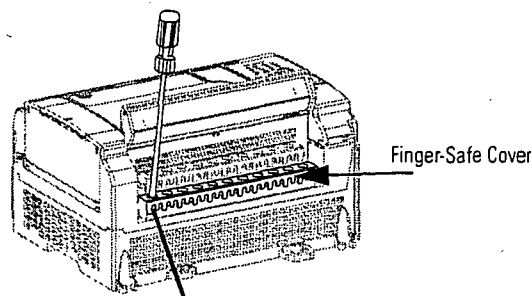
**NOTE**

Do not run signal or communications wiring and power wiring in the same conduit. Wires with different signal characteristics should be routed by separate paths.

- Separate wiring by signal type. Bundle wiring with similar electrical characteristics together.
- Separate input wiring from output wiring.
- Label wiring to all devices in the system. Use tape, shrink-tubing, or other dependable means for labeling purposes. In addition to labeling, use colored insulation to identify wiring based on signal characteristics. For example, you may use blue for dc wiring and red for ac wiring.

*Wiring without Spade Lugs*

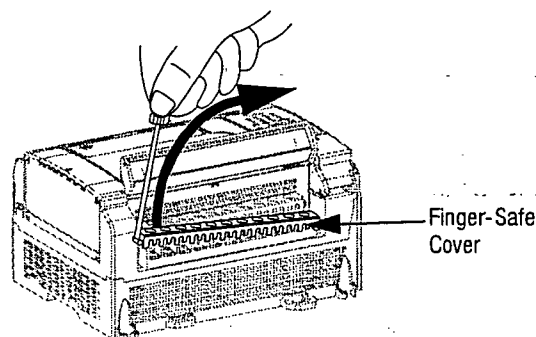
When wiring without spade lugs, it is recommended to keep the finger-safe covers in place. Loosen the terminal screw and route the wires through the opening in the finger-safe cover. Tighten the terminal screw making sure the pressure plate secures the wire.



### Wiring with Spade Lugs

The diameter of the terminal screw head is 5.5 mm (0.220 in.). The input and output terminals of the MicroLogix 1500 base unit are designed for a 6.35 mm (0.25 in.) wide spade (standard for #6 screw for up to 14 AWG) or a 4 mm (metric #4) fork terminal.

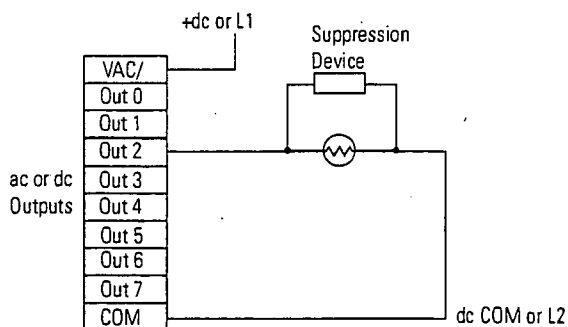
When using spade lugs, use a small, flat-blade screwdriver to pry the finger-safe cover from the terminal blocks as shown below. Then loosen the terminal screw.



### Using Surge Suppressors

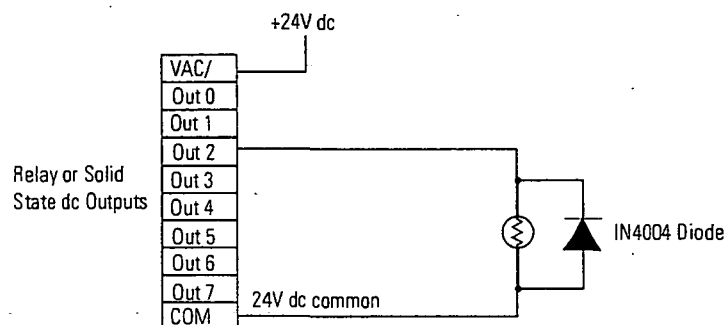
Inductive load devices, such as motor starters and solenoids, require the use of some type of surge suppression to protect and extend the operating life of the controller's output contacts. Switching inductive loads without surge suppression can *significantly* reduce the life expectancy of relay contacts. By adding a suppression device directly across the coil of an inductive device, you prolong the life of the output or relay contacts. You also reduce the effects of voltage transients and electrical noise from radiating into adjacent systems.

The following diagram shows an output with a suppression device. We recommend that you locate the suppression device as close as possible to the load device.

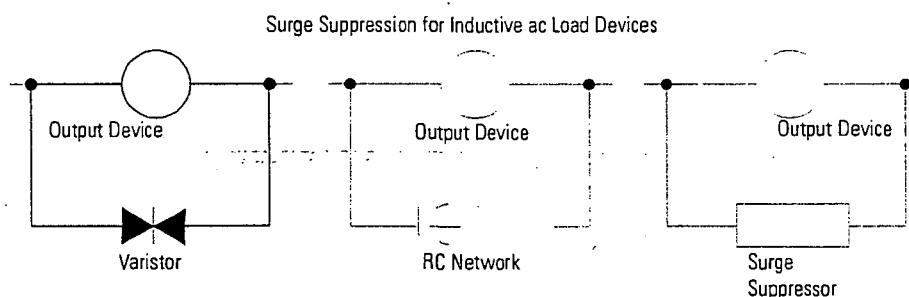


## 3-4 Wiring Your Controller

If the outputs are dc, we recommend that you use an 1N4004 diode for surge suppression, as shown below.



Suitable surge suppression methods for inductive ac load devices include a varistor, an RC network, or an Allen-Bradley surge suppressor, all shown below. These components must be appropriately rated to suppress the switching transient characteristic of the particular inductive device. See the table on page 3-5 for recommended suppressors.

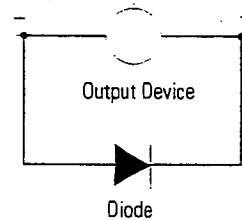


If you connect an expansion I/O triac output to control an inductive load, we recommend that you use varistors to suppress noise. Choose a varistor that is appropriate for the application. The suppressors we recommend for triac outputs when switching 120V ac inductive loads are a Harris MOV, part number V175 LA10A, or an Allen-Bradley MOV, catalog number 599-K04 or 599-KA04. Consult the varistor manufacturer's data sheet when selecting a varistor for your application.

For inductive dc load devices, a diode is suitable. A 1N4004 diode is acceptable for most applications. A surge suppressor can also be used. See the table on page 3-5 for recommended suppressors.

As shown in the illustration below, these surge suppression circuits connect directly across the load device.

Surge Suppression for Inductive dc Load Devices



(A surge suppressor can also be used.)

### Recommended Surge Suppressors

Use the Allen-Bradley surge suppressors shown in the following table for use with relays, contactors, and starters.

Suppressor Device	Coil Voltage	Catalog Number
Bulletin 509 Motor Starter	120V ac	599-KD4
Bulletin 509 Motor Starter	240V ac	599-KA04
Bulletin 100 Contactor	120V ac	199-FSMA1
Bulletin 100 Contactor	240V ac	199-FSMA2
Bulletin 709 Motor Starter	120V ac	1401-N10
Bulletin 700 Type R, RM Relays	ac coil	None Required
Bulletin 700 Type R Relay	12V dc	700-N22
Bulletin 700 Type RM Relay	12V dc	700-N28
Bulletin 700 Type R Relay	24V dc	700-N10
Bulletin 700 Type RM Relay	24V dc	700-N13
Bulletin 700 Type R Relay	48V dc	700-N16
Bulletin 700 Type RM Relay	48V dc	700-N17
Bulletin 700 Type R Relay	115-125V dc	700-N11
Bulletin 700 Type RM Relay	115-125V dc	700-N14
Bulletin 700 Type R Relay	230-250V dc	700-N12
Bulletin 700 Type RM Relay	230-250V dc	700-N15
Bulletin 700 Type N, P, or PK Relay	150V max, ac or DC	700-N24
Miscellaneous electromagnetic devices limited to 35 sealed VA	150V max, ac or DC	700-N24

## 3-6 Wiring Your Controller

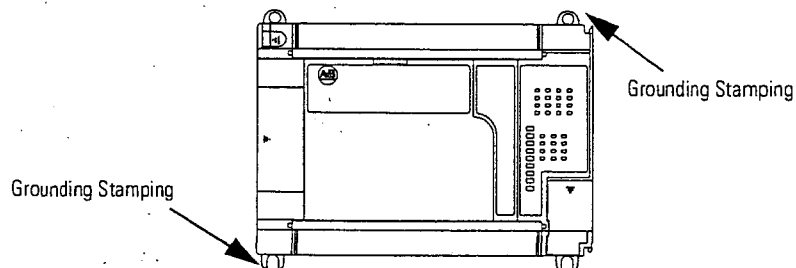
## Grounding the Controller


In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw of the base unit to the electrical panel's ground bus prior to connecting any devices. Use AWG #14 wire. This connection must be made for safety purposes.

This product is intended to be mounted to a well grounded mounting surface such as a metal panel. Refer to the *Industrial Automation Wiring and Grounding Guidelines*, publication 1770-4.1, for additional information. Additional grounding connections from the mounting tabs or DIN rail, if used, are not required unless the mounting surface cannot be grounded. You must also provide an acceptable grounding path for each device in your application.

**NOTE**

It is recommended to use all four mounting positions for panel mounting installation.

**NOTE**

This  symbol denotes a protective earth ground terminal which provides a low impedance path between electrical circuits and earth for safety purposes and provides noise immunity improvement. This connection must be made for safety purposes


**ATTENTION**

Remove the protective debris strips before applying power to the controller. Failure to remove the strips may cause the controller to overheat.

## Wiring Diagrams

This section shows the wiring diagrams for the MicroLogix 1500 controllers. Controllers with dc inputs can be wired as either sinking or sourcing configuration. (Sinking and sourcing does not apply to ac inputs.) See pages 3-11 through 3-14 for sinking and sourcing wiring diagrams.

### NOTE

This  symbol denotes a protective earth ground terminal which provides a low impedance path between electrical circuits and earth for safety purposes and provides noise immunity improvement. This connection must be made for safety purposes.

### Miswiring - 1764-28BXB Only

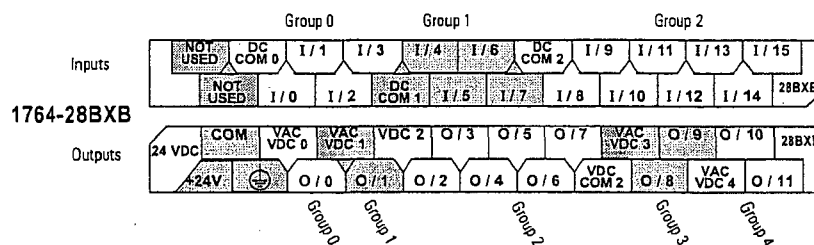
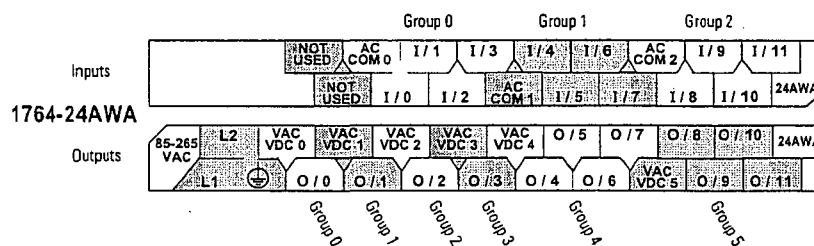
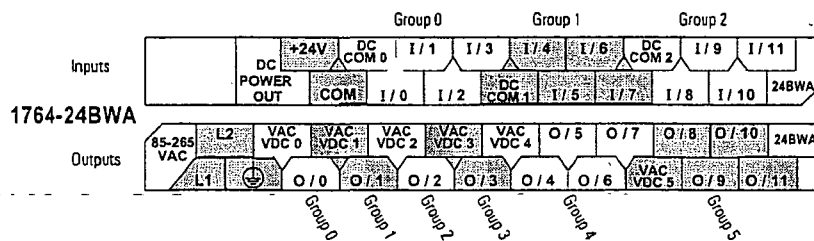
The following table shows miswiring conditions and the consequences of improper wiring:

Condition	Result
Operating with Voltage Less than 20.4V dc	This will not damage the base unit. The base unit may not power up.
	<b>IMPORTANT</b> This is not recommended. You must verify that the line voltage remains within specified limits.
Reverse Wiring of the Line Terminals (0 to 30V dc)	Reverse wiring will not damage the base unit. The base unit will not power up.
Applied Voltage Level Exceeds the Published Recommended Value	Exceeding the published recommended voltage may result in permanent damage to the base unit.

## 3-8 Wiring Your Controller

## Terminal Block Layouts

The base unit terminal block layouts are shown below. The shading on the labels indicates how the terminals are grouped. A detail of the groupings is shown in the table following the terminal block layouts.



## Terminal Groupings

Controller	Inputs		
	Input Group	Common Terminal	Input Terminal
1764-24BWA	Group 0	DC COM 0	I/0 through I/3
	Group 1	DC COM 1	I/4 through I/7
	Group 2	DC COM 2	I/8 through I/11
1764-24AWA	Group 0	AC COM 0	I/0 through I/3
	Group 1	AC COM 1	I/4 through I/7
	Group 2	AC COM 2	I/8 through I/11
1764-28BXB	Group 0	DC COM 0	I/0 through I/3
	Group 1	DC COM 1	I/4 through I/7
	Group 2	DC COM 2	I/8 through I/15

Controller	Outputs		
	Output Group	Voltage Terminal	Output Terminal
1764-24BWA	Group 0	VAC/VDC 0	O/0
	Group 1	VAC/VDC 1	O/1
	Group 2	VAC/VDC 2	O/2
	Group 3	VAC/VDC 3	O/3
	Group 4	VAC/VDC 4	O/4 through O/7
	Group 5	VAC/VDC 5	O/8 through O/11
1764-24AWA	Group 0	VAC/VDC 0	O/0
	Group 1	VAC/VDC 1	O/1
	Group 2	VAC/VDC 2	O/2
	Group 3	VAC/VDC 3	O/3
	Group 4	VAC/VDC 4	O/4 through O/7
	Group 5	VAC/VDC 5	O/8 through O/11
1764-28BXB	Group 0	VAC/VDC 0	O/0
	Group 1	VAC/VDC 1	O/1
	Group 2	VDC 2, VDC COM 2	O/2 through O/7
	Group 3	VAC/VDC 3	O/8 and O/9
	Group 4	VAC/VDC 4	O/10 and O/11

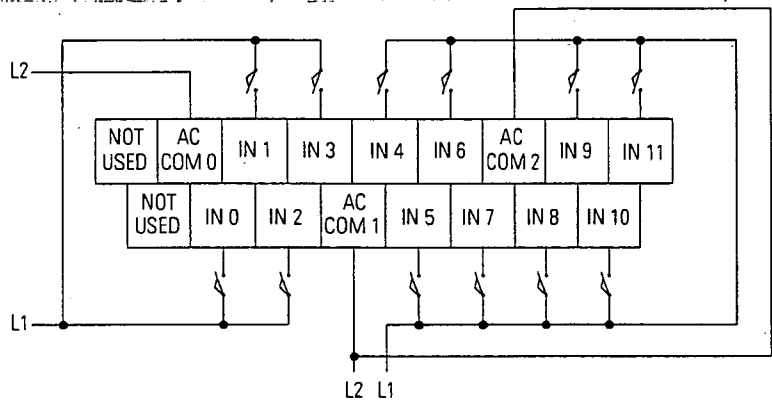
# Sinking and Sourcing Circuits

Any of the MicroLogix 1500 DC embedded input groups can be configured as sinking or sourcing depending on how the DC COM is wired on the group. See pages 3-11 through 3-14 for sinking and sourcing wiring diagrams.

Type	Definition
Sinking Input <i>connection of a PNP sourcing device</i>	The input energizes when high-level voltage is applied to the input terminal (active high). Connect the power supply VDC (-) to the DC COM terminal.
Sourcing Input <i>connection of an NPN sinking device</i>	The input energizes when low-level voltage is applied to the input terminal (active low). Connect the power supply VDC (+) to the DC COM terminal.

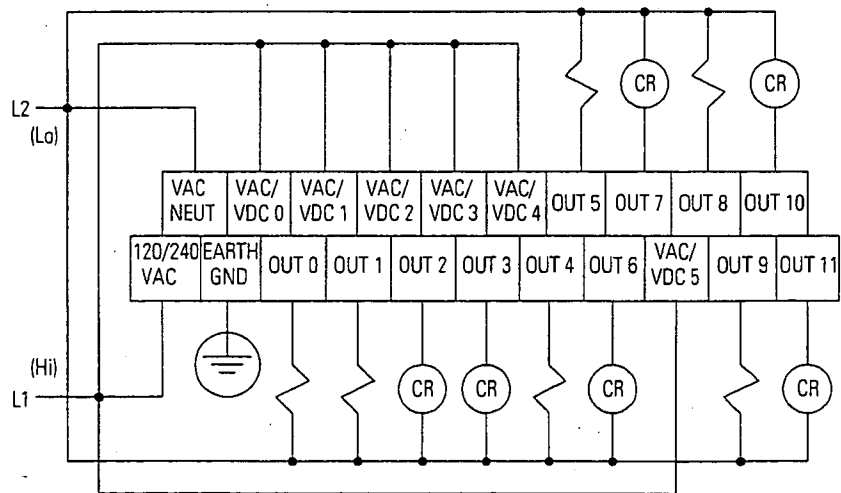
## 1764-24AWA Wiring Diagram

### Input Terminals



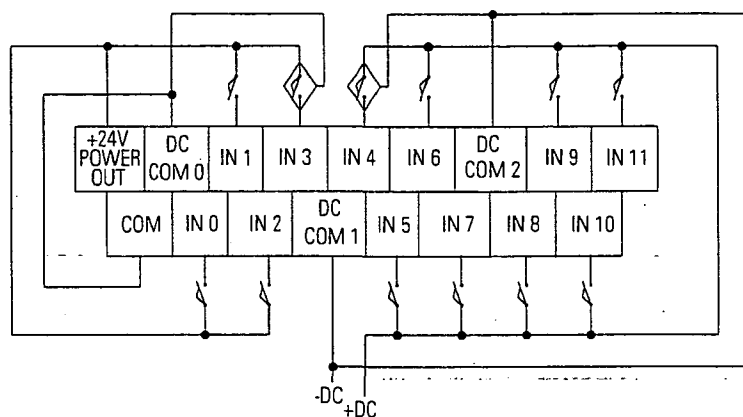
"NOT USED" terminals are not intended for use as connection points.

### Output Terminals

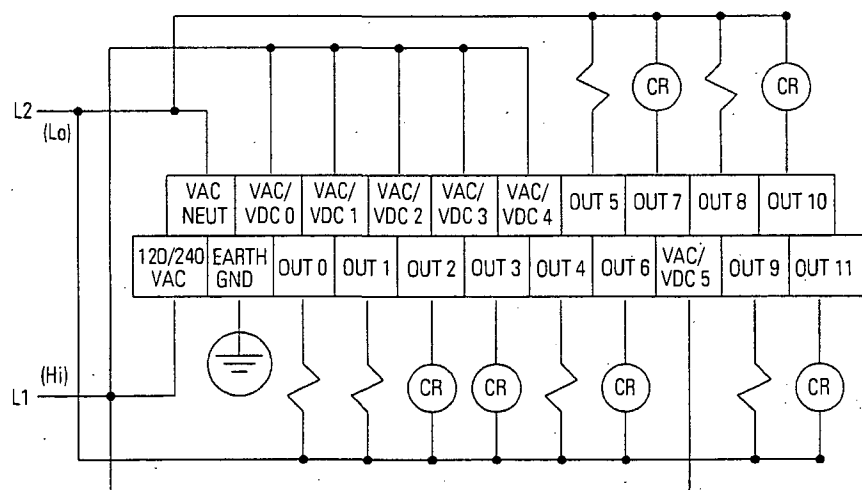


## 1764-24BWA Sinking Wiring Diagram

### Input Terminals



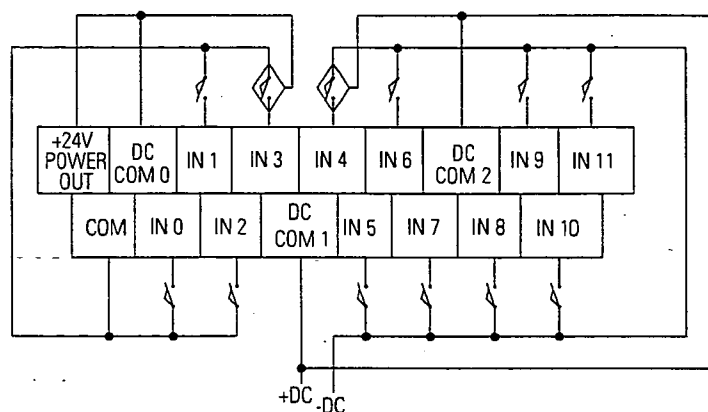
### Output Terminals



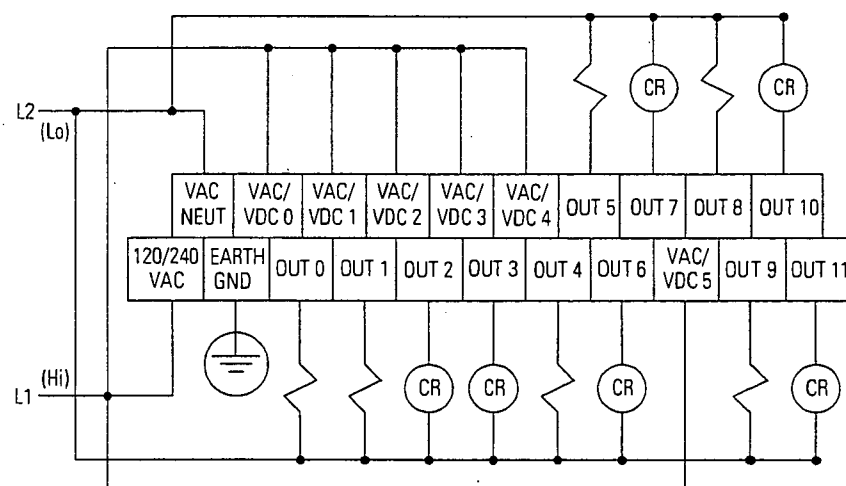
## 3-12 Wiring Your Controller

## 1764-24BWA Sourcing Wiring Diagram

## Input Terminals

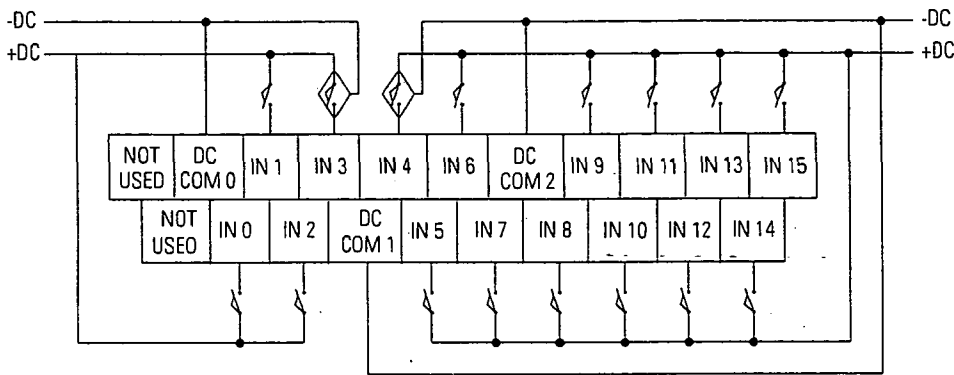


## Output Terminals



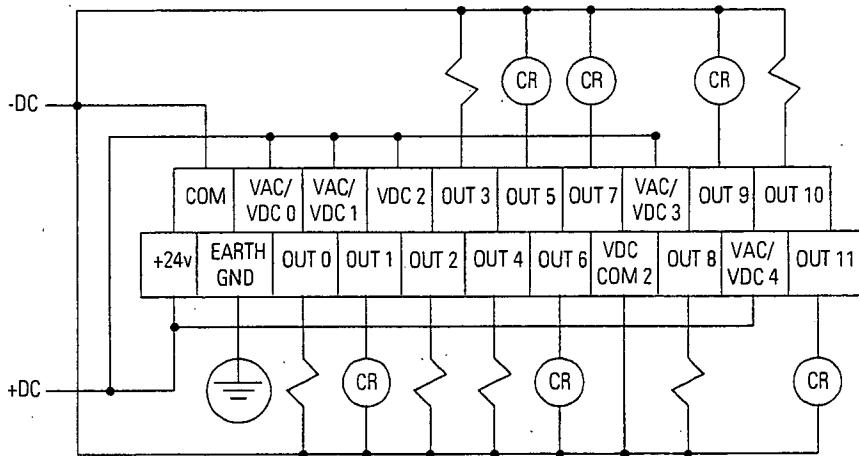
1764-28BXB Sinking Wiring Diagram

Input Terminals



"NOT USED" terminals are not intended for use as connection points.

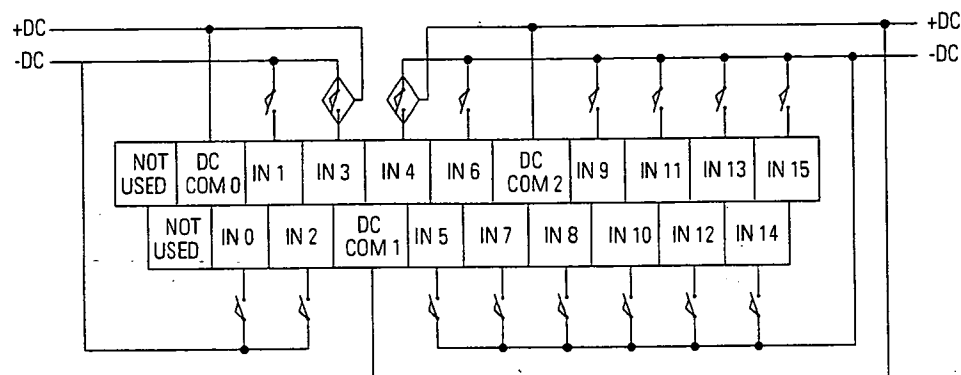
Output Terminals



## 3-14 Wiring Your Controller

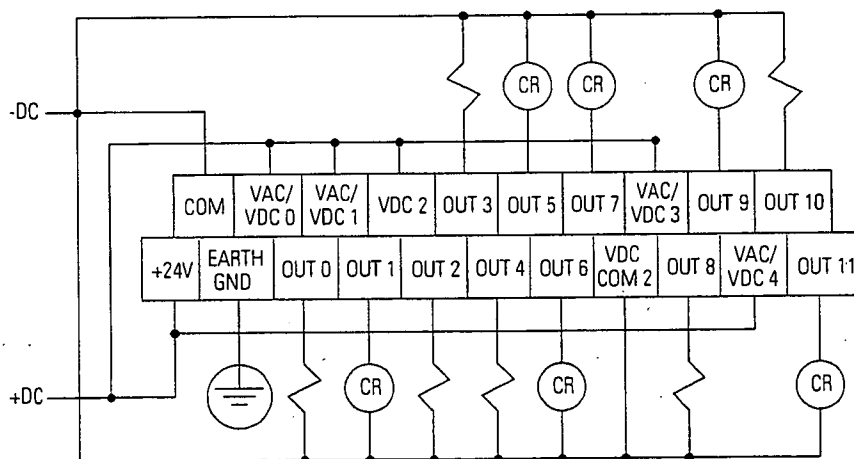
## 1764-28BXB Sourcing Wiring Diagram

## Input Terminals



"NOT USED" terminals are not intended

## Output Terminals



## Controller I/O Wiring

### Minimizing Electrical Noise

Because of the variety of applications and environments where controllers are installed and operating, it is impossible to ensure that all environmental noise will be removed by input filters. To help reduce the effects of environmental noise, install the MicroLogix 1500 system in a properly rated (i.e. NEMA) enclosure. Make sure that the MicroLogix 1500 system is properly grounded.

A system may malfunction may occur due to a change in the operating environment after a period of time. We recommend periodically checking system operation, particularly when new machinery or other noise sources are installed near the Micrologix 1500 system.

### Transistor Output Transient Pulses

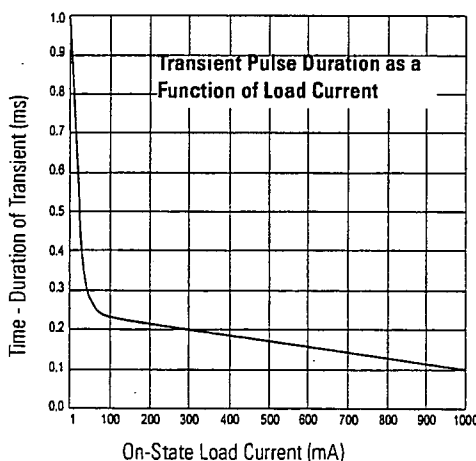
#### ATTENTION



A brief transient current pulse may flow through transistor outputs if the external supply voltage is suddenly applied at the V<sub>dc</sub> and V<sub>dc</sub> com terminals (e.g. via the master control relay). It is a fast rate-of-change of voltage at the terminals that causes the pulse. This condition is inherent in transistor outputs and is common to solid state devices. The transient pulses may occur regardless of whether the controller is powered or running.

The transient energy is dissipated in the load, and the pulse duration is longer for loads with high impedance. The graph below illustrates the relation between pulse duration and load current. Power-up transients will not exceed the times shown in the graph. For most applications the pulse energy is not sufficient to energize the load.

To reduce the possibility of inadvertent operation of devices connected to transistor outputs, consider adding an external resistor in parallel to the load to increase the on-state load current. The duration of the transient pulse is reduced when the on-state load current is increased or the load impedance is decreased.



### 3-16 Wiring Your Controller

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Publication 1764-UM001A-US-P

## Communication Connections

This chapter describes how to set up communications for your control system. The method you use and cabling required depend on your application. This chapter also describes how the controller establishes communication with the appropriate network. Topics include:

- Default Communication Configuration
- Communications Toggle Push Button
- Connecting to the RS-232 Port
- Connecting to a DH-485 Network
- Connecting to DeviceNet

### Default Communication Configuration

The MicroLogix 1500 has the following default communication configuration.

**Table 4.1 DF1 Full-Duplex Configuration Parameters**

Parameter	Default
Baud Rate	19.2K
Parity	none
Source ID (Node Address)	1
Control Line	no handshaking
Error Detection	CRC
Embedded Responses	auto detect
Duplicate Packet (Message) Detect	enabled
ACK Timeout	50 counts
NAK retries	3 retries
ENQ retries	3 retries
Stop Bits	1

#### NOTE

The default configuration is present when:

- The controller is powered-up for the first time.
- The communications toggle push button specifies default communications (the DCOMM LED is on).
- An OS upgrade is completed.

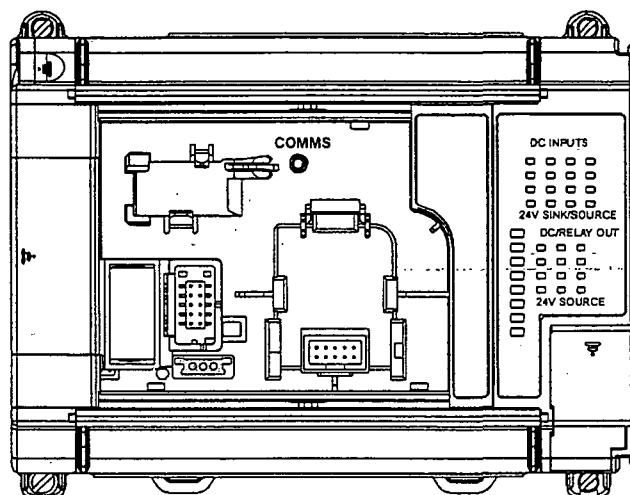
For more information about communications, see Understanding Communication Protocols on page E-1.

## 4-2 Communication Connections

## Communications Toggle Push Button

The Communications Toggle Push Button is located on the processor. You must remove processor door or DAT to access the Communications Toggle Push Button.

Use the Communications Toggle Push Button to change from the user-defined communication configuration to the default communications configuration and back. The Default Communications (DCOMM) LED operates to show when the controller is in the default communications mode (settings shown on page 4-1).

**NOTE**

The Communication Toggle Push Button must be pressed and held for two seconds to activate.

**NOTE**

The Communication Toggle Push Button only affects the communication configuration of Channel 0.

## Connecting to the RS-232 Port

### Making a DF1 Full-Duplex Point-to-Point Connection

You can connect the MicroLogix 1500 programmable controller to your personal computer using a serial cable from your personal computer's serial port to the controller, as shown in the illustrations below.

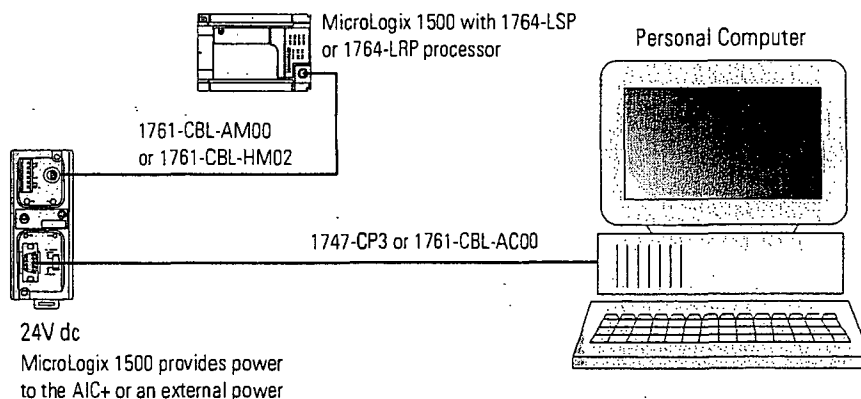
#### ATTENTION



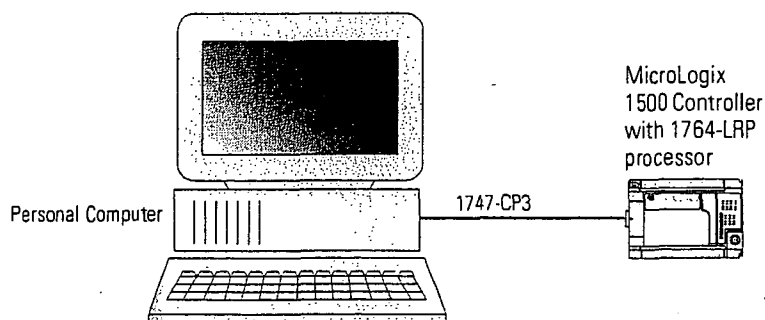
Chassis ground, internal 24V ground, user 24V dc ground, and RS-232 ground are internally connected. You must connect the chassis ground terminal screw to ground prior to connecting any devices. It is important that you understand your personal computer's grounding system before connecting to the controller. An optical isolator is recommended between the controller and your personal computer when using Channel 0. An isolator is not required when using Channel 1 (1764-LRP).

#### Channel 0

We recommend using an Advanced Interface Converter (AIC+), catalog number 1761-NET-AIC, as your optical isolator, as shown below. See page 4-10 for specific AIC+ cabling information.



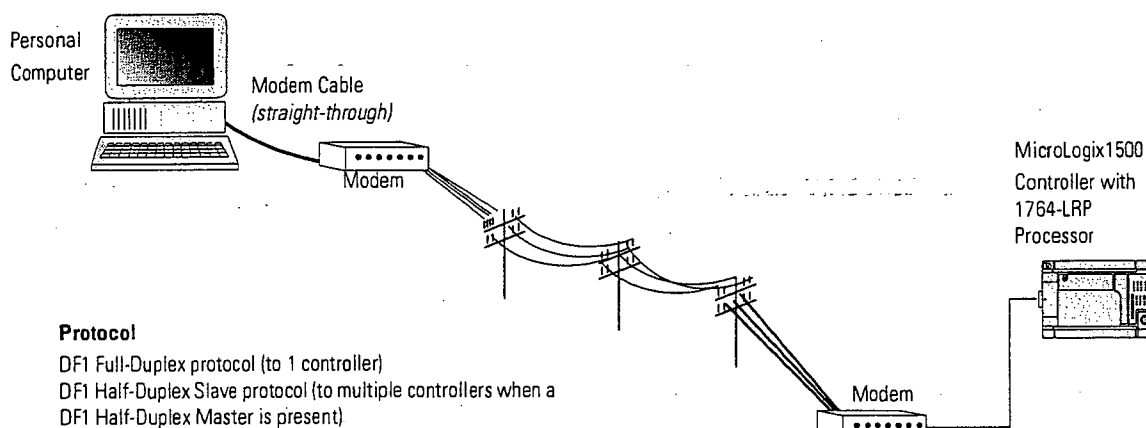
#### Channel 1



## 4-4 Communication Connections

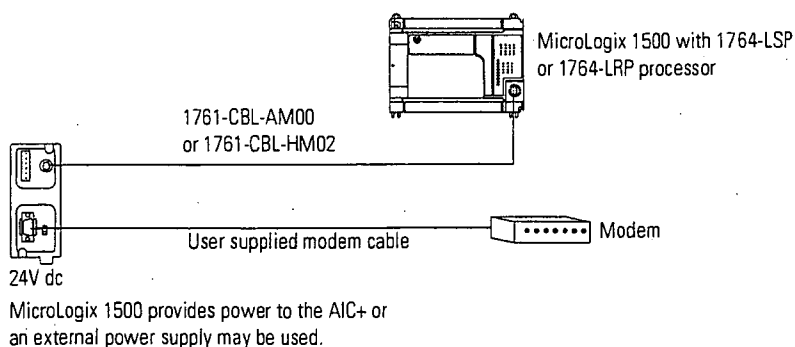
## Using a Modem

You can use modems to connect a personal computer to one MicroLogix 1500 controller (using DF1 Full-Duplex protocol), or to multiple controllers (using DF1 Half-Duplex protocol), or Modbus Slave RTU protocol, as shown in the following illustration. Do not use DH-485 protocol through modems under any circumstance. (See Using Modems with MicroLogix 1500 Programmable Controllers on page E-7 for information on types of modems you can use with the MicroLogix controllers.)



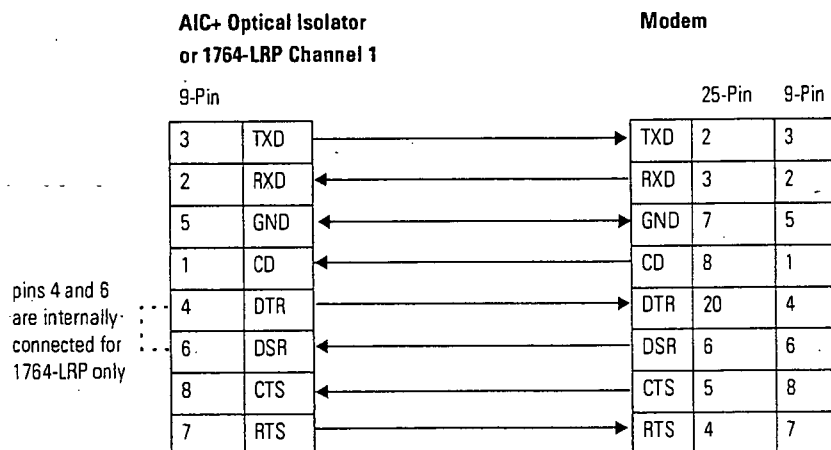
## Isolated Modem Connection

We recommend using an AIC+, catalog number 1761-NET-AIC, as your optical isolator for Channel 0. See page 4-10 for specific AIC+ cabling information. Using an AIC+ to isolate the modem is illustrated below:



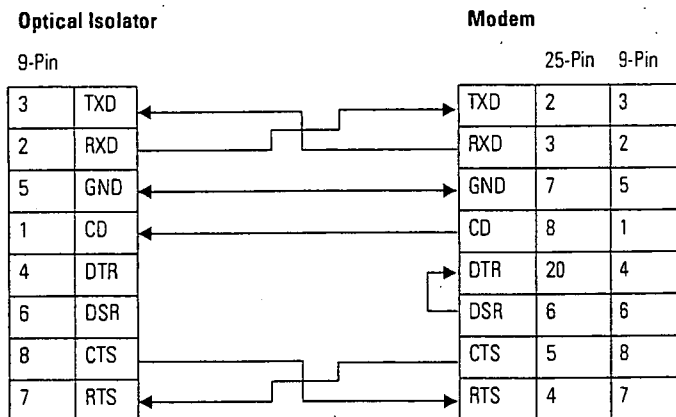
### Constructing Your Own Modem Cable

If you construct your own modem cable, the maximum cable length is 15.24 m (50 ft) with a 25-pin or 9-pin connector. Refer to the following typical pinout for constructing a *straight-through* cable:



### Constructing Your Own Null Modem Cable

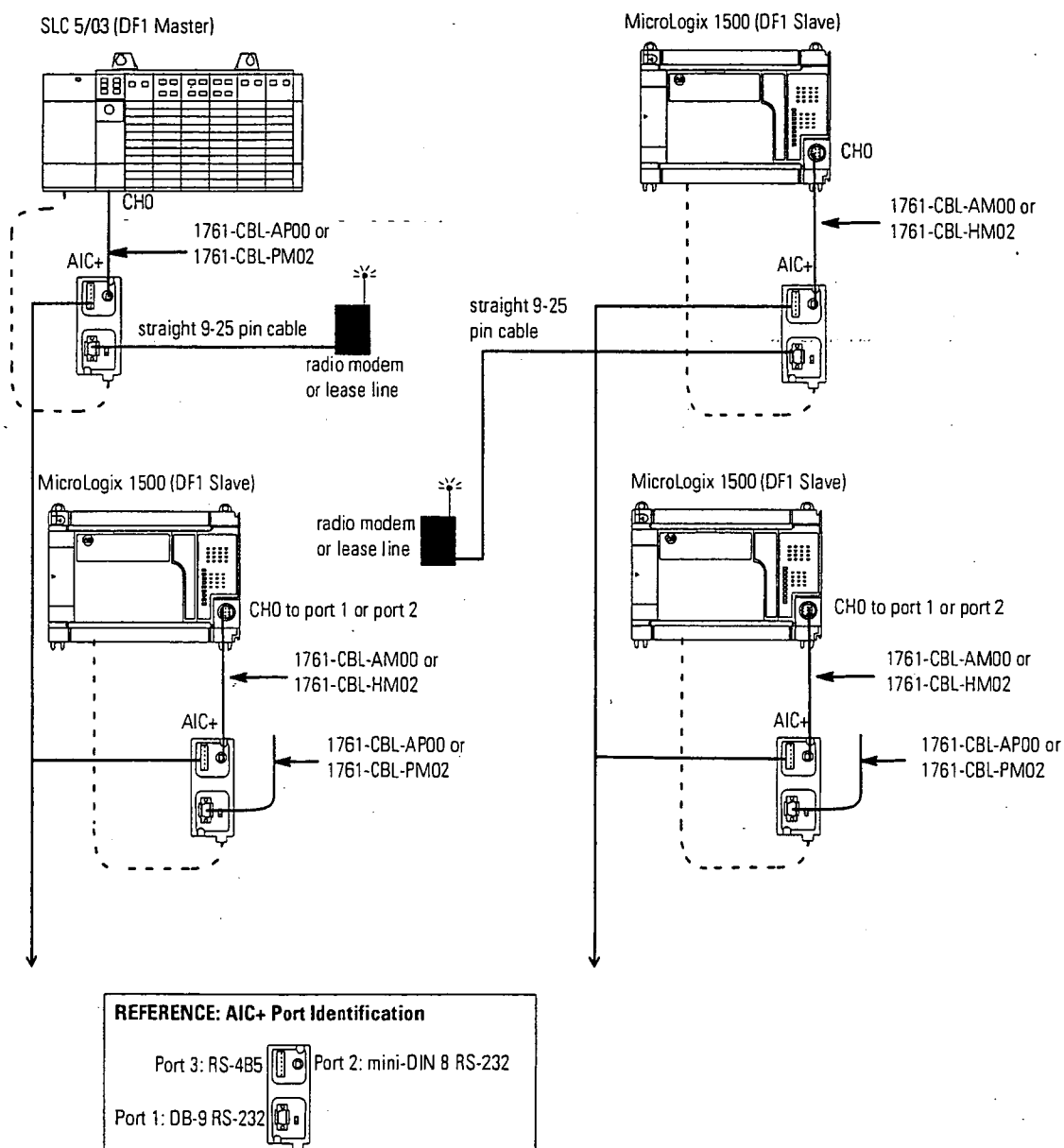
If you construct your own null modem cable, the maximum cable length is 15.24m (50 ft) with a 25-pin or 9-pin connector. Refer to the following typical pinout:



## 4-6 Communication Connections

## Connecting to a DF1 Half-Duplex Network

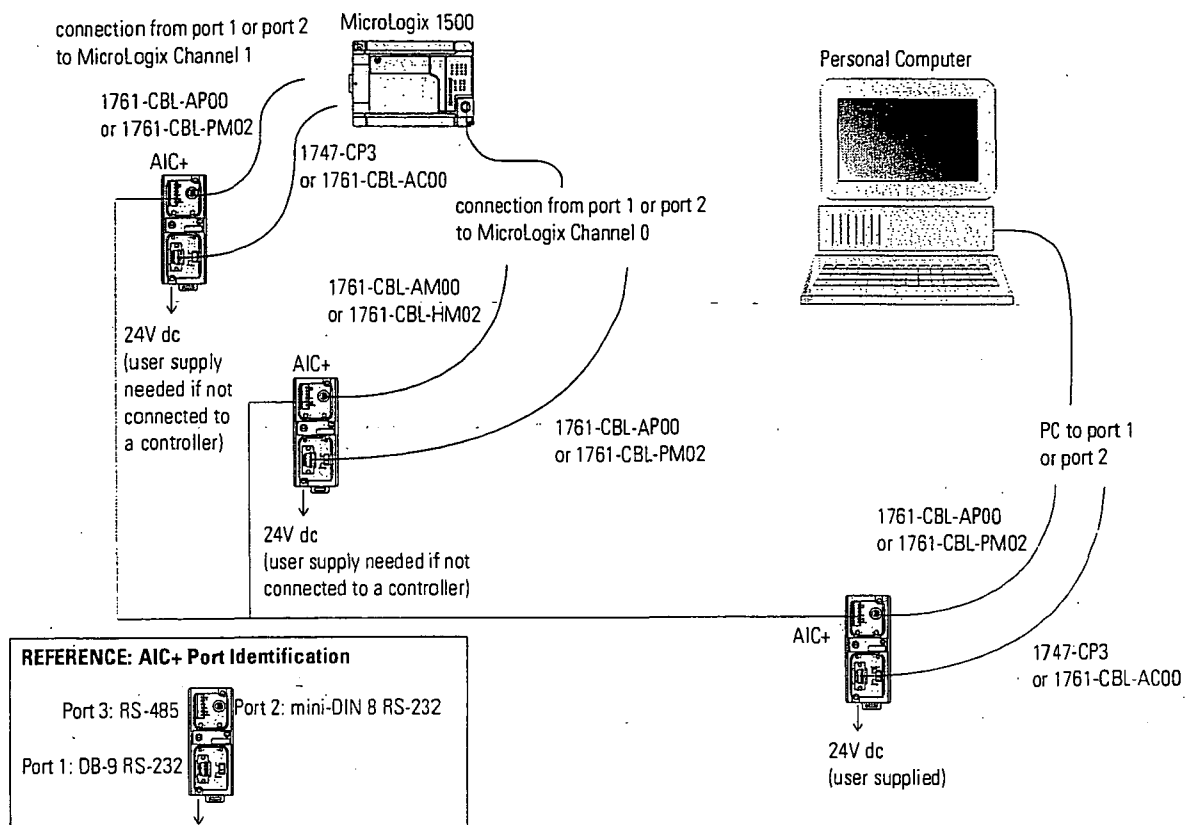
Use this diagram for DF1 Half-Duplex Master-Slave protocol without hardware handshaking.

**NOTE**

Series C or higher cables are required.

## Connecting to a DH-485 Network

The following illustration shows how to connect to a DH-485 network.



## Recommended Tools

To connect a DH-485 network, you need tools to strip and attach the shielded cable. We recommend the following equipment (or equivalent):

### Table 4.2 Working with Cable for DH-485 Network

Description	Part Number	Manufacturer
Shielded Twisted Pair Cable	#3106A or #9842	Belden
Stripping Tool	45-164	Ideal Industries
1/8" Slotted Screwdriver	Not Applicable	Not Applicable

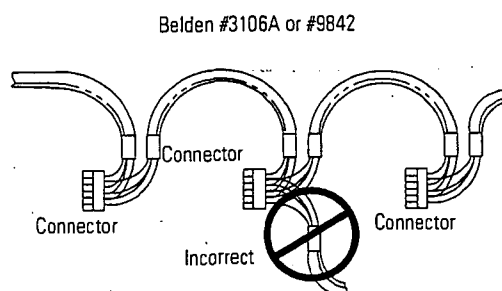
## 4-8 Communication Connections

**DH-485 Communication Cable**

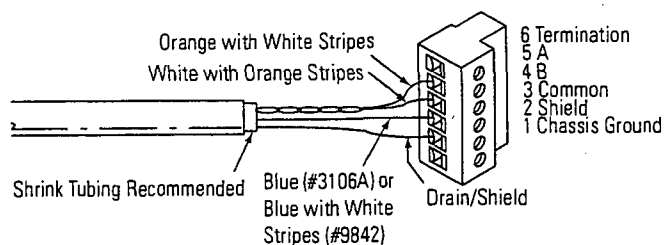
The communication cable consists of a number of cable segments daisy-chained together. The total length of the cable segments cannot exceed 1219 m (4000 ft). However, two segments can be used to extend the DH-485 network to 2438m (8000 ft). For additional information on connections using the AIC+, refer to the *Advanced Interface Converter (AIC+) User Manual*, publication 1761-6.4.

**Connecting the Communication Cable to the DH-485 Connector****NOTE**

A daisy-chained network is recommended. We do *not* recommend the following:

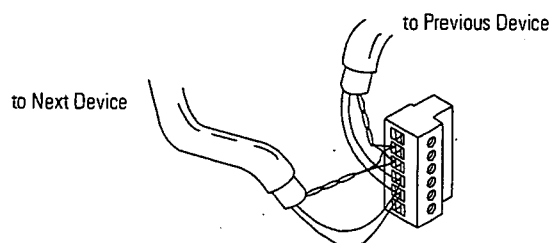
*Single Cable Connection*

When connecting a single cable to the DH-485 connector, use the following diagram.



### Multiple Cable Connection

When connecting multiple cables to the DH-485 connector, use the following diagram.



**Table 4.3 Connections using Belden #3106A Cable**

For this Wire/Pair	Connect this Wire	To this Terminal
Shield/Drain	Non-jacketed	Terminal 2 - Shield
Blue	Blue	Terminal 3 - (Common)
White/Orange	White with Orange Stripe	Terminal 4 - (Data B)
	Orange with White Stripe	Terminal 5 - (Data A)

**Table 4.4 Connections using Belden #9842 Cable**

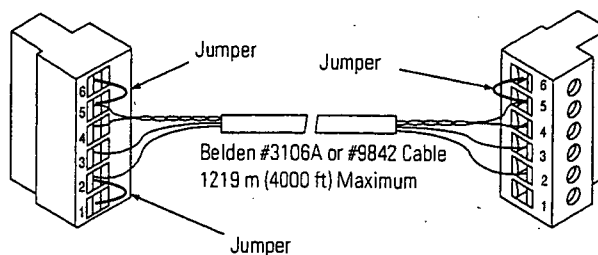
For this Wire/Pair	Connect this Wire	To this Terminal
Shield/Drain	Non-jacketed	Terminal 2 - Shield
Blue/White	White with Blue Stripe	Cut back - no connection <sup>(1)</sup>
	Blue with White Stripe	Terminal 3 - (Common)
White/Orange	White with Orange Stripe	Terminal 4 - (Data B)
	Orange with White Stripe	Terminal 5 - (Data A)

(1) To prevent confusion when installing the communication cable, cut back the white with blue stripe wire immediately after the insulation jacket is removed. This wire is not used by DH-485.

### Grounding and Terminating the DH-485 Network

Only one connector at the end of the link must have Terminals 1 and 2 jumpered together. This provides an earth ground connection for the shield of the communication cable. Both ends of the network must have Terminals 5 and 6 jumpered together, as shown below. This connects the termination impedance (of 120Ω) that is built into each AIC+ as required by the DH-485 specification.

### End-of-Line Termination



## 4-10 Communication Connections

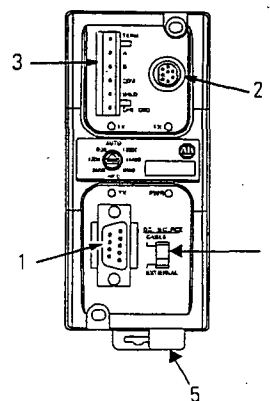
## Connecting the AIC+

The AIC+, catalog number 1761-NET-AIC, enables a MicroLogix controllers to connect to a DH-485 network. The AIC+ has two isolated RS-232 ports and one RS-485 port. When two MicroLogix controllers are closely positioned, you can connect a controller to each of the RS-232 ports on the AIC+.

The AIC+ can also be used as an RS-232 isolator, providing an isolation barrier between the controllers communications port and any equipment connected to it (i.e. personal computer, modem, etc.)

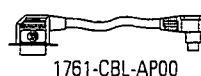
The following figure shows the connections and specifications of the AIC+.

Item	Description
1	Port 1 - DB-9 RS-232, DTE
2	Port 2 - mini-DIN 8 RS-232 DTE
3	Port 3 - RS-485 Phoenix plug
4	DC Power Source selector switch (cable = port 2 power source, external = external power source connected to item 5)
5	Terminals for external 24V dc power supply and chassis ground

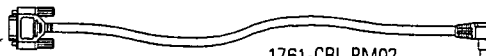


For additional information on connecting the AIC+, refer to the *Advanced Interface Converter (AIC+) User Manual*, publication 1761-6.4.

### Cable Selection Guide



1761-CBL-AP00

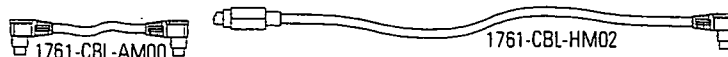


1761-CBL-PM02

Cable	Length	Connections from	to AIC+	External Power Supply Required <sup>(1)</sup>	Power Selection Switch Setting <sup>(1)</sup>
1761-CBL-AP00 <sup>(2)</sup>	45cm (17.7 in)	1764-LRP processor, channel 1	port 2	yes	external
1761-CBL-PM02 <sup>(2)</sup>	2m (6.5 ft)	SLC 5/03 or SLC 5/04 processors, channel 0	port 2	yes	external
		MicroLogix 1000 or 1500	port 1	yes	external
		PanelView 550 through NULL modem adapter	port 2	yes	external
		DTAM Plus / DTAM Micro	port 2	yes	external
		PC COM port	port 2	yes	external

(1) External power supply required unless the AIC+ is powered by the device connected to port 2, then the selection switch should be set to *cable*.

(2) Series C or higher cables are required.



Cable	Length	Connections from	to AIC+	External Power Supply Required <sup>(1)</sup>	Power Selection Switch Setting <sup>(1)</sup>
1761-CBL-AM00 <sup>(2)</sup>	45cm (17.7 in)	MicroLogix 1000 or 1500	port 2	no	cable
1761-CBL-HM02 <sup>(2)</sup>	2m (6.5 ft)	to port 2 on another AIC+	port 2	yes	external

(1) External power supply required unless the AIC+ is powered by the device connected to port 2, then the selection switch should be set to *cable*.

(2) Series C or higher cables are required.



Cable	Length	Connections from	to AIC+	External Power Supply Required <sup>(1)</sup>	Power Selection Switch Setting <sup>(1)</sup>
1747-CP3	3m (9.8 ft)	1764-LRP processor, channel 1	port 1	yes	external
1761-CBL-AC00 <sup>(2)</sup>	45cm (17.7 in)	SLC 5/03 or SLC 5/04 processor, channel 0	port 1	yes	external
		PC COM port	port 1	yes	external
		PanelView 550 through NULL modem adapter	port 1	yes	external
		DTAM Plus / DTAM Micro™	port 1	yes	external
		Port 1 on another AIC+	port 1	yes	external

(1) External power supply required unless the AIC+ is powered by the device connected to port 2, then the selection switch should be set to *cable*.

(2) Series C or higher cables are required.



Cable	Length	Connections from	to AIC+	External Power Supply Required <sup>(1)</sup>	Power Selection Switch Setting <sup>(1)</sup>
straight 9-25 pin	—	modem or other communication device	port 1	yes	external

(1) External power supply required unless the AIC+ is powered by the device connected to port 2, then the selection switch should be set to *cable*.

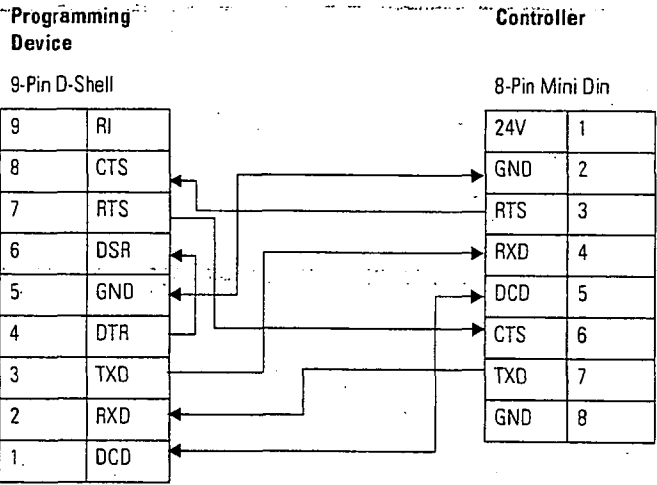
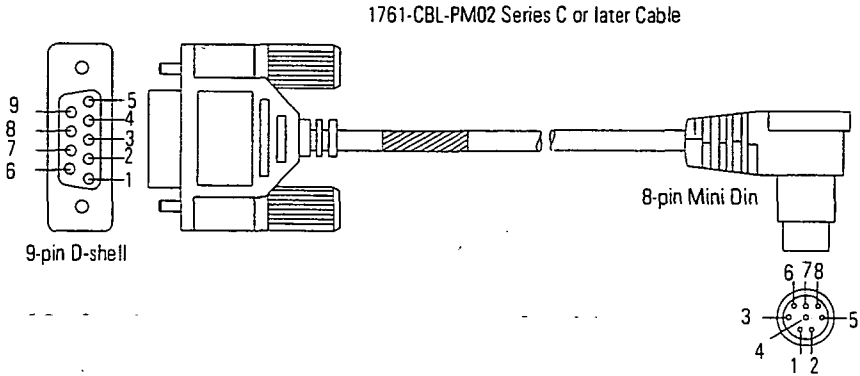


Cable	Length	Connections from	to AIC+	External Power Supply Required <sup>(1)</sup>	Power Selection Switch Setting <sup>(1)</sup>
1761-CBL-AS03	3m (9.8 ft)	SLC 500 Fixed,	port 3	yes	external
1761-CBL-AS09	9.5m (31.17 ft)	SLC 5/01, SLC 5/02, and SLC 5/03 processors			
		PanelView 550 RJ45 port	port 3	yes	external

(1) External power supply required unless the AIC+ is powered by the device connected to port 2, then the selection switch should be set to *cable*.

4-12 Communication Connections

1761-CBL-PM02 Series C (or equivalent) Cable Wiring Diagram

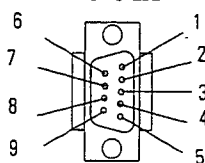
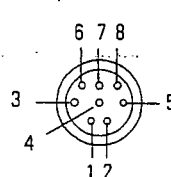
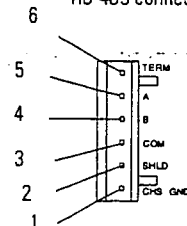


*Recommended User-Supplied Components*

These components can be purchased from your local electronics supplier.

**Table 4.5 User Supplied Components**

Component	Recommended Model
external power supply and chassis ground	power supply rated for 20.4-28.8V dc
NULL modem adapter	standard AT
straight 9-25 pin RS-232 cable	see table below for port information if making own cables

**Port 1  
DB-9 RS-232****Port 2  
8-pin mini-DIN****Port 3  
RS-485 connector****Table 4.6 AIC+ Terminals**

Pin	Port 1: DB-9 RS-232	Port 2 <sup>(1)</sup>	Port 3: RS-485 Connector
1	received line signal detector (DCD)	24V dc	chassis ground
2	received data (RxD)	ground (GND)	cable shield
3	transmitted data (TxD)	request to send (RTS)	signal ground
4	DTE ready (DTR) <sup>(2)</sup>	received data (RxD)	DH-485 data B
5	signal common (GND)	received line signal detector (DCD)	DH-485 data A
6	DCE ready (DSR) <sup>(1)</sup>	clear to send (CTS)	termination
7	request to send (RTS)	transmitted data (TxD)	not applicable
8	clear to send (CTS)	ground (GND)	not applicable
9	not applicable	not applicable	not applicable

(1) An 8-pin mini DIN connector is used for making connections to port 2. This connector is not commercially available.

(2) On port 1, pin 4 is electronically jumpered to pin 6. Whenever the AIC+ is powered on, pin 4 will match the state of pin 6.

**4-14** Communication Connections

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*Safety Considerations*

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

**WARNING**

**EXPLOSION HAZARD** - AIC+ must be operated from an external power source.



This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.

---

See Safety Considerations on page 2-3 for additional information.

*Installing and Attaching the AIC+*

1. Take care when installing the AIC+ in an enclosure so that the cable connecting the MicroLogix 1500 controller to the AIC+ does not interfere with the enclosure door.
2. Carefully plug the terminal block into the RS-485 port on the AIC+ you are putting on the network. Allow enough cable slack to prevent stress on the plug.
3. Provide strain relief for the Belden cable after it is wired to the terminal block. This guards against breakage of the Belden cable wires.

*Powering the AIC+*

In normal operation with a MicroLogix programmable controller connected to port 2 of the AIC+, the controller powers the AIC+. Any AIC+ not connected to a MicroLogix controller requires a 24V dc power source. The AIC+ requires 120 mA at 24V dc.

If both the controller and external power are connected to the AIC+, the power selection switch determines what device powers the AIC+.

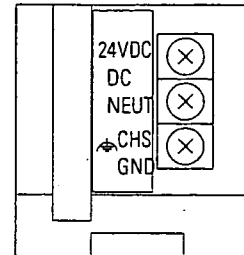
**ATTENTION**

If you use an external power supply, it must be 24V dc. Permanent damage results if higher voltage is used.

---

Set the DC Power Source selector switch to **EXTERNAL** before connecting the power supply to the AIC+. The following illustration shows where to connect external power for the AIC+.

Bottom View

**ATTENTION**

Always connect the CHS GND (chassis ground) terminal to the nearest earth ground. This connection must be made whether or not an external 24V dc supply is used.

*Power Options*

Below are two options for powering the AIC+:

- Use the 24V dc user power supply built into the MicroLogix 1500 controller. The AIC+ is powered through a hard-wired connection using a communication cable (1761-CBL-HM02, or equivalent) connected to port 2.
- Use an external DC power supply with the following specifications:
  - operating voltage: 24V dc +20% or -15%
  - output current: 150 mA minimum
  - rated NEC Class 2

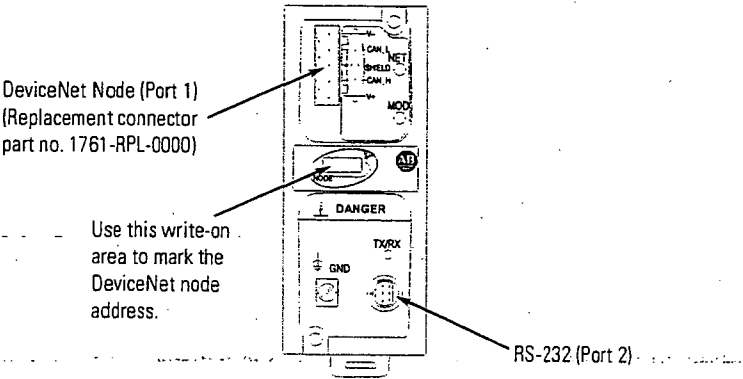
Make a hard-wired connection from the external supply to the screw terminals on the bottom of the AIC+.

**ATTENTION**

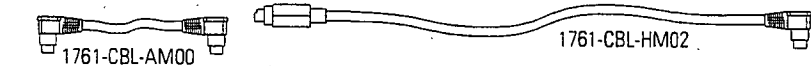
If you use an external power supply, it must be 24V dc. Permanent damage results if miswired with the wrong power source.

Connecting to  
DeviceNet

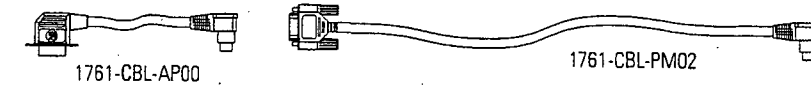
You can connect a MicroLogix 1500 to a DeviceNet network using the DeviceNet Interface (DNI), catalog number 1761-NET-DNI. For additional information on using the DNI, refer to the *DeviceNet Interface User Manual*, publication 1761-6.5. The following figure shows the external wiring connections of the DNI.



Cable Selection Guide



Cable	Length	Connections from	to DNI
1761-CBL-AM00	45 cm (17.7 in)	MicroLogix 1000	port 2
1761-CBL-HM02	2m (6.5 ft)	MicroLogix 1500	port 2



Cable	Length	Connections from	to DNI
1761-CBL-AP00	45 cm (17.7 in)	SLC 5/03 or SLC 5/04 processors, channel 0	port 2
1761-CBL-PM02	2m (6.5 ft)	PC COM port	port 2
		1764-LRP processor, channel 1	port 2

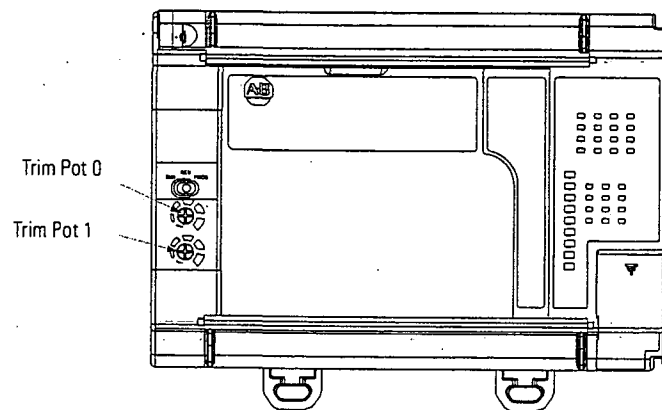
## Chapter 5

### Using Trim Pots and the Data Access Tool (DAT)

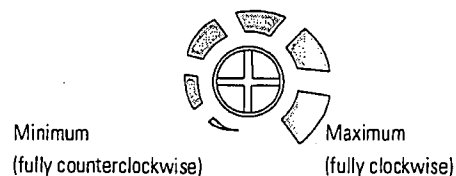
#### Trim Pot Operation

The processor has two trimming potentiometers (trim pots) which allow modification of data within the controller. Adjustments to the trim pots change the value in the corresponding Trim Pot Information (TPI) register. The data value of each trim pot can be used throughout the control program as timer, counter, or analog presets depending upon the requirements of the application.

The trim pots are located below the mode switch under the left access door of the processor.



Use a small flathead screwdriver to turn the trim pots. Adjusting their value causes data to change within a range of 0 to 250 (fully clockwise). The maximum rotation of each trim pot is three-quarters, as shown below. Trim pot stability over time and temperature is typically  $\pm 2$  counts.



Trim pot data is updated continuously whenever the controller is powered-up.

**5-2 Using Trim Pots and the Data Access Tool (DAT)**

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**Trim Pot Information Function File**

The composition of the Trim Pot Information (TPI) Function File is described in the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*, publication 1762-RM001B-US-P.

**Error Conditions**

If the controller detects a problem/error with either trim pot, the last values read remain in the data location, and an error code is put in the error code byte of the TPI file for whichever trim pot had the problem. Once the problem/error is corrected, the error code is cleared. The error codes are described in the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*, publication 1762-RM001B-US-P.

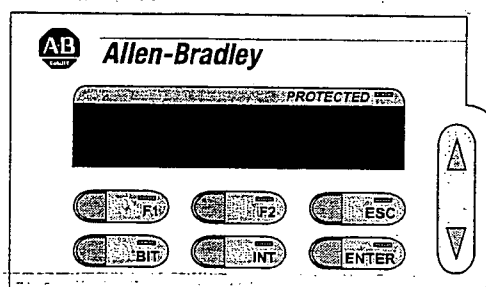
## Data Access Tool (DAT)

The DAT is a convenient and simple tool that provides an interface for editing and monitoring data. The DAT has five primary features:

- Direct access to 48 bit elements
- Direct access to 48 integer elements
- Two function keys
- Display controller faults
- Removal/Insertion under power

### DAT Keypad and Indicator Light Functions

The DAT has a digital display, 6 keys, an up/down key, and 7 indicator lights. Their functions are described in the table on page 5-3.



Feature	Function
Digital Display	Displays address elements, data values, faults and errors.
Up/Down Key	Selects element numbers and change data values. The up/down key scrolls when held.
F1 Key and Indicator Light	Controls the F1 status bit. When the F1 key is pressed or latched, the F1 indicator LED is lit.
F2 Key and Indicator Light	Controls the F2 status bit. When the F2 key is pressed or latched, the F2 indicator LED is lit.
ESC Key	Cancels a current operation.
BIT Key and Indicator Light	Pressing the BIT key puts the DAT in bit mode. The bit indicator light is on when the DAT is in bit mode.
INT Key and Indicator Light	Pressing the INT key puts the DAT in integer mode. The integer indicator light is on when the DAT is in integer mode.
ENTER Key	Press to select the flashing element number or enter data value.
PROTECTED Indicator Light	Indicates element data cannot be changed using the DAT (element is read-only).

#### NOTE

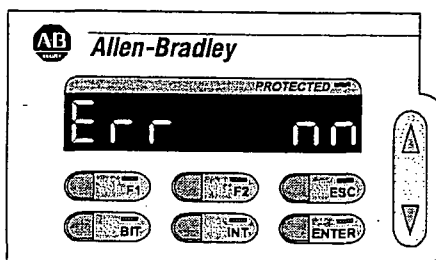
The F1, F2, ESC, BIT, INT, and ENTER keys do not repeat when held. Holding down any one of these keys results in only one key press. The Up/Down arrow key is the only key that repeats when held.

## 5-4 Using Trim Pots and the Data Access Tool (DAT)

## Power-Up Operation

The DAT receives power when it is plugged into the controller. Upon power-up, the DAT performs a self-test.

If the test fails, the DAT displays an error code, all indicator lights are deactivated, and the DAT does not respond to any key presses. See DAT Error Codes on page 5-9.

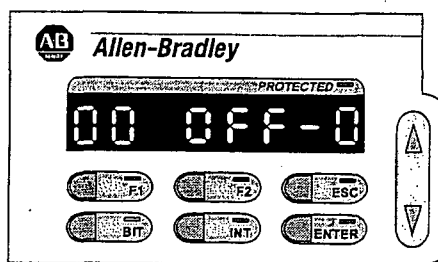


After a successful self-test, the DAT reads the DAT function file to determine its configuration.

## DAT Function File

DAT configuration is stored in the processor in a specialized configuration file called the DAT Function File. The DAT Function File, which is part of the user's control program, is described in the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*, publication 1762-RM001B-US-P.

Following a successful power-up sequence, the DAT enters the bit monitoring mode.



## Power Save Timeout (PST) Parameter

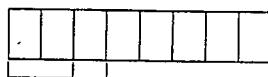
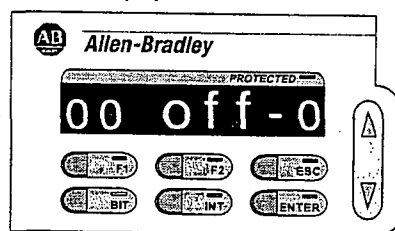
The power save timeout turns off the DAT display after keypad activity has stopped for a user-defined period of time. The power-save (DAT:0.PST) value is set in the DAT Function File. The valid range is 0 to 255 minutes. The power-save feature can be disabled by setting the PST value to 0, which keeps the display on continuously. The default value is 0.

In power-save mode, a dash flashes in the left-most segment of the display. Press any key (except F1 or F2) to return the DAT to its previous mode. If F1 or F2 is pressed, the DAT will change the value of the F1 or F2 status bits, but the display remains in power-save mode.

## Understanding the DAT Display

When the DAT enters either the bit or integer mode, the element number and its data are displayed, as shown below. The element number is either the integer or bit location.

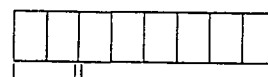
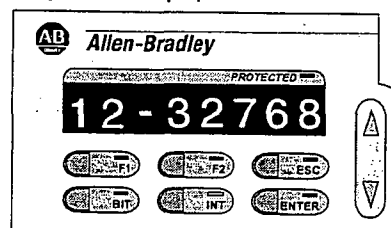
Bit Mode Display



bit element number  
• 0 to 47

bit data  
• OFF - 0  
• ON - 1  
• --- (undefined)

Integer Mode Display



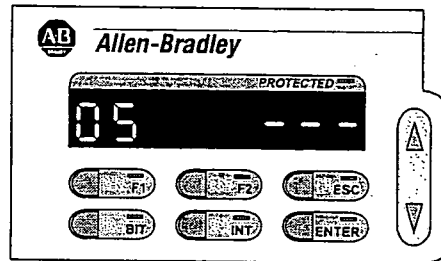
integer element number  
• 0 to 47

integer data  
• -32,768 to 32,767  
• --- (undefined)

If the displayed element is defined in the controller's data file, and is not protected, the element number flashes, indicating that it can be modified. If the displayed element is protected, the PROTECTED indicator light illuminates, and the element number does not flash, indicating that the element cannot be modified.

If the element is undefined, the data field displays three dashes. The element number does not flash because the element does not exist.

## 5-6 Using Trim Pots and the Data Access Tool (DAT)



### Entering Bit Mode

Bit mode allows you to view and modify up to 48 contiguous bit locations in the controller. The DAT enters the bit mode automatically following a successful power-up. The bit mode can also be selected by pressing the BIT key. If the bit mode was previously active, the DAT displays the last bit element monitored. If the integer mode was active, the DAT displays the first bit element in the data file. However, there may be a brief delay while the DAT requests information from the controller. During the delay, the working screen will display. See Working Screen Operation on page 5-7.

### Entering Integer Mode

Integer mode allows you to view and modify up to 48 contiguous 16-bit integer data locations in the controller. To initiate integer mode, press the INT key. If the integer mode was previously active, the DAT displays the last integer element monitored. If the bit mode was active, the DAT displays the first integer element in the data file. However, there may be a brief delay while the DAT requests information from the controller. If there is a delay, the working screen is displayed. See Working Screen Operation on page 5-7.

### Monitoring and Editing

1. Press the INT or BIT key to enter the desired mode. The element number flashes (if not protected).
2. Use the up/down key to scroll and select an element (to scroll rapidly, hold the up/down key).
3. Press ENTER to edit the element. The element number becomes steady and the data flashes if it is not protected.
4. Use the up/down key to change the data. Bit values toggle between "ON" and "OFF". Integer values increment or decrement. Holding down the up/down key causes the integer value to increment or decrement quickly.

**NOTE**

If the data is protected or undefined, pressing the up/down key scrolls to the next element in the list.

5. Press ENTER to load the new data. Press ESC or INT/BIT to discard the new data.

## F1 and F2 Functions

The function keys, F1 and F2, correspond to bits and can be used throughout the control program as desired. They have no effect on bit or integer monitoring.

Each key has two corresponding bits in the DAT function file. The bits within the DAT function file are shown in the table below.

Key	Bits	Address	Data Format	Type	User Program Access
F1 Key	Pressed	DAT:0/F1P	Binary	Status	Read/Write
	Latched	DAT:0/F1L	Binary	Status	Read/Write
F2 Key	Pressed	DAT:0/F2P	Binary	Status	Read/Write
	Latched	DAT:0/F2L	Binary	Status	Read/Write

### *F1 or F2 Key Pressed*

The pressed bits (DAT:0/F1P and DAT:0/F2P) function as push-buttons and provide the current state of either the F1 or F2 key on the keypad. When the F1 or F2 key is pressed, the DAT sets (1) the corresponding pressed key bit. When the F1 or F2 key is not pressed, the DAT clears (0) the corresponding pressed key bit.

### *F1 or F2 Key Latched*

The latched bits (DAT:0/F1L and DAT:0/F2L) function as latched push-buttons and provide latched/toggle key functionality. When the F1 or F2 key is pressed, the DAT sets (1) the corresponding latched key bit within the DAT Function File. When the F1 or F2 key is pressed a second time, the DAT clears (0) the corresponding latched key bit.

## Working Screen Operation

Because the DAT is a communications device, its performance is affected by the scan time of the controller. Depending on the user program, if a long scan time is encountered and the DAT waits for information from the controller, a working screen is displayed. The working screen consists of three dashes that move across the display from left to right. While the working screen is displayed, key presses are not recognized. Once the DAT receives data from the controller, it returns to its normal mode of operation.

If you encounter excessive working screen conditions, you can minimize the effect by adding an SVC instruction to the control program. Refer to the *MicroLogix*

## 5-8 Using Trim Pots and the Data Access Tool (DAT)

*1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual*, publication 1762-RM001B-US-P, for information on the SVC instruction.

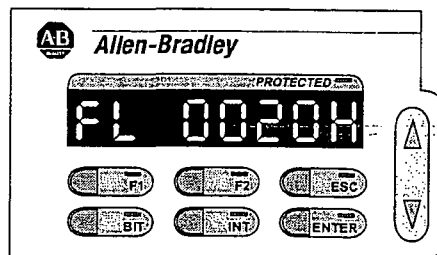
### Non-Existent Elements

When the DAT determines that an element number does not exist in the controller, the element value displays as three dashes.

If the protection bit for an element is undefined, the DAT will assume that the element is unprotected.

### Controller Faults

The DAT checks for controller faults every 10 seconds. When the DAT detects a controller fault, the display shows "FL" in the element number field and the value of the controller's major fault word (S2:6) is displayed in the value field, as shown below.

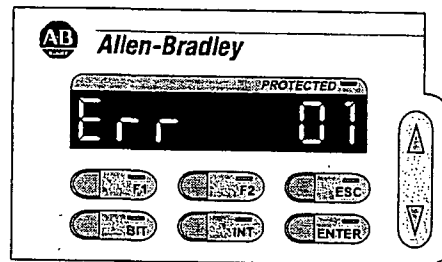

**NOTE**

If an element value is being modified when the fault is detected, the fault is stored until the modification is accepted or discarded. Then, the fault will be displayed.

Pressing ESC while the fault is being displayed returns the DAT to its previous mode. The fault is not removed from the controller, just from the DAT display screen. The fault that was on screen will not display again and cannot be "recalled". If a new fault is detected, it will be displayed. If the initial fault is cleared and returns at a later time, the DAT will display the fault at that time.

## Error Conditions

When the DAT detects an error in its own operation, it displays the error screen. The error screen consists of "Err" and a two-digit error code, as shown below.



The DAT can experience two different types of errors, internal errors and communication errors.

### Internal DAT Errors

Internal DAT errors are non-recoverable. When the DAT experiences an internal error, it displays the error screen, and does not respond to any key presses. Remove and re-install the DAT. If this does not clear the error, the DAT must be replaced.

### Communication Errors

The DAT continually monitors the interface between the DAT and the controller to ensure a good communication path. If the DAT loses communication with the controller for more than three seconds, it generates an interface time-out error. The DAT automatically attempts to re-establish communications. The error screen displays until the DAT regains communications with the processor. All key presses are ignored until the display clears.

### DAT Error Codes

Error Code	Description	Caused by	Recommended Action
00	Interface time-out	Communication traffic	Add SVC instructions to ladder program
01 to 02	Power-up test failure	Internal failure	Remove and re-insert the DAT. If failure persists, replace the unit.
03 to 07	internal error	Internal failure	Remove and re-insert the DAT. If failure persists, replace the unit.
08	processor owned <sup>(1)</sup>	Another device has ownership of the controller	Release ownership by the other device
09	access denied	Cannot access that file because another device has ownership	Release file ownership by the other device
31 to 34	internal error	Internal failure	Remove and re-insert the DAT. If failure persists, replace the unit.

(1) This error can occur after a download in which communications configurations are changed. This error can be cleared by removing and re-installing the DAT, or by cycling power to the controller.

## 5-10 Using Trim Pots and the Data Access Tool (DAT)

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## Chapter 6

### Using Real-Time Clock and Memory Modules

Five modules with different levels of functionality are available for use with the MicroLogix 1500 controller.

Catalog Number	Function	Memory Size
1764-RTC	Real-Time Clock	not applicable
1764-MM1	Memory Module	8K
1764-MM2	Memory Module	16K
1764-MM1RTC	Memory Module and Real-Time Clock	8K
1764-MM2RTC	Memory Module and Real-Time Clock	16K

#### Real-Time Clock Operation

#### Removal/Insertion Under Power

The real-time clock module can be installed or removed at any time without risk of damage to either the module or the controller. If a module is installed while the MicroLogix 1500 is in an executing mode (Run or Remote Run), the module is not recognized until either a power cycle occurs, or until the controller is placed in a non-executing mode (program mode or fault condition).

Removal of the memory module is detected within one program scan. Removal of the real-time clock under power causes the controller to write zeros to the (RTC) Function File.

#### Real-Time Clock Function File

The real-time clock provides year, month, day of month, day of week, hour, minute, and second information to the Real-Time Clock (RTC) Function File in the controller. Refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*, publication 1762-RM001B-US-P for information about the RTC function file.

#### Accuracy

The following table indicates the expected accuracy of the real-time clock at various temperatures.

Ambient Temperature	Accuracy <sup>(1)</sup>
0°C (+32°F)	+34 to -70 seconds/month
+25°C (+77°F)	+36 to -68 seconds/month
+40°C (+104°F)	+29 to -75 seconds/month
+55°C (+131°F)	-133 to -237 seconds/month

(1) These numbers are expected worst case values over a 31 day month.

Publication 1764-UM001A-US-P

## 6-2 Using Real-Time Clock and Memory Modules

## Writing Data to the Real-Time Clock

When valid data is sent to the real-time clock from the programming device, the new values take effect immediately.

The real-time clock does not allow you to write invalid date or time data.

## RTC Battery Operation

The real-time clock has an internal battery that is not replaceable. The RTC Function File features a battery low indicator bit (RTC:0/BL), which shows the status of the RTC battery. When the battery is low, the indicator bit is set (1). This means that the battery may fail within 14 days and the real-time clock module needs to be replaced. When the battery low indicator bit is clear (0), the battery level is acceptable or a real-time clock is not attached.

If the RTC battery is low and the controller is powered, the RTC operates normally. If the controller power is removed and the RTC battery is low, RTC data may be lost.

Use the *Disable Clock* button in your programming device to disable the real-time clock before storing a module. This decreases the drain on the battery during storage.

**Table 6.1 RTC Battery Life Expectancy**

Battery State	Temperature	Time Duration
Operating	0°C to +40°C (+32°F to +104°F)	5 years <sup>(1)</sup>
Storage	-40°C to +25°C (-40°F to +77°F)	5 years minimum
	+26°C to +60°C (+79°F to +140°F)	3 years minimum

(1) The operating life of the battery is based on 6 months of storage time before the real-time clock is used.

### ATTENTION



Operating with a low battery indication for more than 14 days may result in invalid RTC data if controller power is lost.

## Memory Module Operation

The memory module supports program back-up as well as the following features:

- User Program and Data Back-Up
- Program Compare
- Data File Download Protection
- Memory Module Write Protection
- Removal/Insertion Under Power

### User Program and Data Back-Up

The memory module provides a simple and flexible program/data transport mechanism, allowing the user to transfer the program and data to the controller without the use of a personal computer and programming software.

The memory module can store one user program at a time.

During transfers from a memory module, the controller's RUN LED flashes.

### Program Compare

The memory module can also provide application security, allowing you to specify that if the program stored in the memory module does not match the program in the controller, the controller will not enter an executing (run or remote run) mode. To enable this feature, set the S:2/9 bit in the system status file. Refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual* for more information.

### Data File Download Protection

The memory module allows the user to specify individual data files in the controller that are protected from the download procedure. This allows user data to be saved (not overwritten) during a download.

#### NOTE

Data file download protection is only functional if the processor does not have a fault and if all protected data files in the memory module exactly match the protected data file structure within the controller. Refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual* for information on protecting data files during download.

## Memory Module Write Protection

The memory module supports write-once, read-many behavior. Write protection is enabled using your programming software.

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<b>IMPORTANT</b>	Once set, write protection cannot be removed. A change cannot be made to the control program or data stored in a write-protected memory module. If a change is required, you must use a different memory module.
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## Removal/Insertion Under Power

The memory module can be installed or removed at any time without risk of damage to either the memory module or the controller. If a memory module is installed while the MicroLogix 1500 is executing, the memory module will not be recognized until either a power cycle occurs, or until the controller is placed in a non-executing mode (program mode or fault condition).

## Memory Module Information File

The controller has a Memory Module Information (MMI) File which provides status from the attached memory module. At power-up or on detection of a memory module being inserted, the catalog number, series, revision, and type (memory module and/or real-time clock) are identified and written to the MMI file. If a memory module and/or real-time clock is not attached, zeros are written to the MMI file. Refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*, publication 1762-RM001B-US-P, for more information.

# Appendix A

## Specifications

### Controller Specifications

Table A.1 General Specifications

Description	1764-24BWA	1764-24AWA	1764-28BxB
Number of I/O	12 inputs 12 outputs	12 inputs 12 outputs	16 inputs 12 outputs
Line Power	85 to 265V ac at 47 to 63 Hz	85 to 265V ac at 47 to 63 Hz	20.4 to 30V dc
Power Supply Usage	88 VA	70 VA	30VA
Power Supply Inrush	120V ac = 25A for 8 ms 240V ac = 40A for 4 ms	120V ac = 25A for 8 ms 240V ac = 40A for 4 ms	24V dc = 4A for 150 ms
User Power Output	24V dc at 400 mA, 400 $\mu$ F max.	none	none <sup>(1)</sup>
Input Circuit Type	24V dc, sink/source	120V ac	24V dc, sink/source
Output Circuit Type	relay	relay	6 relay, 6 FET transistor (24V-dc source)
Operating Temp.	+0°C to +55°C (+32°F to +131°F) ambient		
Storage Temp.	-40°C to +85°C (-40°F to +185°F) ambient <sup>(2)</sup>		
Operating Humidity	5% to 95% relative humidity (non-condensing)		
Vibration	Operating: 10 to 500 Hz, 5G, 0.030 in. max. peak-to-peak Relay Operation: 2G		
Shock (without Data Access Tool installed)	Operating: 30G panel mounted (15G DIN Rail mounted) Relay operation: 7.5G panel mounted (5G DIN Rail mounted) Non-Operating: 40G panel mounted (30G DIN Rail mounted)		
Shock (with Data Access Tool installed)	Operating: 20G panel mounted (15G DIN Rail mounted) Relay operation: 7.5G panel mounted (5G DIN Rail mounted) Non-Operating: 30G panel mounted (20G DIN Rail mounted)		
Agency Certification	<ul style="list-style-type: none"> <li>• UL 508</li> <li>• C-UL under CSA C22.2 no. 142</li> <li>• Class I, Div. 2, Groups A, B, C, D (UL 1604, C-UL under CSA C22.2 no. 213)</li> <li>• CE compliant for all applicable directives</li> </ul>		
Electrical/EMC	The module has passed testing at the following levels: <ul style="list-style-type: none"> <li>• IEC1000-4-2: 4 kV contact, 8 kV air, 4 kV indirect</li> <li>• IEC1000-4-3: 10 V/m</li> <li>• IEC1000-4-4: 2 kV, 5 kHz; communications cable: 1 kV, 5 kHz</li> <li>• IEC1000-4-5: communications cable 1 kv galvanic gun               <ul style="list-style-type: none"> <li>-I/O: 2 kV CM, 1 kV DM,</li> <li>-Power Supply (1764-24AWA/1764-24BWA): 4 kV CM, 2 kV DM</li> <li>-Power Supply (1764-28BxB): 0.5 kV CM, 0.5 kV DM</li> </ul> </li> <li>• IEC1000-4-6: 10V, communications cable 3V</li> </ul>		
Terminal Screw Torque	1.13 Nm (10 in-lb) rated; 1.3 Nm (12 in-lb) maximum		
Programming Software	For 1764-LSP Series A Processors: RSLogix 500, Version 3.01.09 or higher, RSLinx, Version 2.10.118 or higher For 1764-LSP and 1764-LRP Series B Processors: RSLogix 500; Version 4.00.00 or higher.		

(1) See Choosing a Power Supply on page A-2.

(2) Recommended storage temperature for maximum battery life (5 years typical with normal operating/storage conditions) of the 1764-RTC, 1764-MM1RTC, and 1764-MM2RTC is -40°C to +40°C (-40°F to +104°F). Battery life is significantly shorter at elevated temperatures.

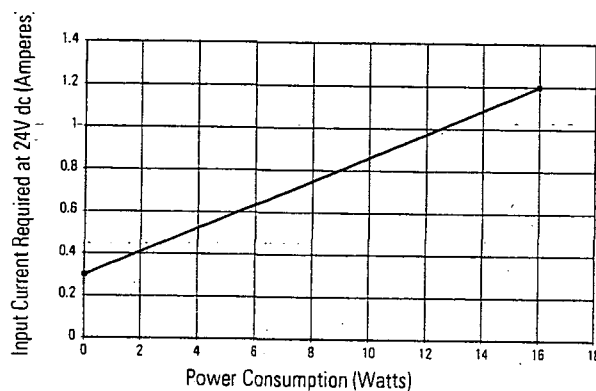
Publication 1764-UM001A-US-P

**A-2 Specifications**

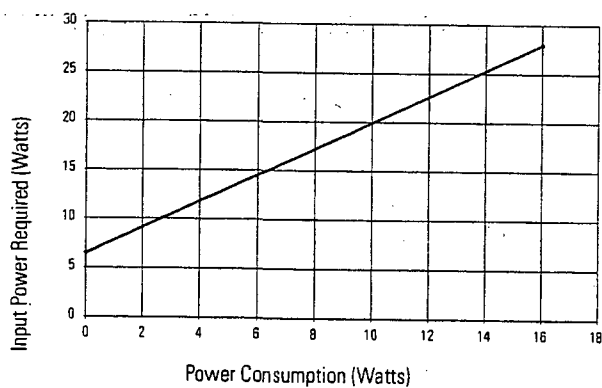
### Choosing a Power Supply

This section contains information for selecting a power supply for applications using a 1764-28BXB base unit. Use the tables in Appendix F to calculate the total power (Watts) consumed by the system. With that information, use the graphs below to choose a power supply. You can use either current or power, depending on how the power supply is rated.

**Figure 1.1 Input Current Required**



**Figure 1.2 Input Power Required**



**Table A.2 Input Specifications**

Description	1764-24AWA	1764-24BWA and 1764-28BxB	
		Inputs 0 thru 7	Inputs 8 and Higher
On-State Voltage Range	79 to 132V ac	14 to 30.0V dc at 30°C (86°F) 14 to 26.4V dc at 55°C (131°F)	10 to 30.0V dc at 30°C (86°F) 10 to 26.4V dc at 55°C (131°F)
Off-State Voltage Range	0 to 20V ac	0 to 5V dc	
Operating Frequency	47 Hz to 63 Hz	1 kHz to 20 kHz	1 kHz to 500 Hz <sup>(1)</sup>
On-State Current:			
• minimum	• 5.0 mA at 79V ac	• 2.5 mA at 14V dc	• 2.0 mA at 10V dc
• nominal	• 12.0 mA at 120V ac	• 7.3 mA at 24V dc	• 8.9 mA at 24V dc
• maximum	• 16.0 mA at 132V ac	• 12.0 mA at 30V dc	• 12.0 mA at 30V dc
Off-State Leakage Current	2.5 mA minimum	1.5 mA minimum	
Nominal Impedance	12k ohms at 50 Hz 10k ohms at 60 Hz	3.3k ohms	2.7k ohms
Inrush Current (max.)	250 mA at 120V ac	Not Applicable	Not Applicable

(1) Scan-time dependant.

**NOTE**

The 1764-24AWA input circuits (inputs 0-11) do not support adjustable filter settings. They have maximum turn-on and maximum turn-off times of 20 milliseconds.

**Table A.3 Response Times for High-Speed dc Inputs 0 Through 7 (applies to 1764-24BWA and 1764-28BxB)**

Maximum High-Speed Counter Frequency at 50% Duty Cycle (KHz)	Filter Setting (ms)	Minimum ON Delay (ms)	Maximum ON Delay (ms)	Minimum OFF Delay (ms)	Maximum OFF Delay (ms)
20.000	0.025	0.005	0.025	0.005	0.025
6.700	0.075	0.040	0.075	0.045	0.075
5.000	0.100	0.050	0.100	0.060	0.100
2.000	0.250	0.170	0.250	0.210	0.250
1.000	0.500	0.370	0.500	0.330	0.500
0.500	1.000	0.700	1.000	0.800	1.000
0.200	2.000	1.700	2.000	1.600	2.000
0.125	4.000	3.400	4.000	3.600	4.000
0.063	8.000 <sup>(1)</sup>	6.700	8.000	7.300	8.000
0.031	16.000	14.000	16.000	14.000	16.000

(1) This is the default setting.

## A-4 Specifications

**Table A.4 Response Times for Normal dc Inputs 8 Through 11 (1764-24BWA) and 8 Through 15 (1764-28BWB)**

Maximum Frequency at 50% Duty Cycle (kHz)	Filter Setting (ms)	Minimum ON Delay (ms)	Maximum ON Delay (ms)	Minimum OFF Delay (ms)	Maximum OFF Delay (ms)
1.000	0.500	0.090	0.500	0.020	0.500
0.500	1.000	0.500	1.000	0.400	1.000
0.250	2.000	1.100	2.000	1.300	2.000
0.125	4.000	2.800	4.000	2.700	4.000
0.063	8.000 <sup>(1)</sup>	5.800	8.000	5.300	8.000
0.031	16.000	11.000	16.000	10.000	16.000

(1) This is the default setting.

**Table A.5 Relay Contact Rating Table 1764-24AWA, -24BWA, -28BWB**

Maximum Volts	Amperes		Amperes Continuous	Voltamperes	
	Make	Break		Make	Break
240V ac	7.5A	0.75A	2.5A	1800VA	180VA <sup>(1)</sup>
120V ac	15A	1.5A			
125V dc	0.22A <sup>(2)</sup>		1.0A	28VA	
24V dc	1.2A <sup>(2)</sup>		2.0A	28VA	

(1) The total load controlled by the 1764-24AWA and 1764-24BWA is limited to 1440VA (break).

(2) For dc voltage applications, the make/break ampere rating for relay contacts can be determined by dividing 28 VA by the applied dc voltage. For example, 28 VA/48V dc = 0.58A. For dc voltage applications less than 14V, the make/break ratings for relay contacts cannot exceed 2A.

**Table A.6 Output Specifications - Maximum Continuous Current**

Specification	1764-24AWA, -24BWA	1764-28BWB
Current per Common	8A	8A
Current per Controller	at 150V Maximum	24A
	at 240V Maximum	20A
		18A

**Table A.7 1764-28BWB FET Output Specifications**

Specification		General Operation (Outputs 2 thru 7)	High Speed Operation <sup>(1)</sup> (Outputs 2 and 3 Only)
User Supply Voltage	minimum	20.4V dc	20.4V dc
	maximum	26.4V dc	26.4V dc
On-State Voltage Drop	at maximum load current	1V dc	Not Applicable
	at maximum surge current	2.5V dc	Not Applicable
Current Rating per Point	maximum load	1A at 55°C (131°F) 1.5A at 30°C (86°F)	100 mA
	minimum load	1.0 mA	10 mA
	maximum leakage	1.0 mA	1.0 mA

**Table A.7 1764-28BxB FET Output Specifications**

Specification		General Operation (Outputs 2 thru 7)	High Speed Operation <sup>(1)</sup> (Outputs 2 and 3 Only)
Surge Current per Point	peak current	4.0A	Not Applicable
	maximum surge duration	10 msec	Not Applicable
	maximum rate of repetition at 30°C (86°F)	once every second	Not Applicable
	maximum rate of repetition at 55°C (131°F)	once every 2 seconds	Not Applicable
Current per Common	maximum total	6A	Not Applicable
Turn-On Time	maximum	0.1 msec	6 µsec
Turn-Off Time	maximum	1.0 msec	18 µsec
Repeatability	maximum	n/a	2 µsec
Drift	maximum	n/a	1 µsec per 5°C (1 µsec per 9°F)

(1) Outputs 2 and 3 are designed to provide increased functionality over the other FET outputs (4 through 7). They may be used like the other FET transistor outputs, but in addition, within a limited current range, they may be operated at a higher speed. Outputs 2 and 3 also provide a pulse train output (PTO) or pulse width modulation output (PWM) function.

**Table A.8 Working Voltage (1764-24AWA)**

Specification	1764-24AWA
Power Supply Input to Backplane Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (IEC Class 2 reinforced insulation)
Input Group to Backplane Isolation and Input Group to Input Group Isolation	Verified by one of the following dielectric tests: 151V ac for 1 second or 2145V dc for 1 second 132V Working Voltage (IEC Class 2 reinforced insulation)
Output Group to Backplane Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (IEC Class 2 reinforced insulation)
Output Group to Output Group Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (basic insulation) 150V Working Voltage (IEC Class 2 reinforced insulation).

## A-6 Specifications

**Table A.9 Working Voltage (1764-24BWA)**

Specification	1764-24BWA
Power Supply Input to Backplane Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (IEC Class 2 reinforced insulation)
Power Supply User 24V Output to Backplane Isolation	Verified by one of the following dielectric tests: 600V ac for 1 second or 848V dc for 1 second 50V Working Voltage (IEC Class 2 reinforced insulation)
Input Group to Backplane Isolation and Input Group to Input Group Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 second or 1697V dc for 1 second 75V dc Working Voltage (IEC Class 2 reinforced insulation)
Output Group to Backplane Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (IEC Class 2 reinforced insulation)
Output Group to Output Group Isolation.	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (basic insulation) 150V Working Voltage (IEC Class 2 reinforced insulation)

**Table A.10 Working Voltage (1764-28BXB)**

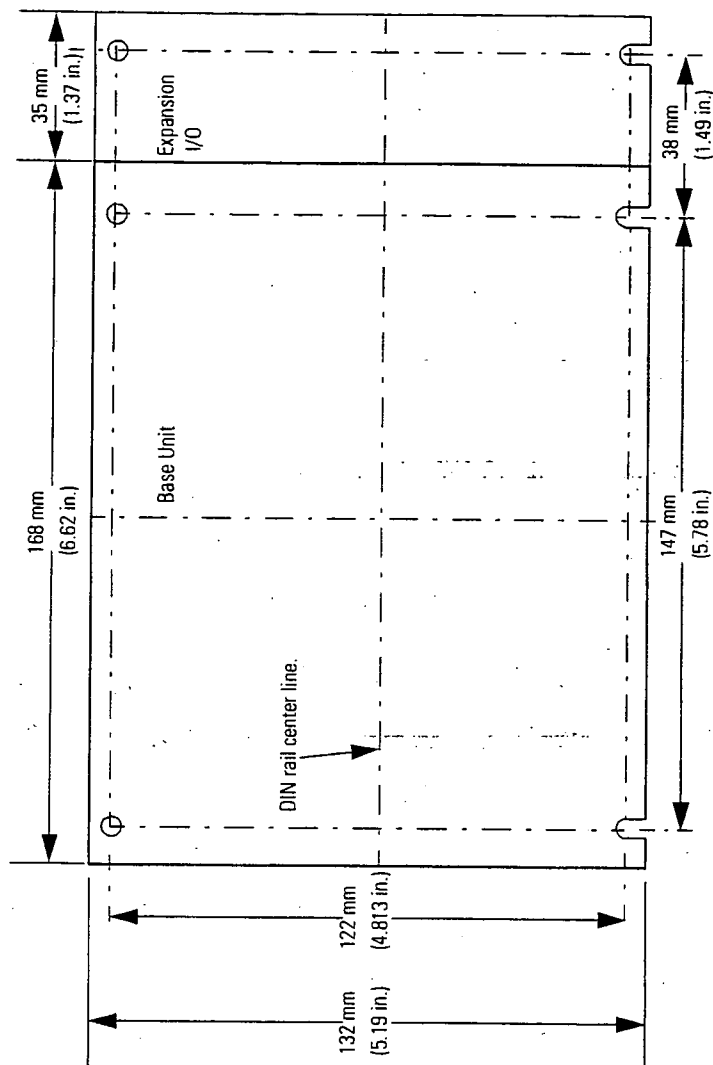
Specification	1764-28BXB
Input Group to Backplane Isolation and Input Group to Input Group Isolation	Verified by one of the following dielectric tests: 1200V ac for 1 second or 1697V dc for 1 second 75V dc Working Voltage (IEC Class 2 reinforced insulation)
FET Output Group to Backplane Isolation and FET Outputs Group to Group	Verified by one of the following dielectric tests: 1200V ac for 1 second or 1697V dc for 1 second 75V dc Working Voltage (IEC Class 2 reinforced insulation)
Relay Output Group to Backplane Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (IEC Class 2 reinforced insulation)
Relay Output Group to Relay and FET Output Group Isolation	Verified by one of the following dielectric tests: 1836V ac for 1 second or 2596V dc for 1 second 265V Working Voltage (basic insulation) 150V Working Voltage (IEC Class 2 reinforced insulation)

**Transistor Output Transient Pulses**

Refer to page 3-15 for "Transistor Output Transient Pulses".

**Controller Dimensions**

See page 2-11 for Base Unit Mounting Dimensions.

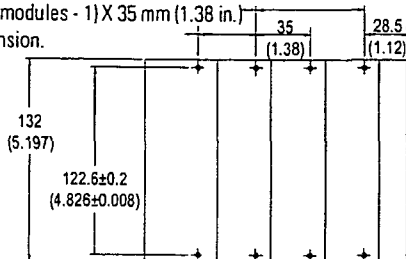


Publication 1764-UM001A-US-P

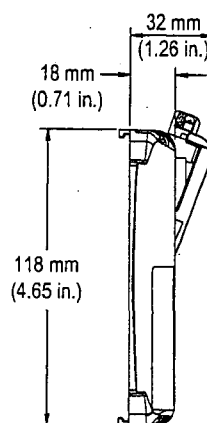
## A-8 Specifications

**Compact I/O Dimensions Panel Mounting**

For more than 2 modules: (number of modules - 1) X 35 mm (1.38 in.)  
Refer to host controller for this dimension.



NOTE: All dimensions are in mm (inches).  
Hole spacing tolerance:  $\pm 0.4$  mm (0.016 in.)

**End Cap**

This illustration shows the 1769-ECR right end cap. For the 1769-ECL left end cap, the drawing would be reversed.

Dimensions are in mm (inches).

**Appendix B****Replacement Parts**

This chapter contains the following information:

- a table of MicroLogix 1500 replacement parts
- procedure for replacing the lithium battery
- illustrations of the MicroLogix 1500 replacement doors and terminal blocks

**MicroLogix 1500  
Replacement Kits**

The table below provides a list of replacement parts and their catalog number.

<b>Description</b>	<b>Catalog Number</b>
Lithium Battery (See page B-2.)	1747-BA
ESD Barrier.	1764-RPL-TRM1
Base Terminal Doors (See page B-5.)	1764-RPL-TDR1
Processor Access Door (See page B-5.)	1764-RPL-CDR1
Door Combination Kit, includes ESD Barrier, Terminal Door, Access Door, Base Comms Door (See page B-5.), and Trim Pots/Mode Switch Cover Door (See page B-5.)	1764-RPL-DR
17-Point Terminal Block (for inputs on 1764-24AWA and -24BWA bases) (See page B-4.)	1764-RPL-TB1
21-Point Terminal Block (for inputs of 1764-28BXB and outputs for all base units)(See page B-4.)	1764-RPL-TB2

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**B-2** Replacement Parts**Lithium Battery  
(1747-BA)**

**IMPORTANT** When the processor's Battery Low indicator is lit, install a replacement battery immediately. After the indicator turns on, the battery lasts for at least:

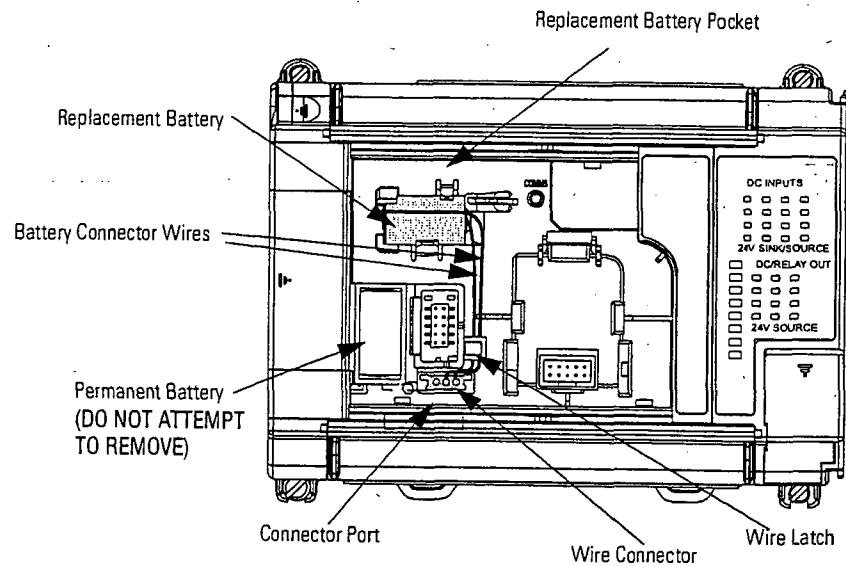
- 14 days for the 1764-LSP
- 7 days for the 1764-LRP

**Installing**

Follow the procedure below to ensure proper replacement battery installation.

**IMPORTANT** Do not remove the permanent battery when installing replacement battery.

1. Insert battery into replacement battery pocket with wires facing up.
2. Insert replacement battery wire connector into connector port.
3. Secure battery wires under wire latch (as shown below).



## Battery Handling

Follow the procedure below to ensure proper battery operation and reduce personnel hazards.

- Use only for the intended operation.
- Do not ship or dispose of cells except according to recommended procedures.
- Do not ship on passenger aircraft.

### ATTENTION



- Do not charge the batteries. An explosion could result or the cells could overheat causing burns.
- Do not open, puncture, crush, or otherwise mutilate the batteries. A possibility of an explosion exists and/or toxic, corrosive, and flammable liquids would be exposed.
- Do not incinerate or expose the batteries to high temperatures. Do not attempt to solder batteries. An explosion could result.
- Do not short positive and negative terminals together. Excessive heat can build up and cause severe burns.

### Storing

Store lithium batteries in a cool, dry environment, typically +20°C to +25°C (+68°F to 77°F) and 40% to 60% humidity. Store the batteries and a copy of the battery instruction sheet in the original container, away from flammable materials.

### Transporting

#### *One or Two Batteries*

Each battery contains 0.23 grams of lithium. Therefore, up to two batteries can be shipped together within the United States without restriction. Regulations governing shipment to or within other countries may differ.

#### *Three or More Batteries*

Procedures for the transportation of three or more batteries shipped together within the United States are specified by the Department of Transportation (DOT) in the Code of Federal Regulations, CFR49, "Transportation." An exemption to these regulations, DOT - E7052, covers the transport of certain hazardous materials classified as flammable solids. This exemption authorizes transport of lithium batteries by motor vehicle, rail freight, cargo vessel, and cargo-only aircraft, providing certain conditions are met. Transport by passenger aircraft is not permitted.

A special provision of DOT-E7052 (11th Rev., October 21, 1982, par. 8-a) provides that:

"Persons that receive cell and batteries covered by this exemption may reship them pursuant to the provisions of 49 CFR 173.22a in any of these packages authorized in this exemption including those in which they were received."

The Code of Federal Regulations, 49 CFR 173.22a, relates to the use of packaging authorized under exemptions. In part, it requires that you must maintain a copy of the exemption at each facility where the packaging is being used in connection with shipment under the exemption.

Shipment of depleted batteries for disposal may be subject to specific regulation of the countries involved or to regulations endorsed by those countries, such as the IATA Articles Regulations of the International Air Transport Association, Geneva, Switzerland.

### IMPORTANT

Regulations for transportation of lithium batteries are periodically revised.

**B-4 Replacement Parts****Disposing****ATTENTION**

Do not incinerate or dispose of lithium batteries in general trash collection. Explosion or violent rupture is possible. Batteries should be collected for disposal in a manner to prevent against short-circuiting, compacting, or destruction of case integrity and hermetic seal.

For disposal, batteries must be packaged and shipped in accordance with transportation regulations, to a proper disposal site. The U.S. Department of Transportation authorizes shipment of "Lithium batteries for disposal" by motor vehicle only in regulation 173.1015 of CFR 49 (effective January 5, 1983). For additional information contact:

U.S. Department of Transportation  
Research and Special Programs Administration  
400 Seventh Street, S.W.  
Washington, D.C. 20590

Although the Environmental Protection Agency at this time has no regulations specific to lithium batteries, the material contained may be considered toxic, reactive, or corrosive. The person disposing of the material is responsible for any hazard created in doing so. State and local regulations may exist regarding the disposal of these materials.

For a lithium battery product safety data sheet, contact the manufacturer:

Sanyo Energy Corporation  
2001 Sanyo Avenue  
San Diego, CA 92173  
(619) 661-4801

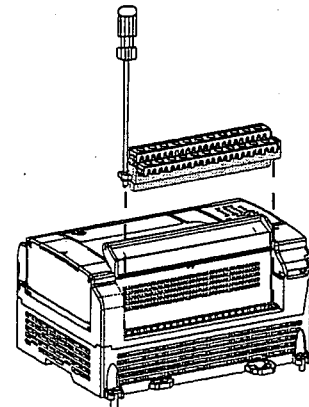
Tadiran Electronic Industries  
2 Seaview Blvd.  
Port Washington, NY 11050  
(516) 621-4980

**Replacement Terminal Blocks**

This figure illustrates how to replace the MicroLogix 1500 terminal blocks.

Catalog Numbers:

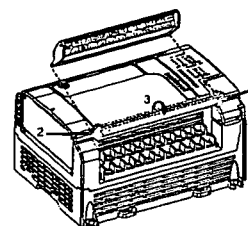
- 1764-RPL-TB1: 17-point terminal block
- 1764-RPL-TB2: 21-point terminal block



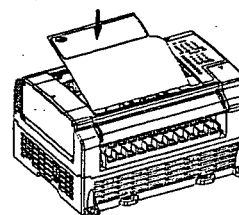
## Replacement Doors

The following figures illustrate the procedure for installing the MicroLogix 1500 replacement doors.

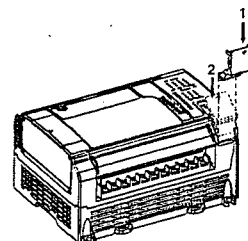
### Base Terminal Door (1764-RPL-TDR1)



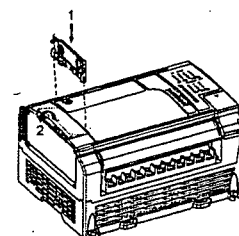
### Processor Access Door (1764-RPL-CDR1)



### Base Comms Door (included in 1764-RPL-DR)



### Trim Pots/Mode Switch Cover Door (included in 1764-RPL-DR)



**B-6** Replacement Parts

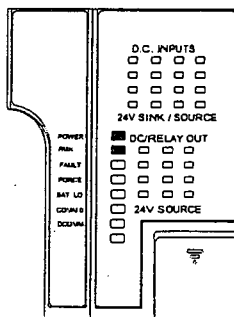
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## Troubleshooting Your System

This chapter describes how to troubleshoot your controller. Topics include:

- understanding the controller LED status
- controller error recovery model
- identifying controller faults
- calling Rockwell Automation for assistance

### Understanding Controller LEDs



The controller status LEDs provide a mechanism to determine the current status of the controller if a programming device is not present or available.

LED	Color	Indicates
POWER	off	no input power
	green	power on
RUN	off	controller is not in Run mode or REM Run
	green	controller is in Run mode or REM Run
	green	system is not in Run mode; memory module transfer is in progress
	flashing	
FAULT	off	no fault detected
	red flashing	faulted user program
	red	processor hardware fault or critical fault
FORCE	off	no forces installed
	amber	forces installed
BATTERY LOW	off	battery OK
	red	battery needs replacement (See page B-2.)
COMM 0	off	flashes when communications are active
	green	
COMM 1 (1764-LRP only)	off	flashes when communications are active
	green	
DCOMM <sup>(1)</sup>	off	user configured communications mode is active
	green	default communications mode active
INPUTS	off	input is not energized
	amber	input is energized (logic status)
OUTPUTS	off	output is not energized
	amber	output is energized (logic status)

(1) When using a 1764-LRP processor, the DCOMM LED applies only to Channel 0.

**C-2** Troubleshooting Your System**When Operating Normally**

The POWER and RUN LEDs are on. If a force condition is active, the FORCE LED turns on and remains on until all forces are removed.

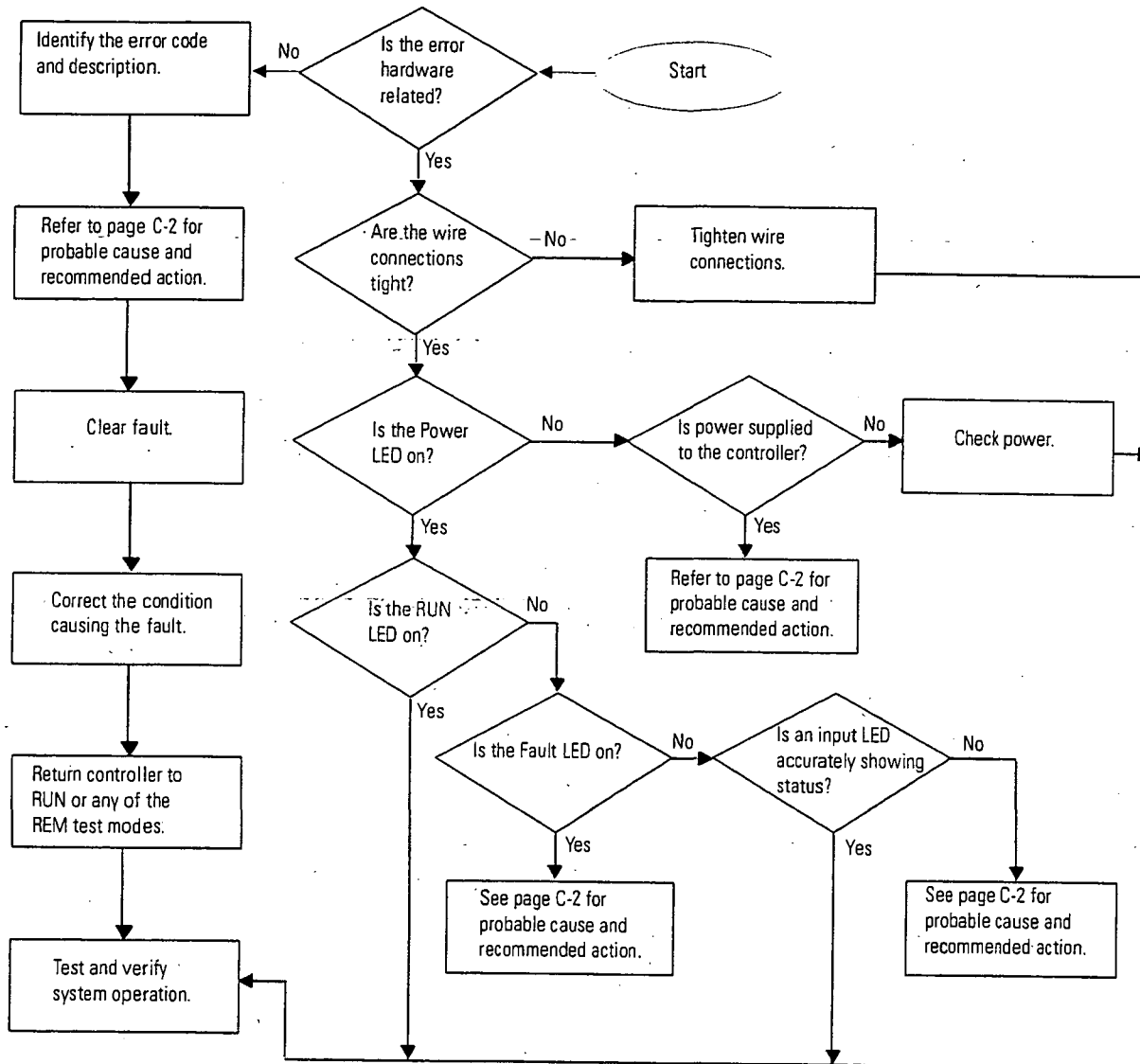
**When an Error Exists**

If an error exists within the controller, the controller LEDs operate as described in the following tables.

If the LEDs indicate:	The Following Error Exists	Probable Cause	Recommended Action
All LEDs off	No input power or power supply error	No Line Power	Verify proper line voltage and connections to the controller.
		Power Supply Overloaded	This problem can occur intermittently if power supply is overloaded when output loading and temperature varies.
Power and FAULT LEDs on solid	Hardware faulted	Processor Hardware Error	Cycle power. Contact your local Rockwell Automation representative if the error persists.
		Loose Wiring	Verify connections to the controller.
Power LED on and FAULT LED flashing	Application fault	Hardware/Software Major Fault Detected	<ol style="list-style-type: none"> <li>4. Monitor Status File Word S:6 for major error code. See page C-4 for more information.</li> <li>5. Remove hardware/software condition causing fault.</li> <li>6. Clear Major Error Halted flag, bit S2:1/13.</li> <li>7. Attempt a controller Run mode entry. If unsuccessful, repeat recommended action steps above or contact your local Rockwell Automation distributor.</li> </ol>

## Controller Error Recovery Model

Use the following error recovery model to help you diagnose software and hardware problems in the micro controller. The model provides common questions you might ask to help troubleshoot your system. Refer to the recommended pages within the model for further help.



## Identifying Controller Faults

While a program is executing, a fault may occur within the operating system or your program. When a fault occurs, you have various options to determine what the fault is and how to correct it. This section describes how to clear faults and provides a list of possible advisory messages with recommended corrective actions.

### Automatically Clearing Faults

You can automatically clear a fault by cycling power to the controller when the Fault Override at Power-up bit (S:1/8) is set in the status file.

You can also configure the controller to clear faults and go to RUN every time the controller is power cycled. This is a feature that OEMs can build into their equipment to allow end users to reset the controller. If the controller faults, it can be reset by simply cycling power to the machine. To accomplish this, set the following bits in the status file:

- S2:1/8 - Fault Override at Power-up
- S2:1/12 - Mode Behavior

If the fault condition still exists after cycling power, the controller re-enters the fault mode. For more information on status bits, refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual*.

#### NOTE

You can declare your own application-specific major fault by writing your own unique value to S:6 and then setting bit S:1/13 to prevent reusing system defined codes. The recommended values for user defined faults are FF00 to FF0F.

### Manually Clearing Faults Using the Fault Routine

The occurrence of recoverable or non-recoverable user faults can cause the user fault subroutine to be executed. If the fault is recoverable, the subroutine can be used to correct the problem and clear the fault bit S:1/13. The controller then continues in the Run or test mode.

The subroutine does not execute for non-user faults. Refer to the *MicroLogix 1200 and MicroLogix 1500 Instruction Set Reference Manual* for information on creating a user fault subroutine.

### Fault Messages

Refer to the *MicroLogix 1200 and 1500 Instruction Set Reference Manual* for the controller fault messages that can occur during operation of the MicroLogix 1500 programmable controllers. Each fault message includes the error code description, the probable cause, and the recommended corrective action.

## Calling Rockwell Automation for Assistance

If you need to contact Rockwell Automation or local distributor for assistance, it is helpful to obtain the following (prior to calling):

- controller type, series letter, and revision letter of the base unit
- series letter, revision letter, and firmware (FRN) number of the processor (on bottom side of processor unit)
- controller LED status
- controller error codes (found in S2:6 of status file).

**C-6** Troubleshooting Your System

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## Appendix **D**

### Upgrading Your Operating System

The operating system (OS) can be upgraded through the communication port on the controller. In order to download a new operating system, you must have the following:

- ControlFlash™ Upgrade Kit containing the new OS
- a Windows 95®, Windows 98® or Windows NT™ based computer to run the download software.

The ControlFlash™ Upgrade Kit includes:

- the operating system upgrade to be downloaded
- the ControlFlash programming tool, along with its support drivers and on-line help
- a readme first file explaining how to upgrade the operating system

### Preparing for Upgrade

Before upgrading the controller's operating system, you must:

- Obtain the operating system upgrade from <http://www.ab.com/micrologix> or from your local Rockwell Automation distributor

**IMPORTANT**

Installing a new operating system deletes the controller's user program.

- Install the ControlFlash Software. Double click the processor catalog number/firmware revision number to install the operating system upgrade.
- The controller must be configured for default communications (use communications toggle push button; DCOMM LED on) and be in the Program mode to allow the download of a new operating system.

**D-2 Upgrading Your Operating System**

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**Performing the Upgrade**

The following steps occur during the upgrade process.

1. Controller mode and communications parameters are checked.
2. Download begins.
3. During the download, the Force, Battery, and Comms LEDs perform a walking bit pattern.
4. When the download is complete, the integrity of the new OS is checked. If the new OS is corrupt, the controller sends an error message to the computer and flashes the Missing or Corrupt OS LED pattern. See "Missing/Corrupt OS LED Pattern" below.
5. Following a successful transfer, the Power, Force, and Battery LEDs flash on and remain on for five seconds. Then the controller resets.

**Missing/Corrupt OS LED Pattern**

When an operating system download is not successful or if the controller does not contain a valid operating system, the controller flashes the Run, Force, and Fault LEDs on and off.

## Appendix **E**

### Understanding Communication Protocols

Use the information in this appendix to understand the differences in communication protocols. The following protocols are supported from the RS-232 communication channel:

- DF1 Full-Duplex
- DF1 Half-Duplex Slave
- DH-485
- Modbus RTU Slave (1764-LSP and 1764-LRP Series B Processors only)
- ASCII (1764-LSP and 1764-LRP Series B Processors only)

See Communication Connections on page 4-1 for information about required network devices and accessories.

#### RS-232 Communication Interface

The communications port on the MicroLogix 1500 utilizes an RS-232 interface. RS-232 is an Electronics Industries Association (EIA) standard that specifies the electrical characteristics for serial binary communication. It provides you with a variety of system configuration possibilities. (RS-232 defines electrical characteristics; it is *not* a protocol.)

One of the biggest benefits of an RS-232 interface is that it lets you easily integrate telephone and radio modems into your control system.

#### DF1 Full-Duplex Protocol

DF1 Full-Duplex protocol is an open protocol developed by Allen-Bradley. It provides a point-to-point connection between two devices. DF1 Full-Duplex protocol combines data transparency (American National Standards Institute ANSI - X3.28-1976 specification subcategory D1) and 2-way simultaneous transmission with embedded responses (subcategory F1).

MicroLogix 1500 controllers support the DF1 Full-Duplex protocol via RS-232 connection to external devices such as computers, controllers, and other interface devices that support DF1 Full-Duplex.

DF1 is an open protocol. Refer to *DF1 Protocol and Command Set Reference Manual*, publication 1770-6.5.16, for more information.

Publication 1764-UM001A-US-P

## E-2 Understanding Communication Protocols

## DF1 Full-Duplex Operation

DF1 Full-Duplex protocol (also referred to as DF1 point-to-point protocol) is useful where RS-232 point-to-point communication is required. DF1 protocol controls message flow, detects and signals errors, and retries if errors are detected.

When a communication channel is configured for DF1 Full-Duplex, the following parameters can be changed:

**Table E.1 DF1 Full-Duplex Configuration Parameters**

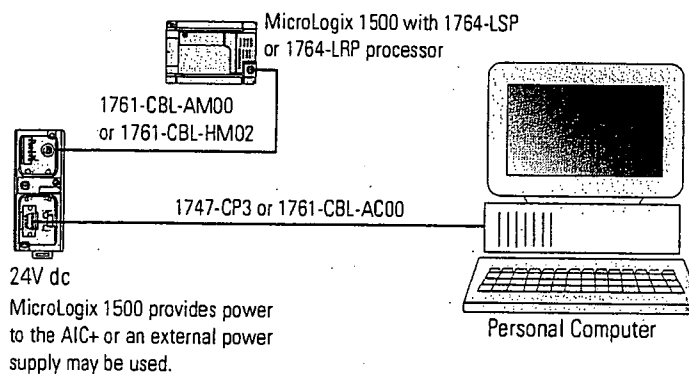
Parameter	Options	Default
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K	19.2K
Parity	none, even	none
Source ID (Node Address)	0 to 254 decimal	1
Control Line	no handshaking, Full-Duplex modem handshaking	no handshaking
Error Detection	CRC, BCC	CRC
Embedded Responses	auto-detect, enabled	auto detect
Duplicate Packet (Message) Detect	enabled, disabled	enabled
ACK Timeout	1 to 65535 counts (20 ms increments)	50 counts
NAK retries	0 to 255	3 retries
ENQ retries	0 to 255	3 retries
Stop Bits	not a setting, always 1	1

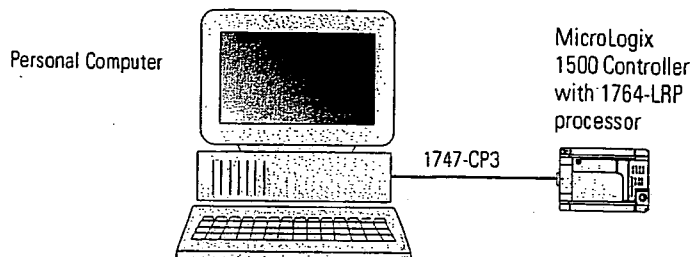
## Example DF1 Full-Duplex Connections

For information about required network connecting equipment, see Communication Connections on page 4-1.

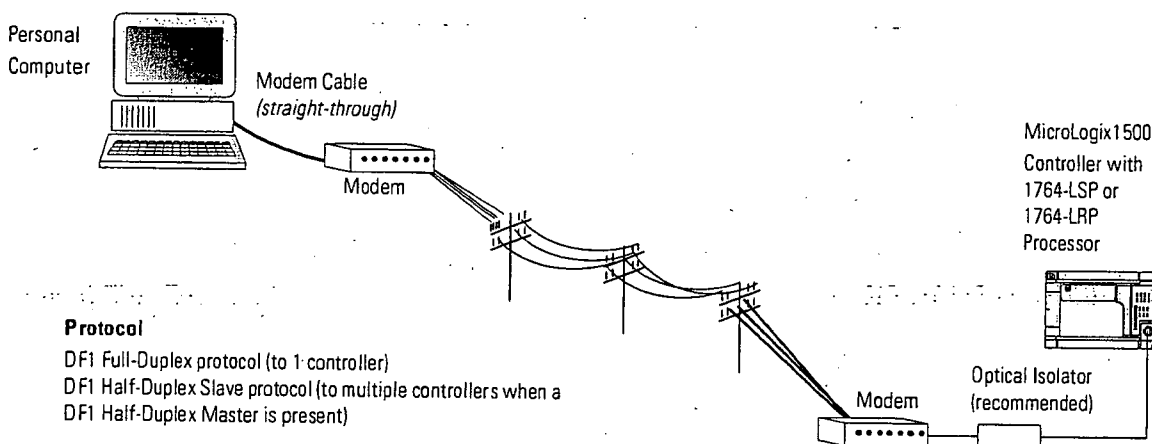
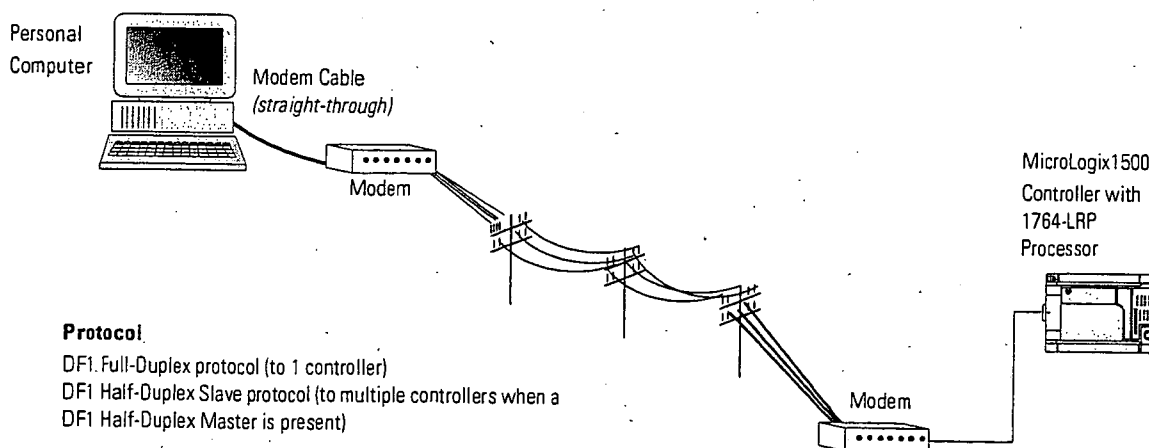
### Connecting to a PC to Channel 0

We recommend using an Advanced Interface Converter (AIC+), catalog number 1761-NET-AIC, as your optical isolator, as shown below. See page 4-10 for specific AIC+ cabling information.



*Connecting a PC to Channel 1**Connecting a Modem to Channel 0*

We recommend using an AIC+, catalog number 1761-NET-AIC, as your optical isolator.

*Connecting a Modem to Channel 1*

Publication 1764-UM001A-US-P

## DF1 Half-Duplex Protocol

DF1 Half-Duplex protocol is a multi-drop single master/multiple slave network. DF1 Half-Duplex protocol supports data transparency (American National Standards Institute ANSI - X3.28-1976 specification subcategory D1). In contrast to DF1 Full-Duplex, communication takes place in one direction at a time. With an active Half-Duplex Master, you can use the RS-232 port on the MicroLogix 1500 as a Half-Duplex programming port and a Half-Duplex peer-to-peer messaging port.

### DF1 Half-Duplex Operation

A DF1 Half-Duplex master device initiates all communication by "polling" each slave device. The slave device may only transmit when it is polled by the master. It is the master's responsibility to poll each slave on a regular and sequential basis to allow slave devices an opportunity to communicate.

An additional feature of the DF1 Half-Duplex protocol is that it is possible for a slave device to enable a MSG write or read to/from another slave. When the initiating slave is polled, the MSG is sent to the master. The master recognizes that the message is not intended for it, but for another slave, so the master immediately forwards the message to the intended slave. The master does this automatically; you do not need to program the master to move data between slave nodes. This slave-to-slave transfer can also be used by programming software to allow slave-to-slave upload and download of programs to processors (including the master) on the DF1 Half-Duplex link.

The MicroLogix 1500 can only act as a slave device. A device that can act as a master is required to "run" the network. Several Allen-Bradley products support DF1 Half-Duplex master protocol. They include the SLC 5/03™ and higher processors, enhanced PLC-5® processors, and Rockwell Software RSLinx (version 2.x and higher).

DF1 Half-Duplex supports up to 255 devices (address 0 to 254) with address 255 reserved for master broadcasts. The MicroLogix 1500 supports broadcast reception.

When a communication port is configured for DF1 Half-Duplex Slave, available parameters include:

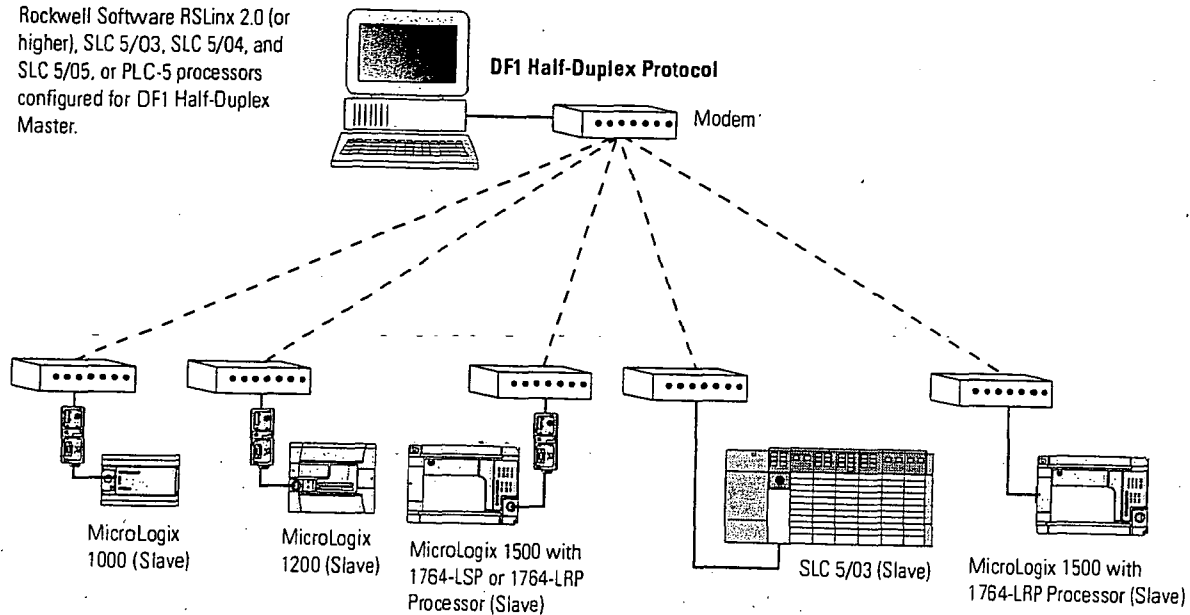
**Table E.2 DF1 Half-Duplex Configuration Parameters**

Parameter	Options
Baud Rate	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K
Parity	none, even
Source ID (Node Address)	0 to 254 decimal
Control Line	no handshaking, handshaking
Error Detection	CRC, BCC
EOT Suppression	enabled, disabled When EOT Suppression is enabled, the slave does not respond when polled if no message is queued. This saves modem transmission power and time when there is no message to transmit.
Duplicate Packet (Message) Detect	enabled, disabled Detects and eliminates duplicate responses to a message. Duplicate packets may be sent under noisy communication conditions if the sender's Message Retries are not set to 0.
Poll Timeout (x20 ms)	0 to 65535 (can be set in 20 ms increments) Poll Timeout only applies when a slave device initiates a MSG instruction. It is the amount of time that the slave device waits for a poll from the master device. If the slave device does not receive a poll within the Poll Timeout, a MSG instruction error is generated, and the ladder program needs to requeue the MSG instruction. If you are using a MSG instruction, it is recommended that a Poll Timeout value of zero not be used. Poll Timeout is disabled when set to zero.
RTS Off Delay (x20 ms)	0 to 65535 (can be set in 20 ms increments) Specifies the delay time between when the last serial character is sent to the modem and when RTS is deactivated. Gives the modem extra time to transmit the last character of a packet.
RTS Send Delay (x20 ms)	0 to 65535 (can be set in 20 ms increments) Specifies the time delay between setting RTS until checking for the CTS response. For use with modems that are not ready to respond with CTS immediately upon receipt of RTS.
Message Retries	0 to 255 Specifies the number of times a slave device attempts to resend a message packet when it does not receive an ACK from the master device. For use in noisy environments where message packets may become corrupted in transmission.
Pre Transmit Delay (x1 ms)	0 to 65535 (can be set in 1 ms increments) <ul style="list-style-type: none"> <li>When the Control Line is set to <i>no handshaking</i>, this is the delay time before transmission. Required for 1761-NET-AIC physical Half-Duplex networks. The 1761-NET-AIC needs delay time to change from transmit to receive mode.</li> <li>When the Control Line is set to <i>DF1 Half-Duplex Modem</i>, this is the minimum time delay between receiving the last character of a packet and the RTS assertion.</li> </ul>

## E-6 Understanding Communication Protocols

## DF1 Half-Duplex Example Network

Rockwell Software RSLinx 2.0 (or higher), SLC 5/03, SLC 5/04, and SLC 5/05, or PLC-5 processors configured for DF1 Half-Duplex Master.

**NOTE**

It is recommended that isolation (1761-NET-AIC) be used between channel 0 of the MicroLogix controller and the modem.

### Considerations When Communicating as a DF1 Slave on a Multi-drop Link

When communication is between either your programming software and a MicroLogix Programmable Controller or between two MicroLogix 1500 Programmable Controllers via slave-to-slave communication on a larger multi-drop link, the devices depend on a DF1 Half-Duplex Master to give each of them access in a timely manner. As the number of slave devices increase, the time between when slave devices are polled also increases. This increase in time may also be large if you are using low baud rates. As these time periods grow, you may need to increase the poll timeout and reply timeout values for slave devices.

**IMPORTANT**

If a program download is started when using DF1 Half-Duplex, but then is interrupted due to electromagnetic interference or other events, discontinue communications to the controller for the *ownership timeout* period and then restart the program download. The *ownership timeout* period is 60 seconds. After the timeout, you can re-establish communications with the processor and try the program download again. The only other way to remove program ownership is to cycle power on the processor.

## Using Modems with MicroLogix 1500 Programmable Controllers

The types of modems that you can use with MicroLogix 1500 controllers include dial-up phone modems, leased-line modems, radio modems and line drivers.

For point-to-point Full-Duplex modem connections that do not require any modem handshaking signals to operate, use DF1 Full-Duplex protocol with no handshaking. For point-to-point Full-Duplex modem connections that require RTS/CTS handshaking, use DF1 Full-Duplex protocol with handshaking.

For multi-drop modem connections, or for point-to-point modem connections that require RTS/CTS handshaking, use DF1 Half-Duplex slave protocol.

**IMPORTANT** Never attempt to use DH-485 protocol through modems under any circumstance.

**NOTE** All MicroLogix controllers support RTS/CTS modem handshaking when configured for DF1 Full-Duplex protocol with the control line parameter set to Full-Duplex Modem Handshaking or DF1 Half-Duplex slave protocol with the control line parameter set to "Half-Duplex Modem". No other modem handshaking lines (i.e. Data Set Ready, Carrier Detect and Data Terminal Ready) are supported by any MicroLogix 1500 controllers. MicroLogix 1500 1764-LRP processors also support DCD (Data Carrier Detect)

### Dial-Up Phone Modems

Some dial-up phone line modems support point-to-point Full-Duplex communications. A MicroLogix 1500 controller, on the receiving end of the dial-up connection, can be configured for DF1 Full-Duplex protocol with or without handshaking. The modem connected to the MicroLogix controller should support auto-answer. The MicroLogix 1500 Series B processors (1764-LSP and 1764-LRP) support ASCII out communications. Therefore, they can cause the modem to initiate or disconnect a phone call.

### Leased-Line Modems

Leased-line modems are used with dedicated phone lines that are typically leased from the local phone company. The dedicated lines may be in a point-to-point topology supporting Full-Duplex communications between two modems or in a multi-drop topology supporting Half-Duplex communications between three or more modems.

### Radio Modems

Radio modems may be implemented in a point-to-point topology supporting either Half-Duplex or Full-Duplex communications, or in a multi-drop topology supporting Half-Duplex communications between three or more modems.

## Line Drivers

Line drivers, also called short-haul "modems", do not actually modulate the serial data, but rather condition the electrical signals to operate reliably over long transmission distances (up to several miles). Line drivers are available in Full- and Half-Duplex models. Allen-Bradley's AIC+ Advanced Interface Converter is a Half-Duplex line driver that converts an RS-232 electrical signal into an RS-485 electrical signal, increasing the signal transmission distance from 50 to 4000 feet (8000 feet when bridged).

## DH-485 Communication Protocol

The information in this section describes DH-485 network functions, network architecture, and performance characteristics. It will also help you plan and operate the MicroLogix controllers on a DH-485 network.

### DH-485 Network Description

The DH-485 protocol defines the communication between multiple devices that coexist on a single pair of wires. DH-485 protocol uses RS-485 Half-Duplex as its physical interface. (RS-485 is a definition of electrical characteristics; it is *not* a protocol.) RS-485 uses devices that are capable of co-existing on a common data circuit, thus allowing data to be easily shared between devices.

The DH-485 network offers:

- interconnection of 32 devices
- multi-master (peer-to-peer) capability
- token passing access control
- the ability to add or remove nodes without disrupting the network
- maximum network segment of 1219 m (4000 ft)

The DH-485 protocol supports two classes of devices: initiators and responders. All initiators on the network get a chance to initiate message transfers. To determine which initiator has the right to transmit, a token passing algorithm is used.

The following section describes the protocol used to control message transfers on the DH-485 network.

## DH-485 Token Rotation

A node holding the token can send a message onto the network. Each node is allowed a fixed number of transmissions (based on the Token Hold Factor) each time it receives the token. After a node sends a message, it passes the token to the next device.

The allowable range of node addresses is 1 to 31. There must be at least one initiator on the network (such as a MicroLogix controller, or an SLC 5/02™ or higher processor).

## DH-485 Configuration Parameters

When MicroLogix communications are configured for DH-485, the following parameters can be changed:

**Table E.3 DF1 Full-Duplex Configuration Parameters**

Parameter	Options
Baud Rate	9600, 19.2K
Node Address	1 to 31 decimal
Token Hold Factor	1 to 4

See Software Considerations on page E-13 for tips on setting the parameters listed above.

## E-10 Understanding Communication Protocols

## Devices that Use the DH-485 Network

In addition to the MicroLogix 1500 controllers, the devices shown in the following table also support the DH-485 network.

**Table E.4 Allen-Bradley Devices that Support DH-485 Communication**

Catalog Number	Description	Installation	Function	Publication
Bulletin 1761 Controllers	MicroLogix 1000	Series C or higher	These controllers support DH-485 communications.	1761-6.3
Bulletin 1762	MicroLogix 1200	Series A or higher	These controllers support DH-485 communications.	1762-UM001A-US-P
Bulletin 1747 Processors	SLC 500 Processors	SLC Chassis	These processors support a variety of I/O requirements and functionality.	1747-6.2
1746-BAS	BASIC Module	SLC Chassis	Provides an interface for SLC 500 devices to foreign devices. Program in BASIC to interface the 3 channels (2 RS232 and 1 DH-485) to printers, modems, or the DH-485 network for data collection.	1746-6.1 1746-6.2 1746-6.3
1785-KA5	DH+™/DH-485 Gateway	(1771) PLC Chassis	Provides communication between stations on the PLC-5® (DH+) and SLC 500 (DH-485) networks. Enables communication and data transfer from PLC® to SLC 500 on DH-485 network. Also enables programming software programming or data acquisition across DH+ to DH-485.	1785-6.5.5 1785-1.21
2760-RB	Flexible Interface Module	(1771) PLC Chassis	Provides an interface for SLC 500 (using protocol cartridge 2760-SFC3) to other A-B PLCs and devices. Three configurable channels are available to interface with Bar Code, Vision, RF, Dataliner™, and PLC systems.	1747-KE 2760-ND001
1784-KTX, -KTXD	PC DH-485 IM	IBM XT/AT Computer Bus	Provides DH-485 using RSLinx.	1784-6.5.22
1784-PCMK	PCMCIA IM	PCMCIA slot in computer and Interchange	Provides DH-485 using RSLinx.	1784-6.5.19
1747-PT1	Hand-Held Terminal	NA	Provides hand-held programming, monitoring, configuring, and troubleshooting capabilities for SLC 500 processors.	1747-NP002
1747-DTAM, 2707-L8P1, -L8P2, -L40P1, -L40P2, -V40P1, -V40P2, -V40P2N, -M232P3, and -M485P3	DTAM, DTAM Plus, and DTAM Micro Operator Interfaces	Panel Mount	Provides electronic operator interface for SLC 500 processors.	1747-ND013 2707-800, 2707-803
2711-K5A2, -B5A2, -K5A5, -B5A5, -K5A1, -B5A1, -K9A2, -T9A2, -K9A5, -T9A5, -K9A1, and -T9A1	PanelView 550 and PanelView 900 Operator Terminals	Panel Mount	Provides electronic operator interface for SLC 500 processors.	2711-802, 2711-816

NA = Not Applicable

Publication 1764-UM001A-US-P

## Important DH-485 Network Planning Considerations

Carefully plan your network configuration before installing any hardware. Listed below are some of the factors that can affect system performance:

- amount of electrical noise, temperature, and humidity in the network environment
- number of devices on the network
- connection and grounding quality in installation
- amount of communication traffic on the network
- type of process being controlled
- network configuration

The major hardware and software issues you need to resolve before installing a network are discussed in the following sections.

### *Hardware Considerations*

You need to decide the length of the communication cable, where you route it, and how to protect it from the environment where it will be installed.

When the communication cable is installed, you need to know how many devices are to be connected during installation and how many devices will be added in the future. The following sections will help you understand and plan the network.

### *Number of Devices and Length of Communication Cable*

The maximum length of the communication cable is 1219m (4000 ft). This is the total cable distance from the first node to the last node in a segment. However, two segments can be used to extend the DH-485 network to 2438m (8000 ft). for additional information on connections using the AIC+, refer to the *Advanced Interface Converter (AIC+) User Manual*, publication 1761-6.4.

**E-12** Understanding Communication Protocols*Planning Cable Routes*

Follow these guidelines to help protect the communication cable from electrical interference:

- Keep the communication cable at least 1.52m (5 ft) from any electric motors, transformers, rectifiers, generators, arc welders, induction furnaces, or sources of microwave radiation.
- If you must run the cable across power feed lines, run the cable at right angles to the lines.
- If you do not run the cable through a contiguous metallic wireway or conduit, keep the communication cable at least 0.15m (6 in.) from ac power lines of less than 20A, 0.30m (1 ft) from lines greater than 20A, but only up to 100 kVA, and 0.60m (2 ft) from lines of 100 kVA or more.
- If you run the cable through a contiguous metallic wireway or conduit, keep the communication cable at least 0.08m (3 in.) from ac power lines of less than 20A, 0.15m (6 in.) from lines greater than 20A, but only up to 100 kVA, and 0.30m (1 ft) from lines of 100 kVA or more.

Running the communication cable through conduit provides extra protection from physical damage and electrical interference. If you route the cable through conduit, follow these additional recommendations:

- Use ferromagnetic conduit near critical sources of electrical interference. You can use aluminum conduit in non-critical areas.
- Use plastic connectors to couple between aluminum and ferromagnetic conduit. Make an electrical connection around the plastic connector (use pipe clamps and the heavy gauge wire or wire braid) to hold both sections at the same potential.
- Ground the entire length of conduit by attaching it to the building earth ground.
- Do not let the conduit touch the plug on the cable.
- Arrange the cables loosely within the conduit. The conduit should contain only serial communication cables.
- Install the conduit so that it meets all applicable codes and environmental specifications.

For more information on planning cable routes, see *Industrial Automation Wiring and Grounding Guidelines*, publication 1770-4.1.

### *Software Considerations*

Software considerations include the configuration of the network and the parameters that can be set to the specific requirements of the network. The following are major configuration factors that have a significant effect on network performance:

- number of nodes on the network
- addresses of those nodes
- baud rate

The following sections explain network considerations and describe ways to select parameters for optimum network performance (speed). See your programming software's user manual for more information.

### *Number of Nodes*

The number of nodes on the network directly affects the data transfer time between nodes. Unnecessary nodes (such as a second programming terminal that is not being used) slow the data transfer rate. The maximum number of nodes on the network is 32.

### *Setting Node Addresses*

The best network performance occurs when node addresses are assigned in sequential order. Initiators, such as personal computers, should be assigned the lowest numbered addresses to minimize the time required to initialize the network. The valid range for the MicroLogix 1500 controllers is 1-31 (controllers cannot be node 0). The default setting is 1. The node address is stored in the controller Communications Status file (CS0:5/0 to CS0:5/7).

### *Setting Controller Baud Rate*

The best network performance occurs at the highest baud rate, which is 19200. This is the default baud rate for a MicroLogix 1500 device on the DH-485 network. All devices must be at the same baud rate. This rate is stored in the controller Communications Status file (CS0:5/8 to CS0:5/15).

### *Setting Maximum Node Address*

Once you have an established network set up and are confident that you will not be adding more devices, you may enhance performance by adjusting the maximum node address of your controllers. It should be set to the highest node address being used.

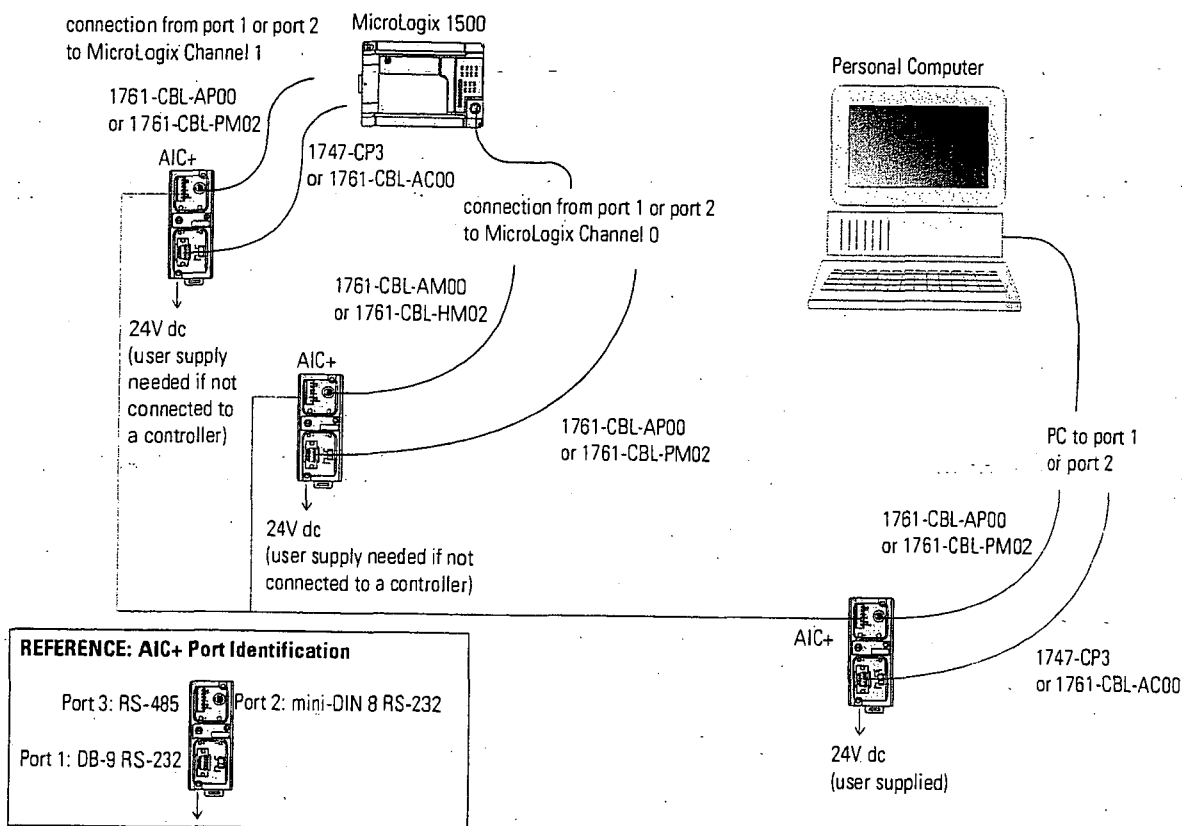
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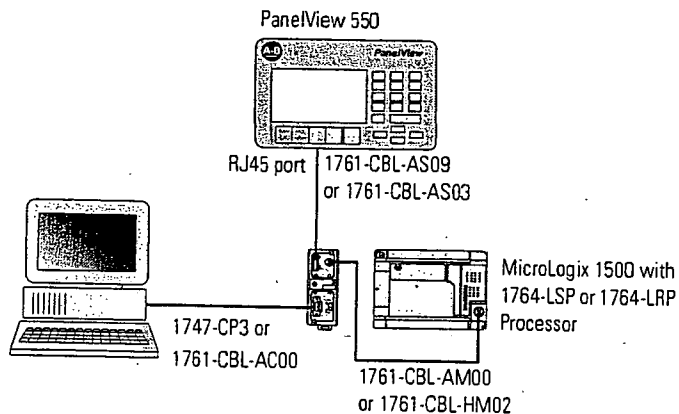
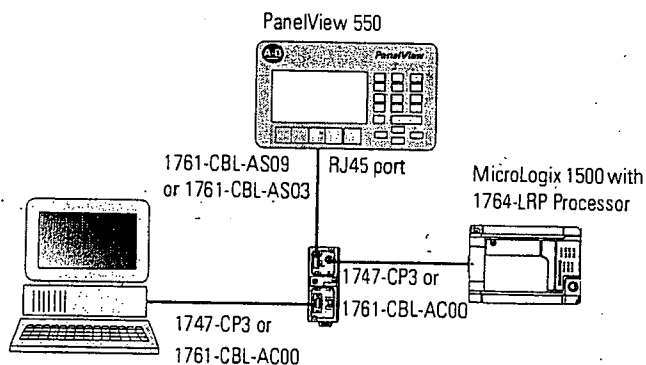
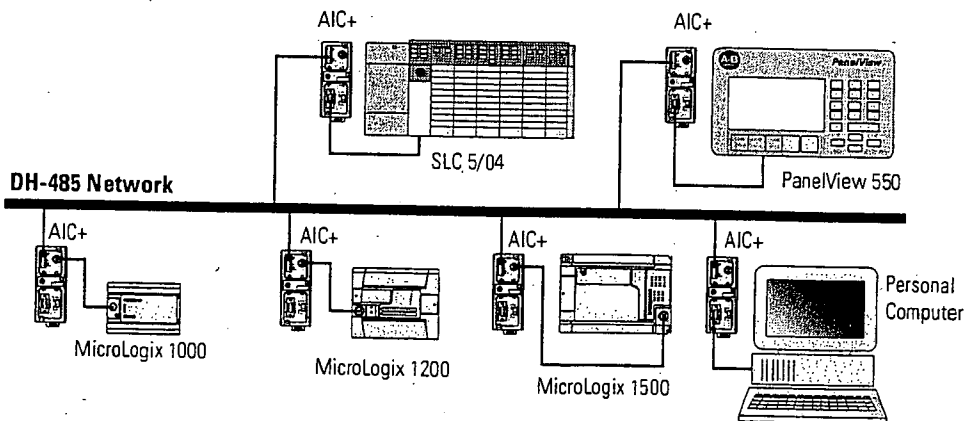
**IMPORTANT** All devices should be set to the same maximum node address.

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**E-14** Understanding Communication Protocols**Example DH-485 Connections**

The following network diagrams provide examples of how to connect MicroLogix 1500 controllers to the DH-485 network using the Advanced Interface Converter (AIC+, catalog number 1761-NET-AIC). For more information on the AIC+, see the *Advanced Interface Converter and DeviceNet Interface Installation Instructions*, Publication 1761-5.11.

*DH-485 Network with a MicroLogix 1500 Controller*

*Typical 3-Node Network (Channel 0 Connection)**Typical 3-Node Network (Channel 1 Connection)**Networked Operator Interface Device and MicroLogix Controllers*

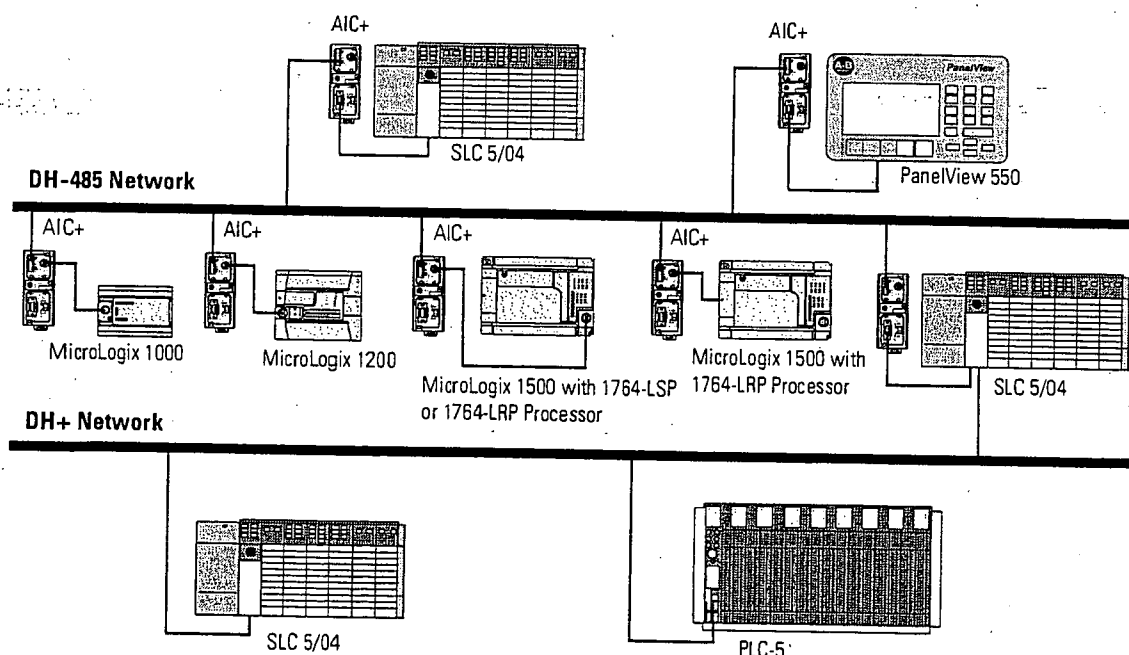
**E-16** Understanding Communication Protocols*MicroLogix Remote Packet Support*

MicroLogix 1500 controllers can respond and initiate with device's communications (or commands) that do not originate on the local DH-485 network. This is useful in installations where communication is needed between the DH-485 and DH+ networks.

The example below shows how to send messages from a PLC device or a PC on the DH+ network to a MicroLogix controller on the DH-485 network. This method uses an SLC 5/04 processor bridge connection.

When using this method (as shown in the following illustration):

- PLC-5 devices can send read and write commands to MicroLogix 1500 controllers.
- MicroLogix 1500 controllers can respond to MSG instructions received.
- The MicroLogix 1500 controllers can initiate MSG instructions to devices on the DH+ network.
- PC can send read and write commands to MicroLogix 1500 controllers.
- PC can do remote programming of MicroLogix 1500 controllers.



## Modbus RTU Slave Communication Protocol (MicroLogix 1764-LSP and 1764-LRP Series B processors only)

Modbus RTU Slave is a Half-Duplex, master-slave communications protocol. The Modbus network master initiates and controls all communications on the network. Modbus protocol allows a single master to communicate with a maximum of 255 slave devices.

When a MicroLogix 1200 or 1500 Communications port is configured for Modbus RTU Slave operation, the user must define where Modbus data (coils, contacts, and registers) is mapped into the MicroLogix data space.

The Modbus address space is comprised of seven distinct memory ranges. Four of these ranges can be mapped into MicroLogix data files. Three Modbus ranges are fixed to MicroLogix file 2, the Status file. The table below illustrates Modbus to MicroLogix mappings.

**Table E.5 Modbus to MicroLogix Memory Map**

Modbus Addressing	Description	Valid MicroLogix Addressing		
		File Type	Data File Number	Address
0001 to 4096	Read/Write Modbus Coil Data space	Bit (B) or Integer (N)	3 to 255	bits 0 to 4095
10001 to 14096	Read-Only Modbus Contact Data space	Bit (B) or Integer (N)	3 to 255	bits 0 to 4095
30001 to 30256	Read-Only Modbus Input Register space	Bit (B) or Integer (N)	3 to 255	words 0 to 255
30501 to 30532	Modbus Communication Parameters	Communication Status Files	2	words 0 to 31
31501 to 31566	Read-Only System Status File space	Status (S)	2	words 32 to 65
40001 to 40256	Read/Write Modbus Holding Register space	Bit (B) or Integer (N)	3 to 255	words 0 to 255
41501 to 41566	Read/Write System Status File space	Status (S)	2	words 0 to 65

For more information on the MicroLogix 1500 configuration parameters for Modbus Slave RTU (Remote Terminal Unit transmission mode) protocol, refer to the MicroLogix 1200 and 1500 Programmable Controllers Instruction Set Reference Manual, publication 1762-RM001A-US-P. For more information about the Modbus Slave protocol, see the Modbus Protocol Specifications (available from <http://www.modicon.com/techpubs/>).

**E-18** Understanding Communication Protocols

## ASCII Protocol (MicroLogix 1500 1764-LSP and 1764-LRP Series B Processors only)

ASCII protocol provides connection to other ASCII devices, such as bar code readers, weigh scales, serial printers, and other intelligent devices.

You can use ASCII protocol by configuring the RS-232 port, channel 0 for ASCII driver (*For the 1764-LRP only, you can select either Channel 0 or Channel 1*). Refer to the *MicroLogix 1200 and MicroLogix 1500 Programmable Controllers Instruction Set Reference Manual*, publication 1762-RM001B-US-P for detailed configuration information.

When the driver is set to ASCII, the following parameters can be changed:

**Table E.6 ASCII Channel Configuration Parameters**

Parameter	Description	Programming Software Default
Baud Rate	Toggles between the communication rate of 300, 600, 1200, 2400, 4800, 9600, 19.2K, and 38.4K.	1200
Parity	Toggles between None, Odd, and Even.	None
Termination 1	Specifies the first termination character. The termination character defines the one or two character sequence used to specify the end of an ASCII line received. Setting the first ASCII termination character to undefined (\ff) indicates no ASCII receiver line termination is used.	\d
Termination 2	Specifies the second termination character. The termination character defines the one or two character sequence used to specify the end of an ASCII line received. Setting the second ASCII Termination character to undefined (\ff) and the first ASCII Termination character to a defined value (\d) indicates a single character termination sequence.	\ff
Control Line	Toggles between No Handshaking, Half-Duplex Modem, and Full-Duplex Modem	No Handshaking
Delete Mode	The Delete Mode allows you to select the mode of the "delete" character. Toggles between Ignore, CRT, and Printer. Delete Mode affects the characters echoed back to the remote device. When Delete Mode is enabled, the previous character is removed from the receive buffer. <ul style="list-style-type: none"> <li>In CRT mode, when a delete character is encountered, the controller echos three characters to the device: backspace, space, and backspace. This erases the previous character on the terminal.</li> <li>In Printer Mode, when a delete character is encountered, the controller echos the slash character, then the deleted character.</li> </ul> Enable the Echo parameter to use Delete Mode.	Ignore
Echo	When Echo Mode is enabled, all of the characters received are echoed back to the remote device. This allows you to view characters on a terminal connected to the controller. Toggles between Enabled and Disabled.	Disabled
XON/XOFF	Allows you to Enable or Disable XON/ XOFF software handshaking. XON/XOFF software handshaking involves the XON and XOFF control characters in the ASCII character set. When the receiver receives the XOFF character, the transmitter stops transmitting until the receiver receives the XON character. If the receiver does not receive an XON character after 60 seconds, the transmitter automatically resumes sending characters. Also, when the receive buffer is more than 80% full, an XOFF character is sent to the remote device to pause the transmission. Then, when the receive buffer drops to less than 80% full, an XON character is sent to the remote device to resume the transmission.	Disabled
RTS Off Delay (x20 ms)	Allows you to select the delay between when a transmission is ended and when RTS is dropped. Specify the RTS Off Delay value in increments of 20 ms. Valid range is 0 to 65535.	0
RTS Send Delay (x20 ms)	Allows you to select the delay between when RTS is raised and the transmission is initiated. Specify the RTS Send Delay value in increments of 20 ms. Valid range is 0 to 65535.	0

**Appendix F**

## System Loading and Heat Dissipation

### System Loading Limitations

When you connect MicroLogix accessories and expansion I/O, an electrical load is placed on the base unit power supply. This section shows how to calculate the load and validate that the system will not exceed the capacity of the base unit power supply.

The following example is provided to illustrate system loading validation. The system validation procedure accounts for the amount of 5V dc and 24V dc current consumed by controller, expansion I/O, and user supplied equipment. Use the MicroLogix 1500 System Expansion Worksheet - Example on page F-2 to validate your specific configuration.

Current consumed by the Base Units, Memory Modules, Real Time Clock Modules, and the Right End Cap Terminator (for systems utilizing Compact I/O expansion) has already been factored into the calculations. A system is valid if the current and power requirements are satisfied.

**NOTE**

An End Cap Terminator (catalog number 1769-ECR or -ECL) is needed for any system using Compact expansion I/O.

## F-2 System Loading and Heat Dissipation

## MicroLogix 1500 System Expansion Worksheet - Example

The following *example* is provided to illustrate system expansion validation. The table below accounts for the amount of 5V dc and 24V dc current consumed by controller, expansion I/O, and user supplied equipment. The worksheet on the next page shows how to validate your specific configuration. Current consumed by the Base Units, Memory Modules, and Real Time Clock Modules has already been factored into the calculations below.

**NOTE**

For an electronic version of the worksheet, visit the MicroLogix web site. On the Internet, go to <http://www.ab.com/micrologix>. Enter MicroLogix 1500; go to Tools and Tips, Expansion I/O System Qualifier.

Catalog Number		Device Current Requirements		Current Consumed	
		at 5V dc (mA)	at 24V dc (mA)	at 5V dc (mA)	at 24V dc (mA)
1764-LSP		300	0	300	0
1764-LRP		380	0		
1764-DAT <sup>(1)</sup>		350	0	350	0
1761-NET-AIC <sup>(1)</sup>		0	120 <sup>(2)</sup>	0	120 <sup>(2)</sup>
2707-MVH232 or 2707-MVP232 <sup>(1)</sup>		0	80 <sup>(2)</sup>		0 <sup>(2)</sup>
Subtotal:				650	120
Catalog Number	n	A	B	n x A	n x B
	Number of Modules (8 maximum)	Module Current Requirements		Calculated Current	
		at 5V dc (mA)	at 24V dc (mA)	at 5V dc (mA)	at 24V dc (mA)
1769-IA16		115	0		
1769-IA8I		90	0		
1769-IM12		100	0		
1769-IQ16	1	115	0	115	0
1769-IQ6XOW4	1	105	50	105	50
1769-OA8		145	0		
1769-OB16	1	200	0	200	0
1769-OV16		200	0		
1769-OW8	2	125	100	250	200
1769-OW8I		125	100		
1769-IF4		120	150		
1769-OF2		120	200		
Total Modules:		5		Subtotal: 670	250

(1) These are optional accessories. Current is consumed only if the accessory is installed.

(2) Current for the 1761-NET-AIC may be supplied from the controller communications port, as seen in this example, or from an external 24V dc source. No current is consumed from the controller when an external source is used. The current for a 2707-MVH232 or 2707-MVP232 MicroView™ Operator Interface is supplied from the controller communication port, if directly connected.

**Validating System Loading - Examples***1764-24AWA and 1764-28BXB Base Units*

Loading Value	Total 5V dc Current Consumed	Total 24V dc Current Consumed	Total Watts
<b>Maximum Current</b>	<b>2250 mA</b>	<b>400 mA</b>	
Calculated Current	650 mA + 670 mA = 1320 mA	120 mA + 250 mA = 370 mA	
<b>Maximum Power</b>			<b>16W</b>
Calculated Power	1320 mA x 5V = 6.60W	+ 370 mA x 24V = 8.88W	= 15.48 W

*1764-24BWA Base Units*

Add any User 24V sensor current for applications with dc input sensors (1764-24BWA base units only).

<b>User 24V Sensor Current Subtotal</b> (sum of all sensors must be 400 mA or less)
150 mA (example sensor value)

Loading Value	Total 5V dc Current Consumed	Total 24V dc Current Consumed	User 24V dc Sensor Current Consumed	Total Watts
<b>Maximum Current</b>	<b>2250 mA</b>	<b>400 mA</b>	<b>400 mA</b>	
Calculated Current	650 mA + 670 mA = 1320 mA	120 mA + 250 mA = 370 mA	150 mA	
<b>Maximum Power</b>				<b>22W</b>
Calculated Power	1320 mA x 5V = 6.60W	+ 370 mA x 24V = 8.88W	+ 150 mA x 24V = 3.6W	= 19.08 W

## F-4 System Loading and Heat Dissipation

## MicroLogix 1500 System Expansion Worksheet

(Refer to the example on page F-2.)

Use the worksheet below to account for the amount of 5V dc and 24V dc current consumed by your controller, expansion I/O, and user supplied equipment. Current consumed by the Base Units, Memory Modules, and Real Time Clock Modules has already been factored into the calculations below. A system is valid if the current and power requirements are satisfied.

**NOTE**

For an electronic version of the worksheet, visit the MicroLogix web site. On the Internet, go to <http://www.ab.com/micrologix>. Enter MicroLogix 1500; go to Tools and Tips, Expansion I/O System Qualifier.

Catalog Number		Device Current Requirements		Current Consumed	
		at 5V dc (mA)	at 24V dc (mA)	at 5V dc (mA)	at 24V dc (mA)
1764-LSP		300	0		
1764-LRP		380	0		
1764-DAT <sup>(1)</sup>		350	0		
1761-NET-AIC <sup>(1)</sup>		0	120 <sup>(2)</sup>		
2707-MVH232 or 2707-MVP232 <sup>(1)</sup>		0	80 <sup>(2)</sup>		
Subtotal:					
Catalog Number	n Number of Modules (8 maximum)	Module Current Requirements		Calculated Current	
		at 5V dc (mA)		at 24V dc (mA)	
		A	B	n x A	n x B
1769-IA16		115	0		
1769-IA8I		90	0		
1769-IM12		100	0		
1769-IQ16		115	0		
1769-IQ6XOW4		105	50		
1769-OA8		145	0		
1769-OB16		200	0		
1769-OV16		200	0		
1769-OW8		125	100		
1769-OW8I		125	100		
1769-IF4		120	150		
1769-OF2		120	200		
Total Modules:		Subtotal:			

(1) These are optional accessories. Current is consumed only if the accessory is installed.

(2) Current for the 1761-NET-AIC may be supplied from the controller communications port, as seen in this example, or from an external 24V dc source. No current is consumed from the controller when an external source is used. The current for a 2707-MVH232 or 2707-MVP232 MicroView™ Operator Interface is supplied from the controller communication port, if directly connected.

## Validating System Loading

### 1764-24AWA and 1764-28BXB Base Units

Loading Value	Total 5V dc Current Consumed	Total 24V dc Current Consumed	Total Watts
Maximum Current	2250 mA	400 mA	
Calculated Current			
Maximum Power			16W
Calculated Power		+	=

### 1764-24BWA Base Units

Add any User 24V sensor current for applications with dc input sensors (1764-24BWA base units only).

<b>User 24V Sensor Current Subtotal</b> (sum of all sensors must be 400 mA or less)

Loading Value	Total 5V dc Current Consumed	Total 24V dc Current Consumed	User 24V dc Sensor Current Consumed	Total Watts
Maximum Current	2250 mA	400 mA	400 mA	
Calculated Current				
Maximum Power				22W
Calculated Power		+	+	=

## F-6 System Loading and Heat Dissipation

## Considerations for System Expansion using Power Supplies and Cables

The following worksheet is provided to assist in system expansion validation using 1769-PA2 and -PB2 Power Supplies with 1769-CRR1, -CRR3, -CRL1, and -CRL3 Bus Communication Expansion Cables. Expansion power supplies must be used with the expansion cables. Only one power supply may be used on an I/O bank. Using an expansion power supply on the same I/O bank as your MicroLogix 1500 controller or two expansion power supplies on the same bank may damage a power supply and may result in unexpected operation. Use the worksheet below to account for the amount of 5V dc and 24V dc current consumed by your expansion I/O and user supplied equipment.

**NOTE**

For an electronic version of the worksheet, visit the MicroLogix web site. On the Internet, go to <http://www.ab.com/micrologix>. Enter MicroLogix 1500; go to Tools and Tips, Expansion I/O System Qualifier.

Catalog Number	Number of Modules	Module Current Requirements		Calculated Current = (Number of Modules) x (Module Current Requirements)	
		at 5V dc (in mA)	at 24V dc (in mA)	at 5V dc (in mA)	at 24V dc (in mA)
1769-IA16		115	0		
1769-IA8I		90	0		
1769-IM12		100	0		
1769-IQ16		115	0		
1769-IQ6XOW4		105	50		
1769-OA8		145	0		
1769-OB16		200	0		
1769-OV16		200	0		
1769-OW8		125	100		
1769-OW8I		125	100		
1769-IF4		120	150		
1769-OF2		120	200		
<b>Total Modules<sup>(1)</sup>:</b>		<b>Subtotal:</b>			

(1) The total number of I/O modules cannot exceed 8, including those connected directly to the controller (Bank 0), and those connected via the cable (Bank 1).

## Validating System Loading for 1769-PA2 and 1769-PB2 Power Supplies

### Power Supply Current Capacity

Specification	1769-PA2	1769-PB2
Expansion Bus Output Current Capacity at 0° to +55°C (+32°F to +131°F)	2A at 5V dc and 0.8A at 24Vdc <sup>(1)</sup>	2A at 5V dc and 0.8A at 24V dc <sup>(1)</sup>
24V dc User Output Capacity (0° to +55°C)	250 mA (maximum)	not applicable

(1) Refer to the Current Graphs below.

### System Using a 1769-PA2

To validate your system, the total 5V dc current and 24V dc current consumed must be considered. The I/O modules must be distributed, such that the current consumed from the left *or* right side of the power supply never exceeds 2A at 5V dc and 1.0A at 24V dc. Use the current graphs below to determine if the power supply loading in your system is within the allowable range.

Figure 6.1 1769-PA2 Current with +24V dc User Load = 0A

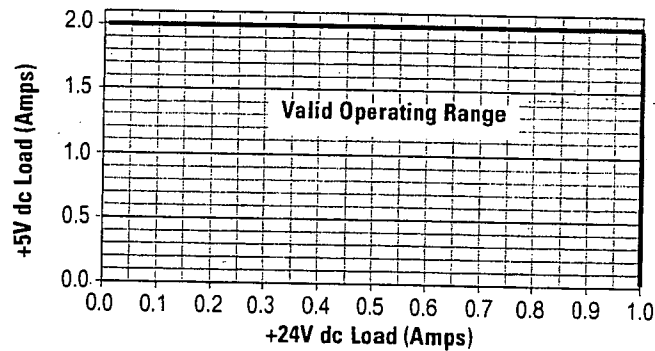
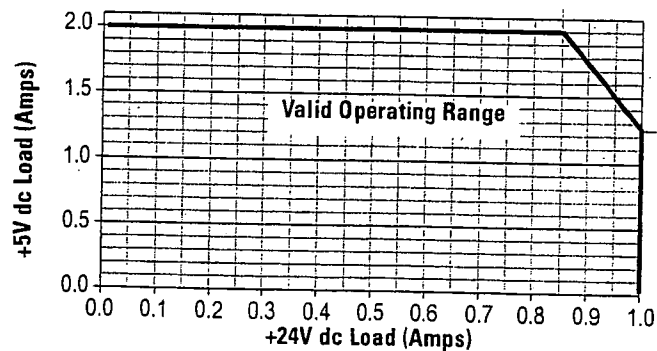
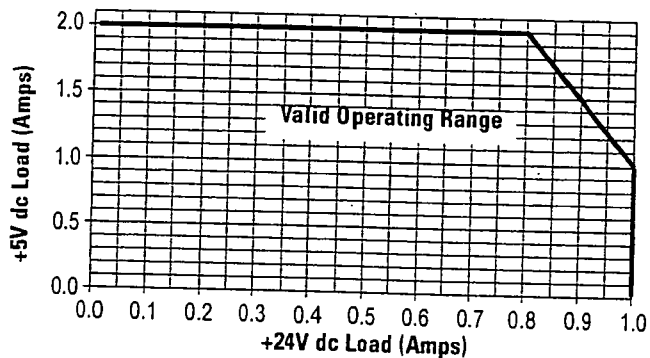


Figure 6.2 1769-PA2 Current with +24V dc User Load = 0.2A



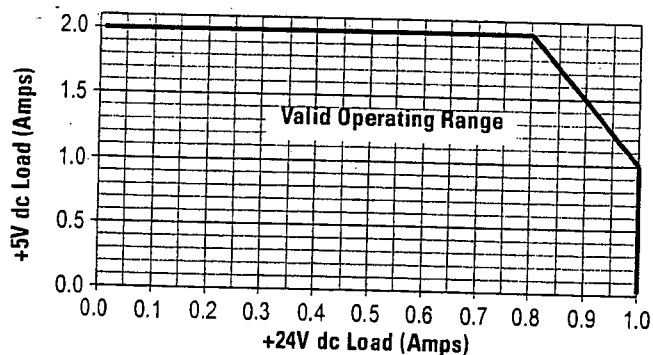
## F-8 System Loading and Heat Dissipation

Figure 6.3 1769-PA2 Current with +24V dc User Load = 0.25A

*System Using a 1769-PB2*

To validate your system, the total 5V dc current and 24V dc current consumed must be considered. The I/O modules must be distributed, such that the current consumed from the left *or* right side of the power supply never exceeds 2A at 5V dc and 1.0A at 24V dc. Use the current graph below to determine if the power supply loading in your system is within the allowable range.

Figure 6.4 1769-PB2 Current



## Calculating Heat Dissipation

Use this procedure when you need to determine the heat dissipation for installation in an enclosure. Use the following table.

Catalog Number	Heat Dissipation		
	Equation or Constant	Calculation	Subtotal
1764-24AWA	$18W + (0.3 \times \text{System Loading})$	$18W + (0.3 \times \text{ } W)$	
1764-24BWA	$20W + (0.3 \times \text{System Loading})$	$20W + (0.3 \times \text{ } W)$	
1764-28BXB	$20W + (0.3 \times \text{System Loading})$	$20W + (0.3 \times \text{ } W)$	
1764-LSP	1.5W		
1764-LRP	1.9W		
1764-DAT	1.75W		
1764-MM1, -RTC, -MM1/RTC	0		
1769-IA16	3.30W x number of modules	3.30W x	
1769-IA8I	1.81W x number of modules	1.81W x	
1769-IM12	3.65W x number of modules	3.65W x	
1769-IQ16	3.55W x number of modules	3.55W x	
1769-IQ6XOW4	2.75W x number of modules	2.75W x	
1769-OA8	2.12W x number of modules	2.12W x	
1769-OB16	2.11W x number of modules	2.11W x	
1769-OV16	2.06W x number of modules	2.06W x	
1769-OW8	2.83W x number of modules	2.83W x	
1769-OW8I	2.83W x number of modules	2.83W x	
1769-IF4	3.99W x number of modules	3.99W x	
1769-OF2	4.77W x number of modules	4.77W x	
Add Subtotals to determine Heat Dissipation			

**F-10** System Loading and Heat Dissipation

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## Glossary

The following terms are used throughout this manual. Refer to the *Allen-Bradley Industrial Automation Glossary*, Publication Number AG-7.1, for a complete guide to Allen-Bradley technical terms.

### address

A character string that uniquely identifies a memory location. For example, I:1/0 is the memory address for data located in Input file word 1, bit 0.

### AIC+ Advanced Interface Converter

A device that provides RS-232 isolation to an RS-485 Half-Duplex communication link. (Catalog Number 1761-NET-AIC.)

### application

1) A machine or process monitored and controlled by a controller. 2) The use of computer- or processor-based routines for specific purposes.

### baud rate

The speed of communication between devices. Baud rate is typically displayed in *K baud*. For example, 19.2K baud = 19,200 bits per second.

### bit

The smallest unit of memory used in discrete or binary logic, where the value 1 represents ON and 0 represents OFF.

### block diagrams

A method used to illustrate logic components or a sequence of events.

### Boolean operators

Logical operators such as AND, OR, NAND, NOR, NOT, and Exclusive-OR that can be used singularly or in combination to form logic statements or circuits. Can have an output response of T or F.

### branch

A parallel logic path within a rung of a ladder program. Its primary use is to build OR logic.

### communication scan

A part of the controller's operating cycle. Communication with devices (such as other controllers and operator interface devices) takes place during this period.

### control program

User logic (the application) that defines the controller's operation.

### controller

A device, such as a programmable controller, used to control output devices.

### controller overhead

A portion of the operating cycle used for housekeeping purposes (memory checks, tests, communications, etc.).

**counter**

A device that counts the occurrence of an event.

**CPU (Central Processing Unit)**

The decision-making and data storage section of a programmable controller.

**data table**

The part of processor memory that contains I/O status and files where user data (such as bit, integer, timers, and counters) is monitored, manipulated, and changed for control purposes.

**DIN rail**

Manufactured according to Deutsche Industrie Normenausschuss (DIN) standards, a metal railing designed to ease installation and mounting of your devices.

**download**

The transfer of program or data files to a device.

**DCD**

Data Carrier Detect. A signal generated by a modem that represents traffic (activity) on a communications network.

**DTE**

Data Terminal Equipment

**EMI**

Electromagnetic interference.

**embedded I/O**

Embedded I/O is the controller's on-board I/O. For MicroLogix controllers, embedded I/O is all I/O residing at slot 0.

**expansion I/O**

Expansion I/O is I/O that is connected to the controller via a bus or cable. MicroLogix 1200 controllers use Bulletin 1762 expansion I/O. MicroLogix 1500 controllers use Bulletin 1769 expansion I/O. For MicroLogix controllers, expansion I/O is all I/O residing at slot 1 and higher.

**encoder**

A device that detects position, and transmits a signal representing that position.

**executing mode**

Any run, remote run, or test mode.

**false**

The status of an instruction that does not provide a continuous logical path on a ladder rung.

**FIFO (First-In-First-Out)**

The order that data is stored and retrieved from a file.

**file**

A collection of data or logic organized into groups.

**full-duplex**

A mode of communication where data may be transmitted and received simultaneously (contrast with half-duplex).

**half-duplex**

A mode of communication where data transmission is limited to one direction at a time.

**hard disk**

A storage device in a personal computer.

**high byte**

Bits 8 to 15 of a word.

**housekeeping**

The portion of the scan when the controller performs internal checks and services communications.

**input device**

A device, such as a push button or a switch, that supplies an electrical signal to the controller.

**input scan**

The controller reads all input devices connected to the input terminals.

**inrush current**

The temporary surge of current produced when a device or circuit is initially energized.

**instruction**

A mnemonic defining an operation to be performed by the processor. A rung in a program consists of a set of input and output instructions. The input instructions are evaluated by the controller as being true or false. In turn, the controller sets the output instructions to true or false.

**instruction set**

The set of instructions available within a controller.

**I/O**

Input and Output

**jump**

Changes the normal sequence of program execution. In ladder programs a JUMP (JMP) instruction causes execution to jump to a specific rung in the user program.

**ladder logic**

A graphical programming format resembling a ladder-like diagram. The ladder logic programming language is the most common programmable controller language.

**least significant bit (LSB)**

The element (or bit) in a binary word that carries the smallest value of weight.

**LED (Light Emitting Diode)**

Used as status indicator for processor functions and inputs and outputs.

**LIFO (Last-In-First-Out)**

The order that data is stored and retrieved from a file.

**low byte**

Bits 0 to 7 of a word.

**logic**

A general term for digital circuits or programmed instructions to perform required decision making and computational functions.

**Master Control Relay (MCR)**

A hard-wired relay that can be de-energized by any series-connected emergency stop switch.

**mnemonic**

A simple and easy to remember term that is used to represent a complex or lengthy set of information.

**Modbus™ RTU Slave**

A serial communication protocol.

**modem**

Modulator/demodulator. Equipment that connects data terminal equipment to a communication line.

**modes**

Selected methods of operation. Example: run, test, or program.

**negative logic**

The use of binary logic in such a way that "0" represents the desired voltage level.

**network**

A series of stations (nodes) connected by some type of communication medium. A network may be made up of a single link or multiple links.

**nominal input current**

The typical amount of current seen at nominal input voltage.

**normally closed**

Contacts on a relay or switch that are closed when the relay is de-energized or deactivated. They are open when the relay is energized or the switch is activated.

**normally open**

Contacts on a relay or switch that are open when the relay is de-energized or the switch is deactivated. They are closed when the relay is energized or the switch is activated.

**off-delay time**

The OFF delay time is a measure of the time required for the controller logic to recognize that a signal has been removed from the input terminal of the controller. The time is determined by circuit component delays and by any applied filter.

**offline**

When a device is not scanning/controlling or when a programming device is not communicating with the controller.

**offset**

A continuous deviation of a controlled variable from a fixed point.

**off-state leakage current**

When a mechanical switch is opened (off-state), no current flows through the switch. Semiconductor switches and transient suppression components which are sometimes used to protect switches, have a small current flow when they are in the off state. This current is referred to as the off-state leakage current. To ensure reliable operation, the off-state leakage current rating must be less than the minimum operating current rating of the device that is connected.

**on-delay time**

The ON delay time is a measure of the time required for the controller logic to recognize that a signal has been presented at the input terminal of the controller.

**one shot**

A programming technique that sets a bit ON or OFF for one program scan.

**online**

When a device is scanning/controlling or when a programming device is communicating with the controller.

**operating voltage**

For inputs, the voltage range needed for the input to be in the On state. For outputs, the allowable range of user-supplied voltage.

**output device**

A device, such as a pilot light or a motor starter coil, that receives a signal or command from the controller.

**output scan**

The controller turns on, off, or modifies the devices connected to the output terminals.

**PCCC**

Programmable Controller Communications Commands

**processor**

A Central Processing Unit. (See CPU.)

**processor files**

The set of program and data files resident in the controller.

**program file**

Areas within a processor that contain the logic programs. MicroLogix controllers support multiple program files.

**program mode**

When the controller is not scanning the control program.

**program scan**

A part of the controller's operating cycle. During the program scan, the logic program is processed and the Output Image is updated.

**programming device**

Programming package used to develop ladder logic diagrams.

**protocol**

The rules of data exchange via communications.

**read**

To acquire data. For example, the processor reads information from other devices via a read message.

**relay**

An electrically operated device that mechanically switches electrical circuits.

**relay logic**

A representation of binary or discrete logic.

**restore**

To transfer a program from a device to a controller.

**reserved bit**

A location reserved for internal use.

**retentive data**

Information (data) that is preserved through power cycles.

**RS-232**

An EIA standard that specifies electrical, mechanical, and functional characteristics for serial binary communication circuits.

**run mode**

An executing mode during which the controller scans or executes the logic program.

**rung**

A rung contains input and output instructions. During Run mode, the inputs on a rung are evaluated to be true or false. If a path of true logic exists, the outputs are made true (energized). If all paths are false, the outputs are made false (de-energized).

**RTU**

Remote Terminal Unit

**save**

To save a program to a computer hard disk.

**scan**

The scan is made up of four elements: input scan, program scan, output scan, and housekeeping.

**scan time**

The time required for the controller to complete one scan.

**sinking**

A term used to describe current flow between two devices. A sinking device provides a direct path to ground.

**sourcing**

A term used to describe current flow between two devices. A sourcing device or circuit provides a power.

**status**

The condition of a circuit or system.

**terminal**

A point on an I/O module that external devices, such as a push button or pilot light, are wired to.

**throughput**

The time between when an input turns on and a corresponding output turns on or off. Throughput consists of input delays, program scan, output delays, and overhead.

**true**

The status of an instruction that provides a continuous logical path on a ladder rung.

**upload**

Data is transferred from the controller to a programming or storage device.

**watchdog timer**

A timer that monitors a cyclical process and is cleared at the conclusion of each cycle. If the watchdog runs past its programmed time period, it causes a fault.

**write**

To send data to another device. For example, the processor writes data to another device with a message write instruction.

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**Asia Pacific Headquarters**, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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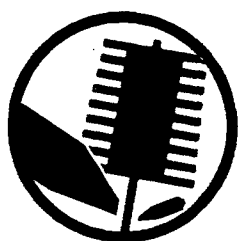
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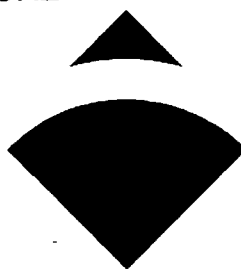
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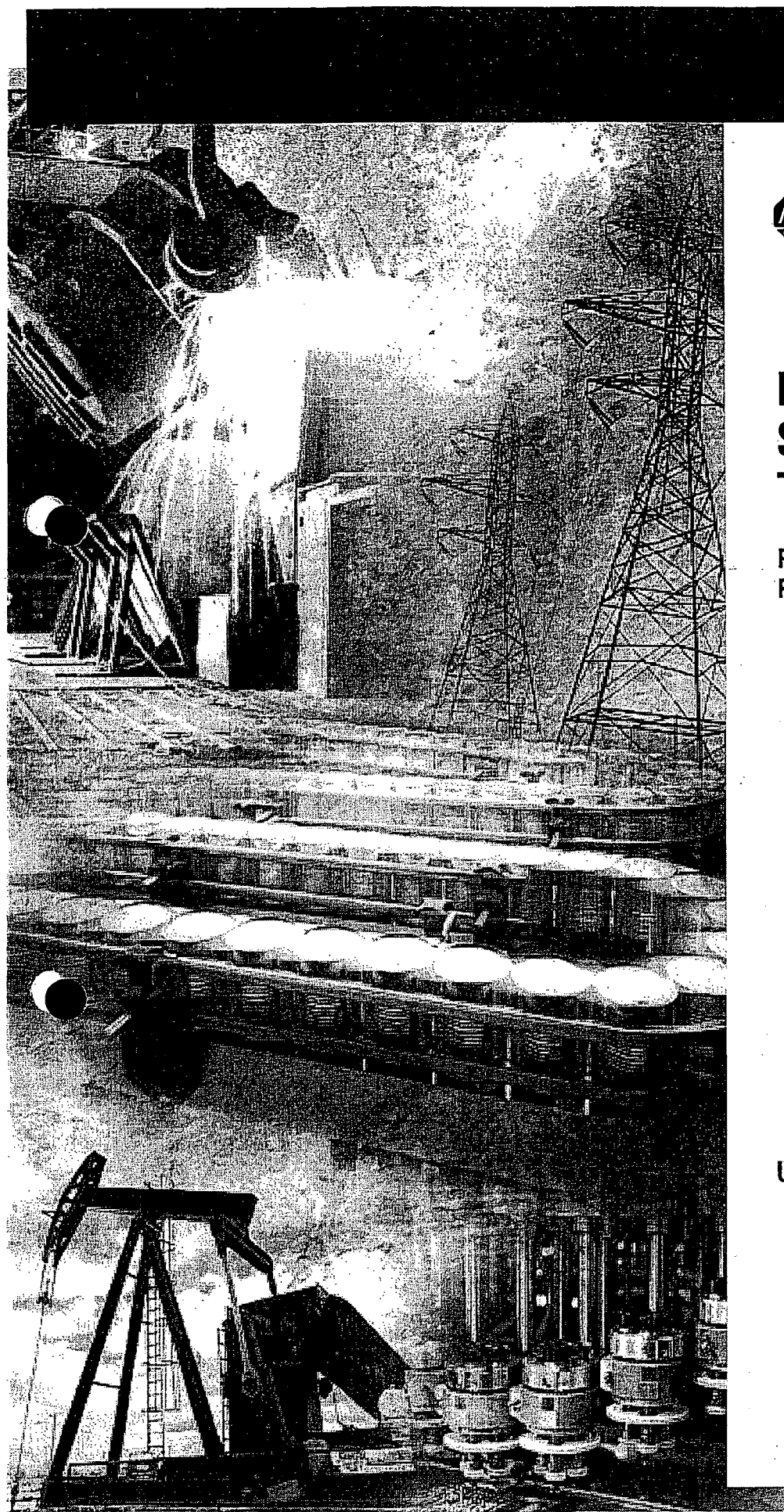
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## **PART 3**

### **Section 27**

### **Electrical**

# **Allen Bradley Panel View Standard Operator Terminals User Manual**



**Allen-Bradley**

## **PanelView Standard Operator Terminals**

**PV300 Micro, PV300, PV550,  
PV600, PV900, PV1000, PV1400**

**User Manual**

**Rockwell  
Automation**

## 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.

---

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## Preface

### Objectives

Read this preface to familiarize yourself with the rest of this manual.

- contents of this manual
- intended audience
- conventions used
- terminology
- installing PanelView terminals
- European Union Directive Compliance
- related publications
- technical support

### Contents of Manual

The following table gives an overview of this manual.

Chapter	Title	Purpose
1	Terminal Overview	Describes features of the PanelView terminals.
2	Applying Power and Resetting Terminal	Describes how to apply power and reset the PanelView terminals.
3	Configuring the Terminal	Shows how to configure the terminal using the Configuration Mode menu.
4	Using a Memory Card	Tells how to copy applications to and from a memory card.
5	Running Applications	Describes objects common to most applications.
6	Installing the PV300 Micro Terminal	Describes enclosure or panel mounting of the PanelView 300 Micro terminal.
7	Installing the PV300 Terminal	Describes enclosure or panel mounting of the PanelView 300 terminal.
8	Installing the PV550 Terminal	Describes enclosure or panel mounting of the PanelView 550 terminal.
9	Installing the PV600 Terminal	Describes enclosure or panel mounting of the PanelView 600 terminal.
10	Installing the PV900/1000 terminals	Describes enclosure or panel mounting of the PanelView 900/1000 terminal.
11	Installing the PV1400 Terminal	Describes enclosure or panel mounting of the PanelView 1400 terminal.
12	Terminal Connections	Describes connections for the Remote I/O, DH-485, DH+, RS-232, DF1, ControlNet, DeviceNet and EtherNet/IP versions of the PanelView terminals. Also shows how to connect a computer or printer to terminals with an RS-232 serial port.
13	Troubleshooting and Maintenance	Provides assistance in identifying and correcting common operating problems. Also gives procedures for routine maintenance.

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## Intended Audience

No special knowledge is required to understand this manual or operate the PanelView terminals. Before running an application, you must know the functions of all screens and screen objects. This information is available from the application designer.

Equipment installers must be familiar with standard panel installation techniques.

## Conventions

The manual uses these conventions:

- for specific PanelView terminals, "PanelView" is replaced with the "PV" abbreviation. For example: PV1000 refers to the PanelView 1000 terminal.
- PanelView terminal refers to any one of the PanelView terminals.

## Terminology

This manual contains some terms that may be unfamiliar. Use the glossary of this manual for assistance.

## Installing PanelView Terminals

Each terminal is shipped with installation instructions and a panel cutout. Please follow these instructions when installing your PanelView terminal in a panel or enclosure.

## European Union Directive Compliance

Refer to Appendix C for details on installing the PanelView terminals in industrial environments requiring compliance with European Union Directives.

## Related Publications

Refer to the extensive online help for the PanelBuilder32 Software or the following publications if necessary.

Publication	Description
2711-GR003B-EN-P	PanelBuilder32 Software Getting Results Manual
2711-QS003B-EN-P	PanelBuilder32 Quick Start Manual
2711-TD006A-EN-P	WinPFT File Transfer Utility
2711-6.3	PROFIBUS DP Communications for PanelView Terminals
2711-6.9	Modbus Communications for PanelView Terminals
1770-4.1	Programmable Controller Wiring and Grounding Guidelines
1770-6.2.2	Data Highway/Data Highway Plus/Data Highway-485 Cable Installation Manual

For information relating to your controller, refer to the appropriate manual.

## Technical Support

If you have questions about the PanelView terminals or the PanelBuilder32 software, please refer to the online manuals or online help provided with the PanelBuilder32 installation CD. These publications are also available from the Automation Bookstore or Manuals Online at the [www.ab.com](http://www.ab.com) website.

If you can't find the answer, contact Rockwell Automation Technical support:

Rockwell Automation  
Technical Support  
6680 Beta Drive  
Mayfield Village, Ohio 44143

Or call 1-440-646-7800, 1-440-646-5800 or fax 1-440-646-5801 for technical support between 8 AM and 8 PM Eastern Time, Monday through Friday.

### Frequently Asked Questions

Documents on frequently asked questions are available at:

- [www.ab.com](http://www.ab.com), select Support and then Knowledge Base.

### Software and Firmware Upgrades

To receive software updates (software serial number required) and firmware upgrades for your PanelView terminal:

- locate on PanelBuilder32 installation CD.
- call Rockwell Software at 1-440-646-7700 or fax 1-440-646-7701
- access [www.software.rockwell.com](http://www.software.rockwell.com)

## What's New

Ethernet communications is now supported on the following PanelView terminals.

- PanelView 550
- PanelView 600
- PanelView 900 (not supported on the monochrome versions)
- PanelView 1000
- PanelView 1400

All of these terminals are available with an EtherNet/IP connector and RS-232 port for file transfers and/or printing.

# Chapter 1

## Terminal Overview

### Chapter Objectives

This chapter gives an overview of the PanelView Operator Terminals.

- intended uses
- terminal types and features
- applications
- configuration mode
- terminal messages
- printing
- accessories and replacement parts

### Intended Uses

You can use the PanelView operator terminals for a wide variety of machine control and monitoring applications.

#### ATTENTION



Do not use a PanelView terminal for emergency stops or other controls critical to the safety of personnel or equipment. Use separate hardwired operator interface devices that do not depend on solid state electronics. See the inside front cover of this manual for guidelines.

### Terminal Types

PanelView terminals are available in a variety of options.

- display size and type (monochrome, grayscale, color)
- operator input (touch screen or keypad)
- communication port (DH-485, RS-232, Remote I/O, DH+, ControlNet, DeviceNet, Ethernet, DF1)
- RS-232 printer port support

In addition, some terminals are available with:

- AC or DC power (L1 at the end of a catalog number indicates a DC terminal, for example, 2711-B5A1L1, or -T9C1L1).
- Stainless steel bezel available on PanelView 550 keypad or keypad & touch terminals.

Contact your Allen-Bradley representative for availability.

Publication 271.1-UM014B-EN-P

## 1-2 Terminal Overview

## Color and Grayscale Terminals

Color terminals support a fixed palette of 16 standard EGA colors. Electroluminescent (grayscale) terminals support a fixed palette of 4 colors (shades of yellow). All color in an application is defined when the application is created. Colors are not selectable at the terminal.

## PanelView 300 Monochrome Terminals

The PanelView 300 terminal is only available with 24V dc input power.

Operator Input	Communication Port				Printer Port RS-232	Catalog Number
	DH-485	RS-232 (DH-485)	DeviceNet	RS-232 (DF1)		
Keypad	x					2711-K3A2L1
		x				2711-K3A5L1
			x		x	2711-K3A10L1
				x		2711-K3A17L1

## PanelView 300 Micro Monochrome Terminals

The PanelView 300 Micro is available only with 24V dc input power and does not have a printer port. The PV300 Micro contains a single RS-232 communication port which supports either DF1 or DH485 communication protocols as specified in the table below.

Operator Input	Communication Port		Catalog Number
	DH-485	DF1	
Keypad	x		2711-M3A19L1
		x	2711-M3A18L1

## PanelView 550 Monochrome Terminals

The Touch Screen version of the PanelView 550 terminal is available only with 24V dc power. The L1 in the catalog number indicates DC power.

Operator Input	Communication Port								Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen and Keypad	x								x	2711-B5A1
		x								2711-B5A2
		x							x	2711-B5A3
			x							2711-B5A5
				x					x	2711-B5A8
			x						x	2711-B5A9
					x				x	2711-B5A10
						x			x	2711-B5A15
							x		x	2711-B5A16
								x	x	2711-B5A20
Keypad	x								x	2711-K5A1
		x								2711-K5A2
		x							x	2711-K5A3
			x							2711-K5A5
				x					x	2711-K5A8
			x						x	2711-K5A9
					x				x	2711-K5A10
						x			x	2711-K5A15
							x		x	2711-K5A16
								x	x	2711-K5A20
Touch Screen (24V dc only)	x								x	2711-T5A1L1
		x								2711-T5A2L1
		x							x	2711-T5A3L1
			x							2711-T5A5L1
				x					x	2711-T5A8L1
			x						x	2711-T5A9L1
					x				x	2711-T5A10L1
						x			x	2711-T5A15L1
							x		x	2711-T5A16L1
								x	x	2711-T5A20L1

<sup>1</sup> Add L1 to the end of the catalog number for 24V dc power.

Add I2 to the end of a catalog number for stainless steel. Not available for the touch screen terminals.

Add L3 to the end of a catalog number for 24V dc power and stainless steel. Stainless steel is not available for the touch screen terminals.

## 1-4 Terminal Overview

## PanelView 600 Color Terminals

Operator Input	Communication Port								Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen and Keypad	x								x	2711-B6C1
		x								2711-B6C2
		x							x	2711-B6C3
			x							2711-B6C5
				x					x	2711-B6C8
			x						x	2711-B6C9
					x				x	2711-B6C10
						x			x	2711-B6C15
							x		x	2711-B6C16
								x	x	2711-B6C20
Keypad	x								x	2711-K6C1
		x								2711-K6C2
		x							x	2711-K6C3
			x							2711-K6C5
				x					x	2711-K6C8
			x						x	2711-K6C9
					x				x	2711-K6C10
						x			x	2711-K6C15
							x		x	2711-K6C16
								x	x	2711-K6C20
Touch Screen (24V dc only)	x								x	2711-T6C1L1
		x								2711-T6C2L1
		x							x	2711-T6C3L1
			x							2711-T6C5L1
				x					x	2711-T6C8L1
			x						x	2711-T6C9L1
					x				x	2711-T6C10L1
						x			x	2711-T6C15L1
							x		x	2711-T6C16L1
								x	x	2711-T6C20L1

<sup>1</sup> Add L1 to the end of the catalog number for 24V dc power.

## PanelView 900 Monochrome Terminals

These terminals are no longer available for purchase.

Operator Input	Communication Port							Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)		
Touch Screen	x							x	2711-T9A1
		x							2711-T9A2
		x						x	2711-T9A3
			x						2711-T9A5
				x				x	2711-T9A8
			x					x	2711-T9A9
					x			x	2711-T9A10
						x		x	2711-T9A15
Keypad							x	x	2711-T9A16
	x							x	2711-K9A1
		x							2711-K9A2
		x						x	2711-K9A3
			x						2711-K9A5
				x				x	2711-K9A8
			x					x	2711-K9A9
					x			x	2711-K9A10
						x		x	2711-K9A15
							x	x	2711-K9A16

<sup>1</sup> Add L1 to the end of the catalog number for 24V dc power.

## PanelView 900 Color Terminals

Operator Input	Communication Port								Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen	x								x	2711-T9C1
		x							x	2711-T9C3
				x					x	2711-T9C8
			x						x	2711-T9C9
					x				x	2711-T9C10
						x			x	2711-T9C15
							x		x	2711-T9C16
								x	x	2711-T9C20
Keypad	x								x	2711-K9C1
		x							x	2711-K9C3
				x					x	2711-K9C8
			x						x	2711-K9C9
					x				x	2711-K9C10
						x			x	2711-K9C15
							x		x	2711-K9C16
								x	x	2711-K9C20

<sup>1</sup> Add L1 to the end of the catalog number for 24V dc power.

Publication 2711-UM014B-EN-P

## 1-6 Terminal Overview

## PanelView 1000 Color Terminals

Operator Input	Communication Port								Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen	x								x	2711-T10C1
		x							x	2711-T10C3
				x					x	2711-T10C8
			x						x	2711-T10C9
					x				x	2711-T10C10
						x			x	2711-T10C15
							x		x	2711-T10C16
								x	x	2711-T10C20
Keypad	x								x	2711-K10C1
		x							x	2711-K10C3
				x					x	2711-K10C8
			x						x	2711-K10C9
					x				x	2711-K10C10
						x			x	2711-K10C15
							x		x	2711-K10C16
								x	x	2711-K10C20

1 Add L1 to the end of the catalog number for 24V dc power.

## PanelView 1000 Grayscale Terminals

Operator Input	Communication Port								Printer Port RS-232	Catalog Number <sup>1</sup>
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen	x								x	2711-T10G1
		x							x	2711-T10G3
				x					x	2711-T10G8
			x						x	2711-T10G9
					x				x	2711-T10G10
						x			x	2711-T10G15
							x		x	2711-T10G16
								x	x	2711-T10G20
Keypad	x								x	2711-K10G1
		x							x	2711-K10G3
				x					x	2711-K10G8
			x						x	2711-K10G9
					x				x	2711-K10G10
						x			x	2711-K10G15
							x		x	2711-K10G16
								x	x	2711-K10G20

1 Add L1 to the end of the catalog number for 24V dc power.

## PanelView 1400 Color Terminals

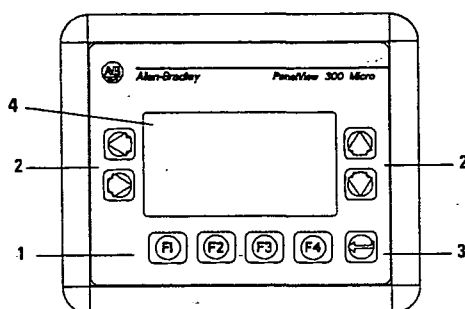
Operator Input	Communication Port								Printer Port RS-232	Catalog Number
	RIO	DH-485	RS-232 (DH-485)	DH+	DeviceNet	ControlNet	RS-232 (DF1)	Ethernet		
Touch Screen	x								x	2711-T14C1
		x							x	2711-T14C3
				x					x	2711-T14C8
			x						x	2711-T14C9
					x				x	2711-T14C10
						x			x	2711-T14C15
							x		x	2711-T14C16
									x	2711-T14C20
Keypad	x							x	x	2711-K14C1
		x							x	2711-K14C3
				x					x	2711-K14C8
			x						x	2711-K14C9
					x				x	2711-K14C10
						x			x	2711-K14C15
							x		x	2711-K14C16
								x	x	2711-K14C20


## 1-8 Terminal Overview

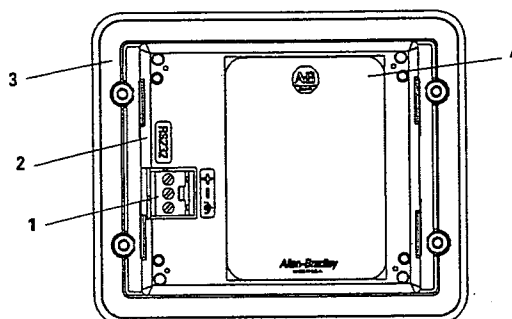
## PanelView 300 Micro Features

This section defines features of the PanelView 300 Micro keypad terminal.

### PanelView 300 Micro Features (Front)



#	Feature	Description
1	<b>Function Keys (F1 - F4)</b>	Use the function keys to initiate functions on the terminal display.
2	<b>Cursor Keys</b>	Use the cursor keys (left, right, up, down) as programmed function keys in addition to the F1 - F4 function keys or to move the cursor in displayed lists, to select a numeric entry object, to enter configuration mode, or to enter/modify numeric and ascii data.
3		Stores an entered value.
4	<b>Keypad Terminal Display</b>	Liquid crystal display with integral backlight. Displays application text, controls, graphics.

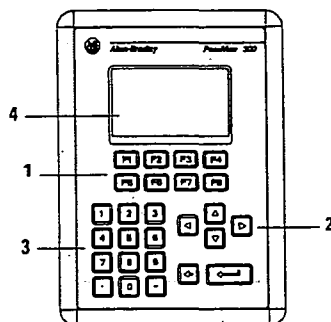
**PanelView 300 Micro Features (Back)**

#	Feature	Description
1	Power Connection Terminals	Connects to a 24V dc (11-30 V dc) external power source.
2	DF1 or DH-485 (RS232) Communication Port	Connects to an SLC, PLC, or MicroLogix controller using an RS-232 connection. Also used for downloading applications directly from a computer.
3	Sealing Gasket	Seals the front of the terminal to an enclosure or panel.
4	Nameplate Label	Provides product information.

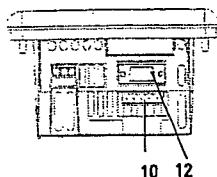
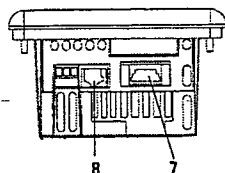
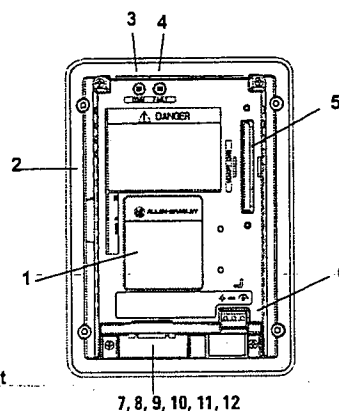
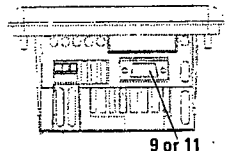
## 1-10 Terminal Overview

**PanelView 300 Features**

This section defines features of the PanelView 300 keypad terminal.

**PanelView 300 Features (Front)**

#	Feature	Description
1	<b>Function Keys (F1 - F8)</b>	Use the function keys to initiate functions on the terminal display. These keys may have custom legends.
2	<b>Cursor Keys</b>	Use the up or down cursor keys to move the cursor up or down in a list or to increment/decrement values. Use the left or right cursor keys to select an object with an indicator bar, or to enter configuration mode.
3	<b>Numeric Entry Keys</b>	0-9 Enters numeric values. . Enters a decimal point. - Enters a negative value. ← Clears entered digits or cancels the scratchpad. ↵ Stores an entered value.
4	<b>Keypad Terminal Display</b>	Initiate the function of a displayed object, such as an ON or OFF push button, by pressing the corresponding function key (F1 - F8).

**PanelView 300 Features (Back)****DeviceNet with additional RS-232 Port****DH-485 without RS-232 Port****RS-232 (DH-485 or DF1) without additional RS-232 Port**

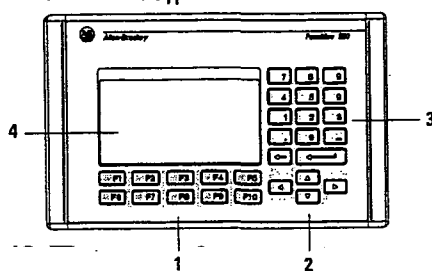
#	Feature	Description
1	<b>Nameplate Label</b>	Provides product information.
2	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
3	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
4	<b>FAULT LED (Red)</b>	Indicates firmware or hardware faults.
5	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
6	<b>Power Connection Terminals</b>	Connects to an external 24V dc power source (18-32V dc).
7	<b>DH-485 Communication Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
8	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PIC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
9	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04 or 5/05 controller for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
10	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
11	<b>RS-232 (DF1) Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port. This port also connects to the RS-232 port of a computer.
12	<b>RS-232 Printer/File Transfer Port</b>	Connects to a printer (K3A10L1 version only). On a DeviceNet terminal, this port also connects to the RS-232 port of a computer for transferring applications.

## PanelView 550 Features

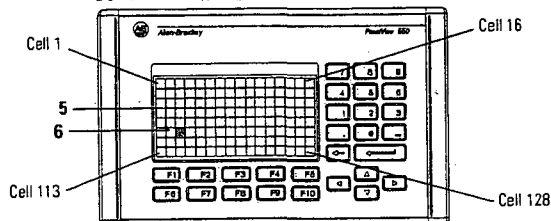
This section defines features of the PanelView 550 terminals.

### PanelView 550 Features (Front)

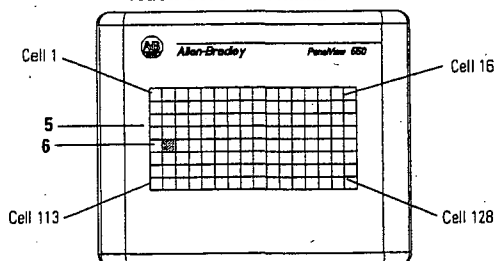
Keypad Terminal



Keypad & Touch Screen Terminal

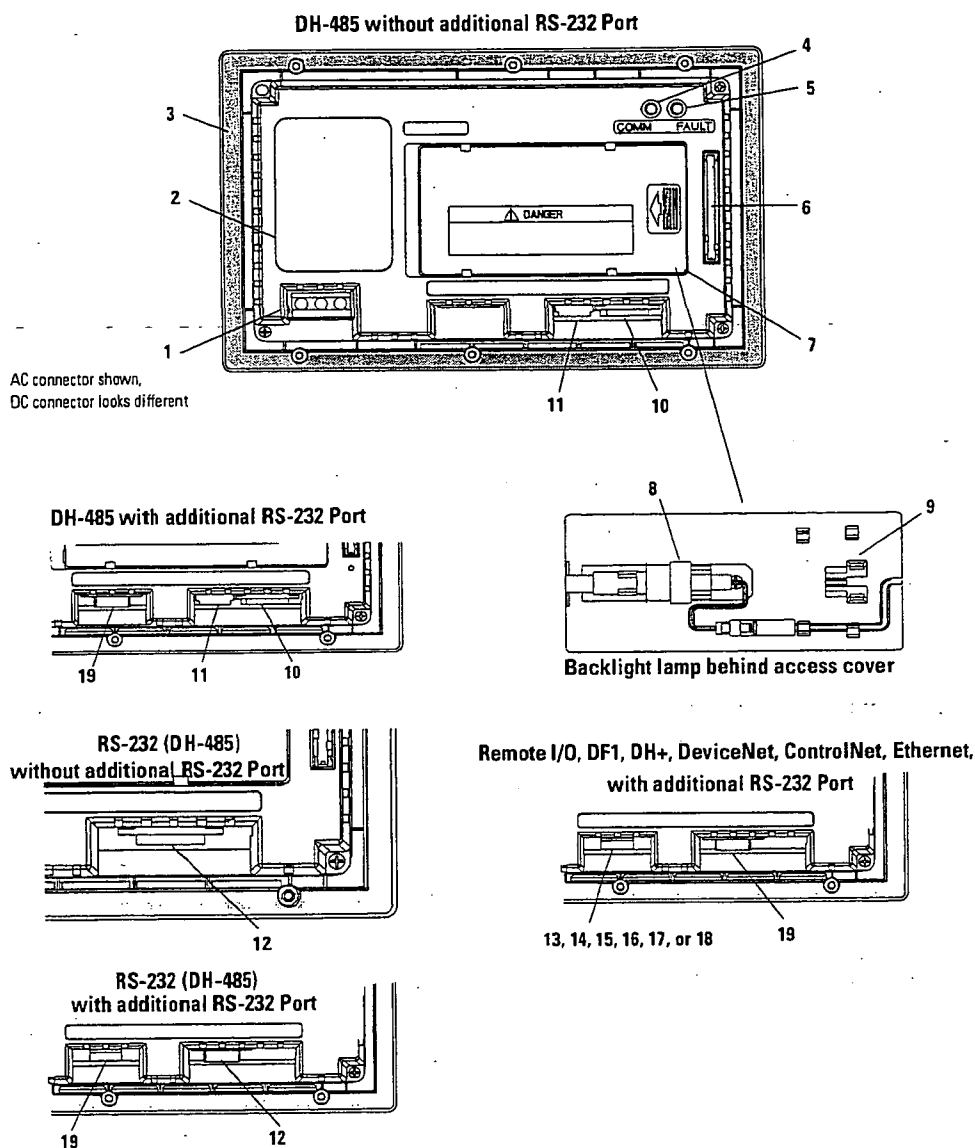


Touch Screen Terminal



#	Feature	Description
1	<b>Function Keys (F1 - F10)</b>	On keypad terminals, use the function keys to initiate functions on the terminal display. These keys may have custom legends. On keypad & touch screen terminals, you can initiate functions using the function keys and/or touch screen objects.
2	<b>Cursor Keys</b>	Use the cursor keys to move the cursor in displayed lists, to select a numeric entry object, or to enter configuration mode.
3	<b>Numeric Entry Keys</b>	0-9 Enters numeric values. . Enters a decimal point. - Enters a negative value. ← Clears entered digits or cancels the scratchpad. ↵ Stores an entered value.
4	<b>Keypad Terminal Display</b>	On keypad terminals, initiate the function of a displayed object, such as an ON or OFF push button, by pressing a function key (F1 - F10).
5	<b>Touch Screen Terminal Display</b>	On touch screen or keypad & touch screen terminals, initiate the function of a displayed object, such as an ON or OFF push button, by touching the screen object. Each interactive screen object occupies one or more of 128 cells. On keypad & touch screen terminals, you can initiate functions using the function keys and/or touch screen objects.
6	<b>Touch Cells (Touch Screen terminal)</b>	The 128 touch cells (16 columns x 8 rows) let you initiate functions by touching the screen. Interactive screen objects are aligned with touch cells when the application is created.

## 1-14 Terminal Overview

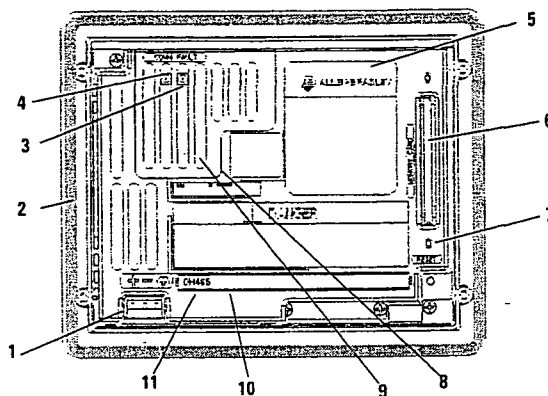
**PanelView 550 Keypad or Keypad & Touch Screen Terminals (Back)**

#	Feature	Description
1	<b>Power Connection Terminals</b>	Connects to external power source.
2	<b>Nameplate Label</b>	Provides product information.
3	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
4	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
5	<b>FAULT LED (Red)</b>	Indicates firmware or hardware faults.
6	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
7	<b>Access Cover</b>	Provides access to the replaceable backlight lamp.
8	<b>Backlight Lamp</b>	Light source for the display backlight. Light transmits through a fiber-optic bundle to the back of the LCD display.
9	<b>Spare Bulb Holder</b>	Stores a spare backlight lamp.
10	<b>DH-485 Communication Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
11	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PIC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
12	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 controller for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
13	<b>Remote I/O Port</b>	Connects to a scanner or sub-scanner on a Remote I/O network.
14	<b>DH+ Communication Port</b>	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
15	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
16	<b>ControlNet Connector</b>	Connects to a ControlLogix controller (with 1756-CNB module) or PLC-5 on a ControlNet network.
17	<b>RS-232 (DF1) Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
18	<b>Ethernet Connector</b>	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
19	<b>RS-232 Printer/File Transfer Port</b>	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.

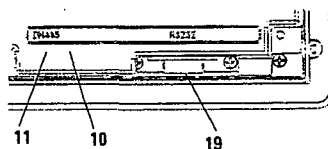
1-16 Terminal Overview

**PanelView 550 Touch Screen Terminal Features (Back)**

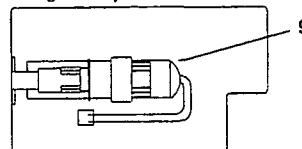
**DH-485 without additional RS-232 Port**



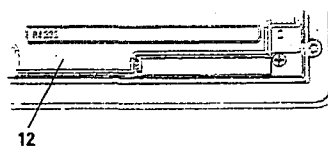
**DH-485 with RS-232 Port**



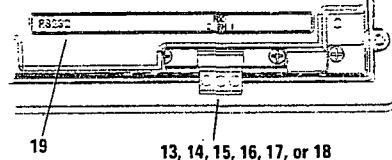
**Backlight lamp behind access cover**



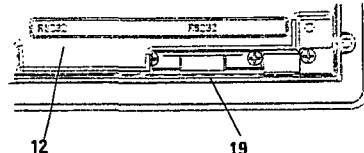
**RS-232 (DH-485) without additional RS-232 Port**



**Remote I/O, DF1, DH+, DeviceNet, ControlNet, Ethernet, with RS-232 Port**



**RS-232 (DH-485) with additional RS-232 Port**



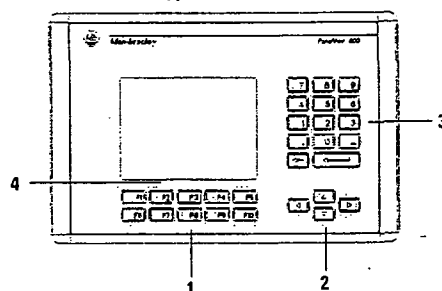
#	Feature	Description
1	<b>Power Connection Terminals</b>	Connects to external DC power source.
2	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
3	<b>FAULT LED (Red)</b>	Indicates firmware or hardware faults.
4	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
5	<b>Nameplate Label</b>	Provides product information.
6	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
7	<b>Reset Button</b>	Resets the terminal.
8	<b>Access Cover</b>	Provides access to the replaceable backlight lamp.
9	<b>Backlight Lamp</b>	Light source for the display backlight.
10	<b>DH-485 Communication Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
11	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PIC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
12	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
13	<b>Remote I/O Port</b>	Connects to a scanner or sub-scanner on a Remote I/O network.
14	<b>DH+ Communication Port</b>	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
15	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
16	<b>ControlNet Connector</b>	Connects to a ControlLogix controller (with 1756-CNB module) or PLC-5 on a ControlNet network.
17	<b>RS-232 (DF1) Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
18	<b>Ethernet Connector</b>	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
19	<b>RS-232 Printer/ File Transfer Port</b>	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.

## PanelView 600 Features

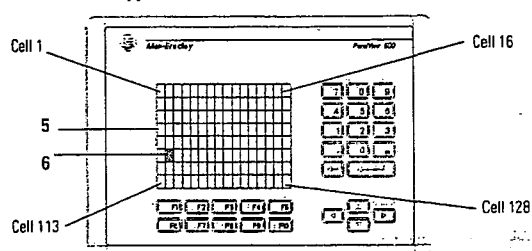
This section defines features of the PanelView 600 terminals.

### PanelView 600 Features (Front)

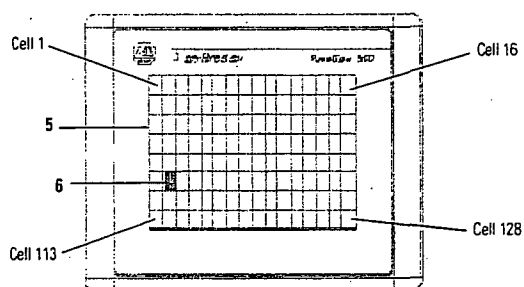
Keypad Terminal



Keypad & Touch Screen Terminal



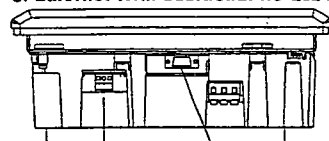
Touch Screen Terminal



#	Feature	Description
1	<b>Function Keys (F1 - F10)</b>	Use the function keys on keypad terminals to initiate functions on the terminal display. These keys may have custom legends. On the keypad & touch screen terminals, you can initiate functions using the function keys and/or touch screen objects.
2	<b>Cursor Keys</b>	Use the cursor keys to move the cursor in displayed lists, to select a numeric entry object, or to enter configuration mode.
3	<b>Numeric Entry Keys</b>	0-9 Enters numeric values. . Enters a decimal point. - Enters a negative value. ← Clears entered digits or cancels the scratchpad. ↵ Stores an entered value.
4	<b>Keypad Terminal Display</b>	On keypad terminals, initiate the function of a displayed object, such as an ON or OFF push button, by pressing a function key (F1 - F10).
5	<b>Touch Screen Terminal Display</b>	On keypad & touch screen terminals, initiate the function of a displayed object, such as an ON or OFF push button, by touching the screen object. Each interactive screen object occupies one or more of 128 cells. On touch screen & keypad terminals, you can initiate functions, using the function keys and/or touch screen objects.
6	<b>Touch Cells (Touch Screen terminal)</b>	The 128 touch cells (16 columns x 8 rows) let you initiate functions by touching the screen. Interactive screen objects are aligned with touch cells when the application is created.

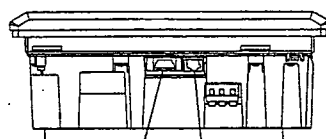
**PanelView 600 Keypad or Keypad & Touch Screen Terminal (Back)**

Remote I/O, DF1, DH+, DeviceNet, ControlNet,  
or Ethernet with additional RS-232 Port



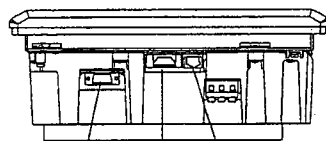
10, 11, 12, 13, 14, or 15 16

DH-485 without additional RS-232 Port



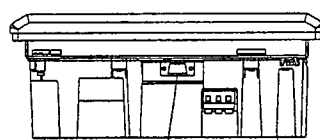
7 8

DH-485 with additional RS-232 Port

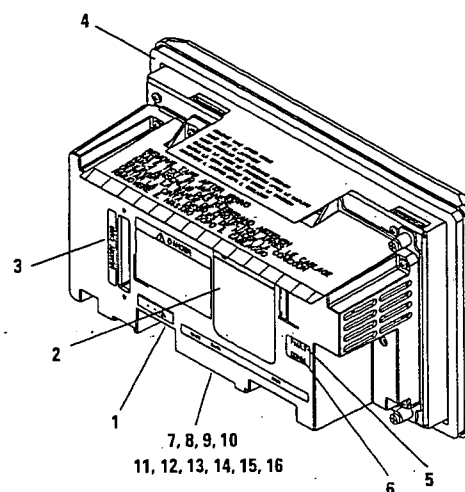


16 7 8

RS-232 (DH-485)  
without additional RS-232 Port

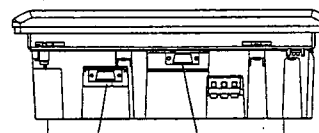


9



7, 8, 9, 10  
11, 12, 13, 14, 15, 16

RS-232 (DH-485) with additional RS-232 Port

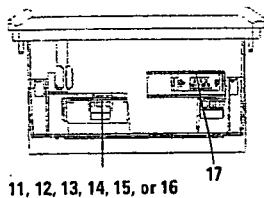


16 9

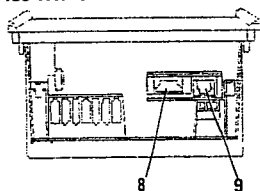
#	Feature	Description
1	<b>Power Connection Terminals</b>	Connects to external power source.
2	<b>Nameplate Label</b>	Provides product information.
3	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
4	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
5	<b>FAULT LED (Red)</b>	Indicates firmware or hardware faults.
6	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
7	<b>DH-485 Communication Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
8	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PIC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
9	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
10	<b>Remote I/O Port</b>	Connects to a scanner or sub-scanner on a Remote I/O network.
11	<b>DH+ Communication Port</b>	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
12	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
13	<b>ControlNet Connector</b>	Connects to a ControlLogix controller (with 1756-CNB module) or PLC-5 on a ControlNet network.
14	<b>(RS-232) DF1 Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
15	<b>Ethernet Connector</b>	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
16	<b>RS-232 Printer/File Transfer Port</b>	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.

### PanelView 600 Touch-Screen Terminal Features (Back)

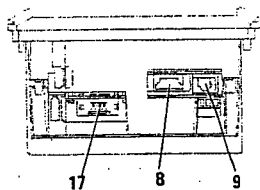
Remote I/O, DF1, DH+, DeviceNet, ControlNet,  
or Ethernet with additional RS-232 Port



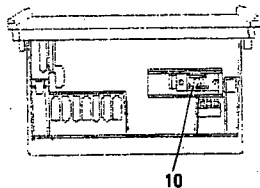
DH-485 without additional RS-232 Port



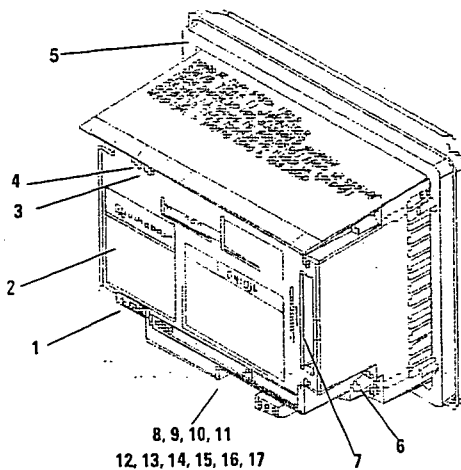
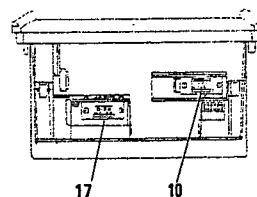
DH-485 with additional RS-232 Port



RS-232 (DH-485)  
without additional RS-232 Port



RS-232 (DH-485) with additional RS-232 Port



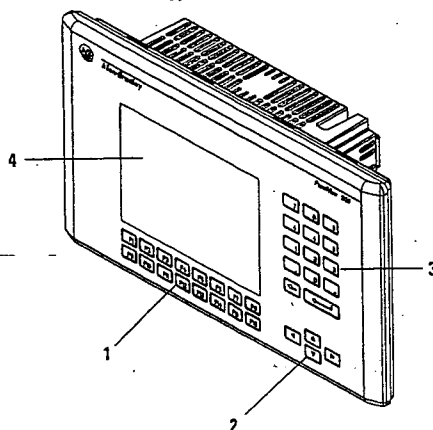
#	Feature	Description
1	<b>Power Connection Terminals</b>	Connects to external power source.
2	<b>Nameplate Label</b>	Provides product information.
3	<b>Fault LED (Red)</b>	Indicates firmware or hardware faults.
4	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
5	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
6	<b>Reset Button</b>	Resets the terminal.
7	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
8	<b>DH-485 Communications Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
9	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PLC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
10	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
11	<b>Remote I/O Port</b>	Connects to a scanner or sub-scanner on a Remote I/O network.
12	<b>DH+ Communication Port</b>	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
13	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
14	<b>ControlNet Connector</b>	Connects to a ControlLogix controller (with 1756-CN8 module) or PLC-5 on a ControlNet network.
15	<b>RS-232 (DF1) Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
16	<b>Ethernet Connector</b>	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
17	<b>RS-232 Printer/File Transfer Port</b>	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.

## PanelView 900/1000 Features

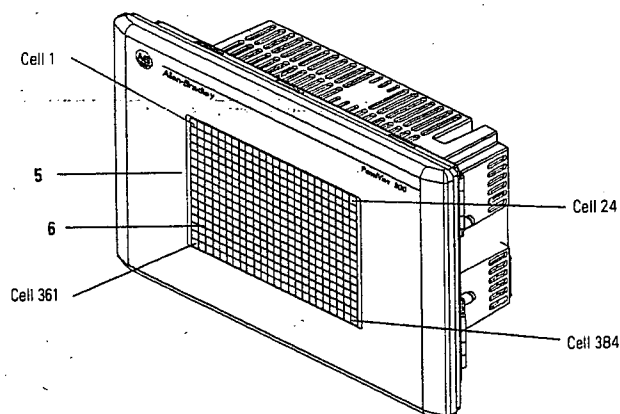
This section defines features of the PanelView 900 and 1000 terminals.

### *PanelView 900/1000 Terminal Features (Front)*

**Keypad Terminal**



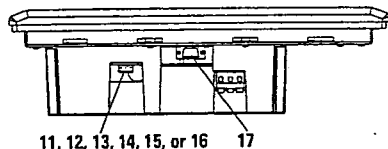
**Touch Screen Terminal**



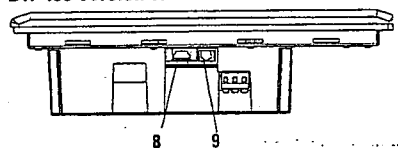
#	Feature	Description
1	<b>Function Keys (F1 - F16)</b>	Use the function keys on keypad terminals to initiate functions on the terminal display. These keys may have custom legends.
2	<b>Cursor Keys</b>	Use the cursor keys to move the cursor in displayed lists, to select a numeric entry object or to enter configuration mode.
3	<b>Numeric Entry Keys</b>	0-9 Enters numeric values. . Enters a decimal point. - Enters a negative value. ← Clears entered digits or cancels the scratchpad. ↵ Stores an entered value.
4	<b>Keypad Terminal Display</b>	On keypad terminals, initiate the function of a displayed object, such as an ON or OFF push button, by pressing a function key (F1 - F16).
5	<b>Touch Screen Terminal Display</b>	On touch screen terminals, initiate the function of a displayed object, such as an ON or OFF push button, by touching the screen object. Each interactive screen object occupies one or more of 384 cells.
6	<b>Touch Cells (Touch Screen terminal)</b>	The 384 touch cells (24 columns x 16 rows) let you initiate functions by touching the screen. Interactive screen objects are aligned with touch cells when the application is created.

**PanelView 900/1000 Terminal Features (Back)**

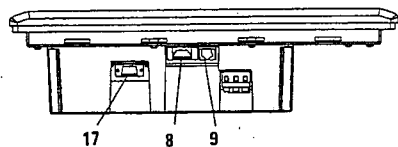
Remote I/O, DF1, DH+, DeviceNet, Ethernet,  
or ControlNet with additional RS-232 Port



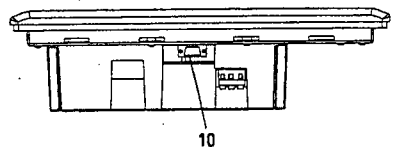
DH-485 Version without additional RS-232 Port



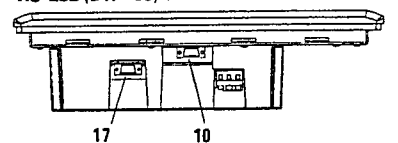
DH-485 with additional RS-232 Port



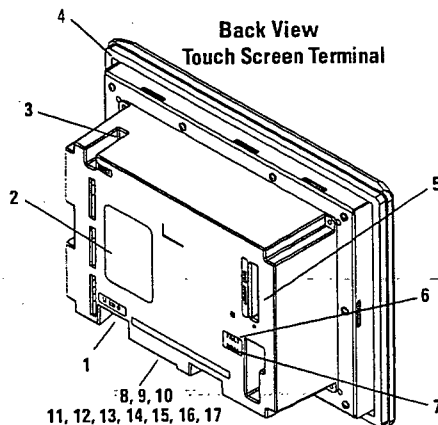
RS-232 (DH-485) without additional RS-232 Port



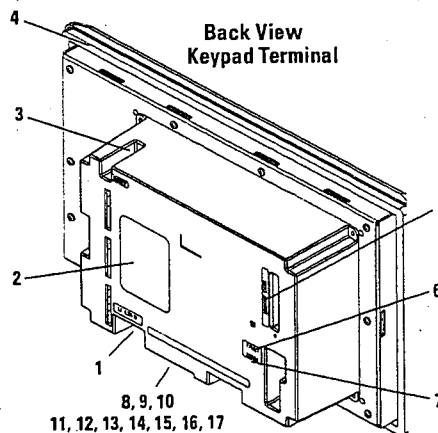
RS-232 (DH-485) with additional RS-232 Port



**Back View  
Touch Screen Terminal**



**Back View  
Keypad Terminal**



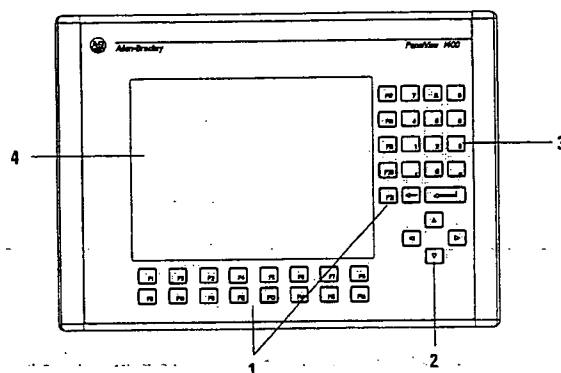
#	Feature	Description
1	<b>Power Connection Terminals</b>	Connects to external power source.
2	<b>Nameplate Label</b>	Provides product information.
3	<b>Reset Button</b>	Resets the terminal.
4	<b>Sealing Gasket</b>	Seals the front of the terminal to an enclosure or panel.
5	<b>Memory Card Slot</b>	Accepts a memory card which stores applications.
6	<b>FAULT LED (Red)</b>	Indicates firmware or hardware faults.
7	<b>COMM LED (Green)</b>	Indicates when communications is occurring.
8	<b>DH-485 Communication Port</b>	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
9	<b>DH-485 Programming Connector</b>	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PIC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
10	<b>RS-232 (DH-485) Communication Port</b>	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
11	<b>Remote I/O Port</b>	Connects to a scanner or sub-scanner on a Remote I/O network.
12	<b>DH+ Communication Port</b>	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
13	<b>DeviceNet Connector</b>	Connects to a DeviceNet network.
14	<b>ControlNet Connector</b>	Connects to a ControlLogix controller (with 1756-CNB module) or PLC-5 on a ControlNet network.
15	<b>RS-232 (DF1) Communication Port</b>	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
16	<b>Ethernet Connector</b>	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
17	<b>RS-232 Printer/File Transfer Port</b>	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.

## PanelView 1400 Features

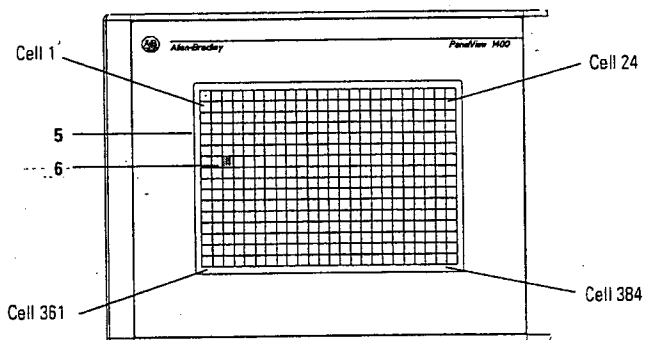
This section defines features of the PanelView 1400 terminals.

### PanelView 1400 Terminal Features (Front)

Keypad Terminal



Touch Screen Terminal

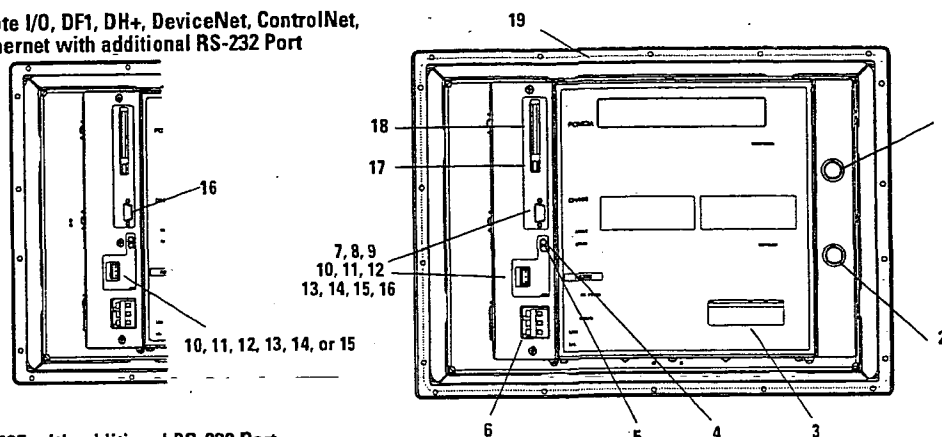


#	Feature	Description
1	<b>Function Keys (F1 - F21)</b>	Use the function keys on keypad terminals to initiate functions on the terminal display. These keys may have custom legends.
2	<b>Cursor Keys</b>	Use the cursor keys to move the cursor in displayed lists, to select a numeric entry object, or to enter configuration mode.
3	<b>Numeric Entry Keys</b>	0-9 Enters numeric values. . Enters a decimal point. - Enters a negative value. ← Clears entered digits or cancels the scratchpad. ↵ Stores an entered value.
4	<b>Keypad Terminal Display</b>	On keypad terminals, initiate the function of a displayed object, such as an ON or OFF push button, by pressing a function key (F1 - F21).
5	<b>Touch Screen Terminal Display</b>	On touch screen terminals, initiate the function of a displayed object, such as an ON or OFF push button, by touching the screen object. Each interactive screen object occupies one or more of 384 cells.
6	<b>Touch Cells (Touch Screen terminal)</b>	The 384 touch cells (24 columns x 16 rows) let you initiate functions by touching the screen. Interactive screen objects are aligned with touch cells when the application is created.

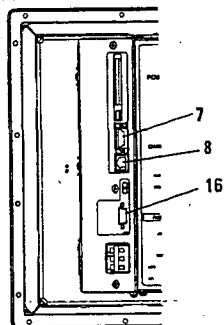
## 1-30 Terminal Overview

**PanelView 1400 Terminal Features (Back and Sides)**

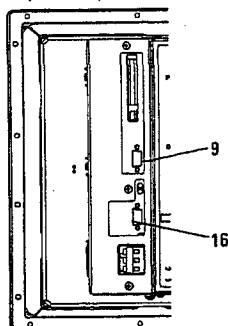
Remote I/O, DF1, DH+, DeviceNet, ControlNet,  
or Ethernet with additional RS-232 Port



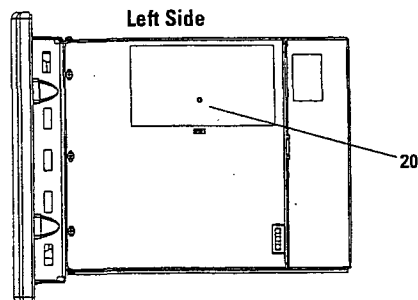
DH-485 with additional RS-232 Port



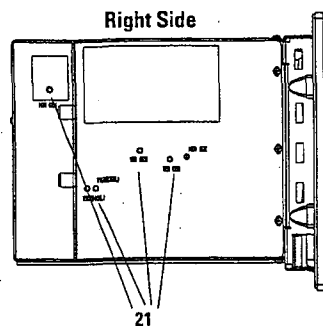
RS-232 (DH-485) with additional RS-232 Port



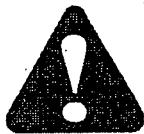
Left Side



Right Side



#	Feature	Description
1	Brightness Control	Adjusts the brightness of the color display.
2	Contrast Control	Adjusts the contrast of the color display.
3	Nameplate Label	Provides product information.
4	FAULT LED (Red)	Indicates firmware or hardware faults.
5	COMM LED (Green)	Indicates when communications is occurring.
6	Power Connection Terminals	Connects to external power source.
7	DH-485 Communication Port	Connects to an SLC or MicroLogix controller, DH-485 network, or Wallmount Power Supply (Cat. No. 1747-NP1).
8	DH-485 Programming Connector	Connects to a Personal Computer Interface Converter (Cat. No. 1747-PLC) for transferring applications. Also connects to an SLC programmer, such as the Hand-Held Terminal (Cat. No. 1747-PT1).
9	RS-232 (DH-485) Communication Port	Connects to the Channel 0 port of an SLC 5/03, 5/04, or 5/05 for point-to-point DH-485 communications. Connects to a MicroLogix controller through an AIC+ Link Coupler. Also connects to the RS-232 serial port of a computer for transferring applications.
10	Remote I/O Port	Connects to a scanner or sub-scanner on a Remote I/O network.
11	DH+ Communication Port	Connects to a PLC-5, SLC 5/04, or ControlLogix controller on a DH+ link.
12	DeviceNet Connector	Connects to a DeviceNet network.
13	ControlNet Connector	Connects to a ControlLogix controller (with 1756-CNB module) or PLC-5 on a ControlNet network.
14	RS-232 (DF1) Communication Port	Connects to a PLC, SLC or MicroLogix controller with a DF1 port.
15	Ethernet Connector	Connects to a PLC-5E or SLC 5/05 controller, or a ControlLogix, MicroLogix, FlexLogix or CompactLogix (with appropriate bridge module) on an EtherNet/IP network.
16	RS-232 Printer/File Transfer Port	Connects to a printer. On Remote I/O, DH+, DF1, DeviceNet, EtherNet/IP, or ControlNet terminals, this port also connects to the RS-232 port of a computer for transferring applications. The RS-232 port on the DH-485 or RS-232 (DH-485) terminal is used to connect a printer but not for file transfers.
17	Memory Card Eject Button	Ejects memory card from slot.
18	Memory Card Slot	Accepts a memory card which stores applications.
19	Sealing Gasket	Seals the front of the terminal to an enclosure or panel.
20	Reset Button	Resets the terminal.
21	CRT Board Adjustments	See the warning below.

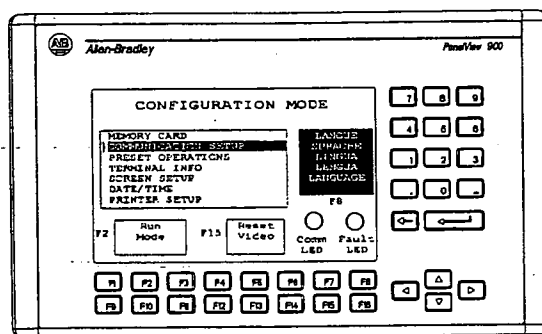
**ATTENTION**

Only qualified service technicians should access the CRT board adjustments. Failure to follow this caution could result in electrical shock, a misadjusted monitor, or a damaged monitor.

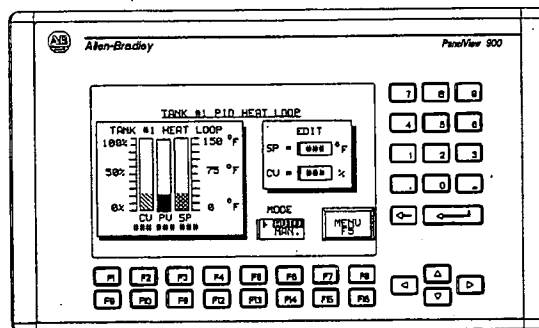
## Applications

PanelView terminals operate with custom designed applications. The first time you power on the terminal, (no application file loaded), the terminal displays the Configuration Mode menu. Chapter 3 describes the terminal functions you can configure from this menu.

**Note:** Remote I/O terminals provide an out-of-box application for setting Remote I/O communication parameters.



If an application is loaded, the terminal displays the application's start-up screen.

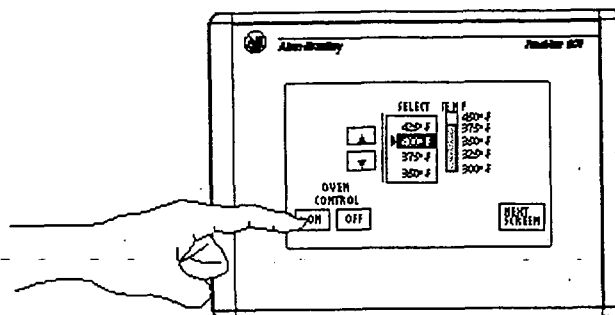


**Note:** The application designer is responsible for documenting the operation of the application and selecting a startup screen.

How the terminal operates depends on the application and the type of terminal (touch screen or keypad).

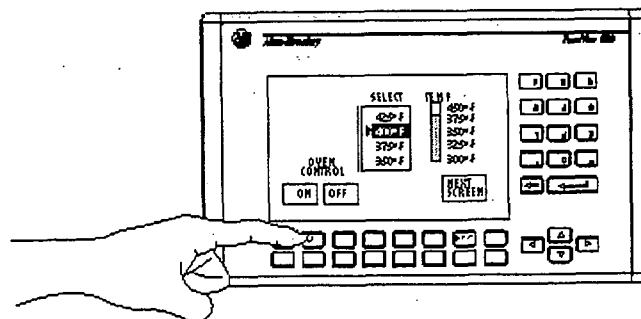
## Touch Screen Operation

Applications for touch screen terminals are controlled by touching screen objects.



## Keypad Operation

Applications for keypad terminals are controlled by pressing function keys that correspond to screen objects. Data is entered manually using the numeric entry keys.



A function key legend kit is available for each terminal (except the 300 Micro) to create custom labels for the function keys. See the accessories at the end of this chapter.

### ATTENTION



Do not press multiple touch screen objects or multiple function keys at the same time. This may result in unintended operation.

## Configuration Mode Menu

You can configure terminal functions from the Configuration Mode menu including:

- select a language
- upload/download applications with a memory card
- set or display serial communication parameters
- select preset values
- obtain terminal and application information
- adjust screen parameters
- set time and date
- set printer parameters (for terminals with an RS-232 printer port)
- return to run mode

Chapter 3 describes how to enter configuration mode and operations you can perform using the Configuration Mode menu.

## Terminal Messages

Terminal messages display:

- status of an operation
- minor faults, errors, or numeric entry mistakes
- operator prompts

Appendix B describes terminal messages and provides a list of recommended actions.

## Printing

PanelView terminals equipped with an RS-232 printer port can print:

- triggered messages in a message display
- triggered states of a multistate indicator
- alarm messages
- alarm list

Print attributes for objects are defined in the application.

Any printer that supports the IBM enhanced character set can be connected to the RS-232 printer port of a PanelView terminal.

## Alarm List

PanelView terminals support an Alarm List queue to store information on triggered alarms. The Alarm List stores a maximum of 100 alarms or as many as the terminal can hold in nonvolatile RAM. The number of alarms stored in the list is configured using the PanelBuilder32 software.

The Alarm List stores the following data for each alarm:

- acknowledge indicator
- alarm date and time
- acknowledge date and time
- alarm trigger value
- alarm text including variables

The Alarm List is cleared:

- when an application is downloaded to the terminal
- when the terminal is reset or power is cycled

The Alarm List object may appear on the Alarm Banner or other application screens. The data that displays in the Alarm List is configured using the PanelBuilder32 Software.

**Accessories****Software**

Catalog No.	300M	300	550	600	900	1000	1400	Description
2711-ND3	x	x	x	x	x	x	x	Windows software required for creating PanelView applications on a personal computer.

**Function Key Legend Kits**

Catalog No.	300	550	600	900	1000	1400	Description
2711-NF1		x					5 legend inserts with key labels F1-F10 on one side. Use blank side to create custom labels.
2711-NF2A				x			1 legend insert for PV900 keypad (monochrome) terminal with key labels F1-F16 on one side. Use blank side to create custom labels.
2711-NF2C				x			1 legend insert for PV900 keypad (color) terminal with key labels F1-F16 on one side. Use blank side to create custom labels.
2711-NF4			x				1 legend insert with key labels F1-F10 on one side. Use blank side to create custom labels.
2711-NF5						x	2 legend inserts. One has key labels F1-F16; the other has key labels F17-F21. Use blank sides to create custom labels.
2711-NF6					x		1 legend insert with key labels F1-F16. Use blank side to create custom labels.
2711-NF7	x						2 legend inserts with key labels F1-F4 and F5-F8. Use blank side to create custom labels.

**Memory Cards and Retainer**

Catalog No.	300	550	600	900	1000	1400	Description
2711-NM11 <sup>1</sup>	x	x	x	x	x	x	256K memory card for storing applications.
2711-NM12 <sup>1</sup>	x	x		x	x	x	1M flash memory card for storing applications.
2711-NM13	x	x	x	x	x	x	2M flash memory card for storing applications.
2711-NM14	x	x	x	x	x	x	4M flash memory card for storing applications.
2711-NM15	x	x	x	x	x	x	10M flash memory card for storing applications.
2711-NM24 <sup>2</sup>	x	x	x	x	x	x	4M flash ATA card for storing applications and font files.
2711-NM28	x	x	x	x	x	x	8M flash ATA card for storing applications and font files.
2711-NM216 <sup>1</sup>	x	x	x	x	x	x	16M flash ATA card for storing applications and font files.
2711-NMCC		x	x	x	x		Secures memory card in the PanelView 500/600 keypad or the PanelView 900/1000 keypad and touch screen. Prevents electrostatic discharge.
2711-NMCD		x					Secures memory card in 550 touch screen terminal and prevents electrostatic discharge.
2711-NMCE	x		x				Secures memory card in PanelView 300 keypad and 600 touch screen terminals and prevents electrostatic discharge.

<sup>1</sup> Contact Allen-Bradley for availability.

<sup>2</sup> Not available for purchase.

**Antiglare Overlay**

Self-adhesive filters minimize the reflection of terminal displays.

Catalog No.	300M	300	550	600	900	1000	1400
2711-NV4 (Keypad)			x				
2711-NV4T (Touch Screen Terminals)			x	x			
2711-NV3K (Keypad)					x		
2711-NV3T (Touch Screen Terminals)					x		
2711-NV5 (Keypad)				x			
2711-NV7K (Keypad Terminals)							x
2711-NV7T (Touch Screen Terminals)							x
2711-NV6K (Keypad Terminals)						x	
2711-NV6T (Touch Screen Terminals)						x	
2711-NV8 (Keypad Terminals)		x					

**DH-485 Operating and Programming Cables**

Catalog No.	Description
1747-PIC	Personal Computer Interface Converter converts RS-232 signals to/from RS-485 signals. Use to transfer applications between a DH-485 terminal and a computer.
1747-C10	1.83 meter (6 foot) cable connects a DH-485 terminal to an SLC or DH-485 network.
1747-C11	0.30 meter (1 foot) cable connects a DH-485 terminal to an SLC or DH-485 network.
1747-C20	6.1 meter (20 foot) cable connects a DH-485 terminal to an SLC or DH-485 network.
1747-CP3	45 cm (17.7 inch) cable connects an RS-232 terminal to an AIC+ (Port1) through a null modem adapter.
1761-CBL-AP00	45 cm (17.7 inch) cable connects an RS-232 terminal to an AIC+ (Port2) through a null modem adapter.
1761-CBL-AC00	3 meter (9.8 foot) cable connects an RS-232 terminal to an AIC+ (Port1) through a null modem adapter.
1761-CBL-AS03	3 meter (9.8 foot) cable connects a DH-485 terminal to an AIC+ (Port3).
1761-CBL-AS09	9.9 meter (29.5 foot) cable connects a DH-485 terminal to an AIC+ (Port3).
1761-CBL-AM00	45 cm (17.7 inch) cable with 2 mini DIN, right angle connectors.
1761-CBL-HM02	2 meter (6.5 foot) cable with 2 mini DIN, right angle connectors.
2711-CBL-HM05	5 meter runtime cable with 2 mini DIN, right angle connectors.
2711-CBL-HM10	10 meter runtime cable with 2 mini DIN, right angle connectors.
1761-CBL-PM00	45 cm (17.7 inch) cable connects an RS-232 terminal to an AIC+ (Port2) through a null modem adapter.
1761-CBL-PM02	2 meter (6.5 foot) cable connects an RS-232 terminal to an AIC+ (Port2) through a null modem adapter.
2711-CBL-PM05	5 meter programming cable with a D-shell and mini DIN connector.
2711-CBL-PM10	10 meter programming cable with a D-shell and mini DIN connector.

**1-38** Terminal Overview***PanelView File Transfer Utility***

Catalog No.	Description
2711-ND7	Transfers .PVA files between a PanelView terminal and a computer running Windows.

***Power Supply and Link Couplers***

The following items are available for all PanelView terminals.

Catalog No.	Description
1747-NP1	Wallmount Power supply provides power for DH-485 communications when an SLC or network is not connected.
1747-AIC	AIC Link Coupler links devices on a DH-485 network.
1761-NET-AIC	AIC+ Advanced Interface Converter links devices on a DH-485 network including MicroLogix.
1761-NET-DNI	DeviceNet Interface links DF1 PanelViews on a DeviceNet network.
1761-NET-ENI	Ethernet Interface links DF1 or Ethernet devices on an EtherNet/IP network.

**RS-232 Cables**

Catalog No.	Description
2711-NC13	5 meter (15 foot) connects an RS-232 terminal to the Channel 0 port of an SLC 5/03 controller or the RS-232 port of a computer or printer.
2711-NC14	10 meter (32 foot) cable connects an RS-232 terminal to the Channel 0 port of an SLC 5/03 controller or the RS-232 port of a computer or printer.
2711-NC21	5 meter (15 foot) connects an RS-232 terminal to a MicroLogix controller (except PV300 Micro).
2711-NC22	15 meter (49 foot) cable connects an RS-232 terminal to a MicroLogix controller (except PV300 Micro).
2706-NC13	3 meter (10 ft) cable connects an RS-232 terminal to an SLC 5/03 controller or the RS-232 port of a computer or printer.
1761-CBL-AP00	0.5 meter (1.5 ft) cable connects a PanelView 300 Micro RS-232 terminal to an SLC or PLC.
1761-CBL-PM02	2 meter (6.5 ft) cable connects a PanelView 300 Micro RS-232 terminal to an SLC or PLC.
2711-CBL-PM05	5 meter (15 ft) cable connects a PanelView 300 Micro RS-232 terminal to a ControlLogix, AIC+, SLC controller, or computer RS-232 port.
2711-CBL-PM10	10 meter (30 ft) cable connects a PanelView 300 Micro RS-232 terminal to a ControlLogix, AIC+, SLC controller, or computer RS-232 port.
1761-CBL-AM00	0.5 meter (1.5 ft) cable connects a PanelView 300 Micro RS-232 terminal to a MicroLogix.
1761-CBL-HM02	2 meter (6.5 ft) cable connects a PanelView 300 Micro RS-232 terminal to a MicroLogix.
2711-CBL-HM05	5 meter (15 ft) cable connects a PanelView 300 Micro RS-232 terminal to a MicroLogix 1000/1200/1500, DeviceNet DNI, or AIC+ module.
2711-CBL-HM10	10 meter (30 ft) cable connects a PanelView 300 Micro RS-232 terminal to a MicroLogix 1000/1200/1500, DeviceNet DNI, or AIC+ module.

**Remote I/O or DH+ Cable**

Catalog No.	Description
1770-CD	Shielded, 3-conductor cable (Belden 9463) for connecting a Remote I/O terminal to a Remote I/O network.

## 1-40 Terminal Overview

## Replacement Parts

**Backlight Lamps**

Catalog No.	550	600	900	1000	Description
2711-NL1	x				Halogen backlight lamp for all PV550 terminals. Provides backlighting for LCD display.
2711-NL2			x		Backlight for PV900 color terminal.
2711-NL3		x			Backlight for PV600 color terminal.
2711-NL4				x	Backlight for PV1000 color terminal.

**Real Time Clock Modules**

Catalog No.	300	550	600	900	1000	1400	Description
2711-NB2		x					Real time clock module for PV550 (Series D or earlier). Does not apply to the PV550 touch screen terminals. Contains lithium battery.
2711-NB3		x	x	x	x	x	Real time clock module for PV600, PV900, PV1000, PV1400 or PV550 (Series E or later). Does not apply to PV550/PV600 touch screen terminals. Contains lithium battery.
2711-NB4	x	x	x				Real time clock module for PV300 keypad, PV550/PV600 touch screen only terminals. Contains lithium battery.

**Panel Mount Clips and Studs**

Catalog No.	600	900	1000	1400	Description
2711-NP1				x	10 panel mount clips for PV1400 terminal.
2711-NP2	x	x	x		6 panel mount clips for PV600, PV900 or PV1000 terminals.
2711-NP3				x	Optional panel mount studs (18) for PV1400 terminals.

**Remote I/O Connector**

Catalog No.	550	600	900	1000	1400	Description
22112-046-03	x	x	x	x	x	Terminal block connector plugs into Remote I/O port of Remote I/O terminals.

**Power Input Connector**

Catalog No.	300M	Description
2711-TBDC	x	Removable DC power input connectors for PanelView 300 Micro (qty. of 10).

## Chapter 2

# Applying Power and Resetting Terminal

### Chapter Objectives

This chapter provides information on:

- wiring and safety guidelines
- connecting AC or DC power
- resetting the terminal.
- power-up sequence

### Wiring and Safety Guidelines

Use publication NFPA 70E, Electrical Safety Requirements for Employee Workplaces when wiring the PanelView terminals. In addition to the NFPA general guidelines:

- connect the terminal to its own branch circuit.
- the input power should be protected by a fuse or circuit breaker rated at no more than 15 Amps.
- route incoming power to the PanelView terminal by a separate path from the communications cable.

#### IMPORTANT

Do not run signal wiring and power wiring in the same conduit.

- where power and communication lines must cross, they should cross at right angles. Communication lines can be installed in the same conduit as low level DC I/O lines (less than 10 volts).

#### DANGER



#### Explosion Hazard

- Substitution of components may impair suitability for Class I, Division 2.
- Do not disconnect equipment unless power has been switched off and area is known to be non-hazardous.
- Do not connect or disconnect components unless power has been switched off.
- All wiring must comply with N.E.C. article 501-4(b).

Publication 2711-UM014B-EN-P

## 2-2 Applying Power and Resetting Terminal

## Connecting AC Power

Below are AC electrical ratings for the PanelView terminals. The PV550/PV600 touch screen only terminal is available only with DC power, not AC power.

Terminal Type	Supply Voltage	Power Consumption
PV550	85 to 264V ac, 47 to 63 Hz	45 VA maximum
PV600	85 to 264V ac, 43 to 63 Hz	60 VA maximum
PV900M/PV900C	85 to 264V ac, 47 to 63 Hz	110 VA maximum
PV1000G/PV1000C	85 to 264V ac, 47 to 63 Hz	100 VA maximum
PV1400	85 to 264V ac, 43 to 63 Hz	200 VA maximum

**ATTENTION**


Do not apply power to the PanelView terminal until all wiring connections have been made. Failure to do so may result in electrical shock.

### AC Power Connections

The PanelView terminals are IEC 1131-2 Equipment Class I devices and require you to connect the GND (Ground) or Ⓛ (Protective Earth) terminal to an earth conductor.

**IMPORTANT**

The PanelView terminals are designed for safe use when installed in a NEMA Type 12, 13, 4X (indoor use only), IP54 or IP65 rated enclosure.

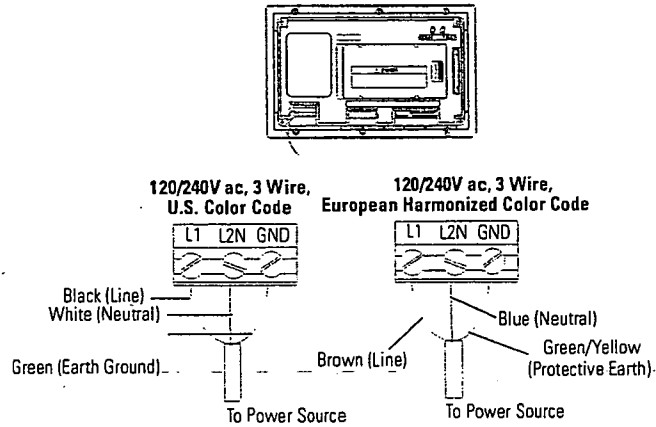
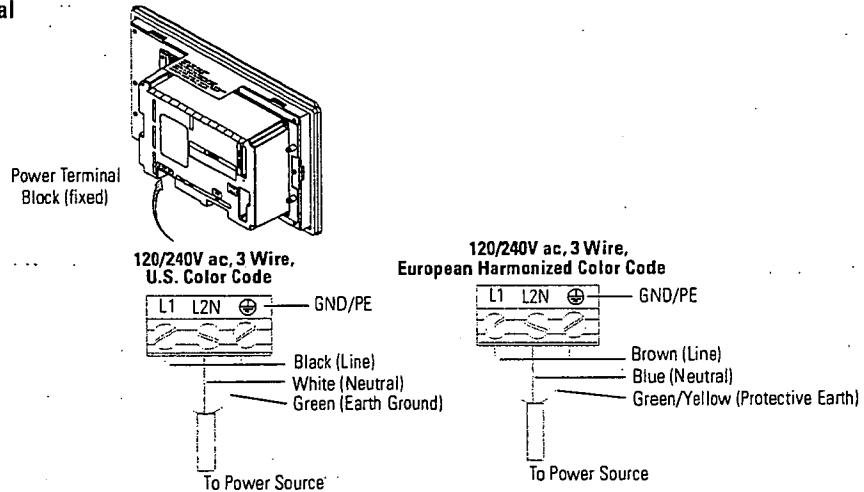
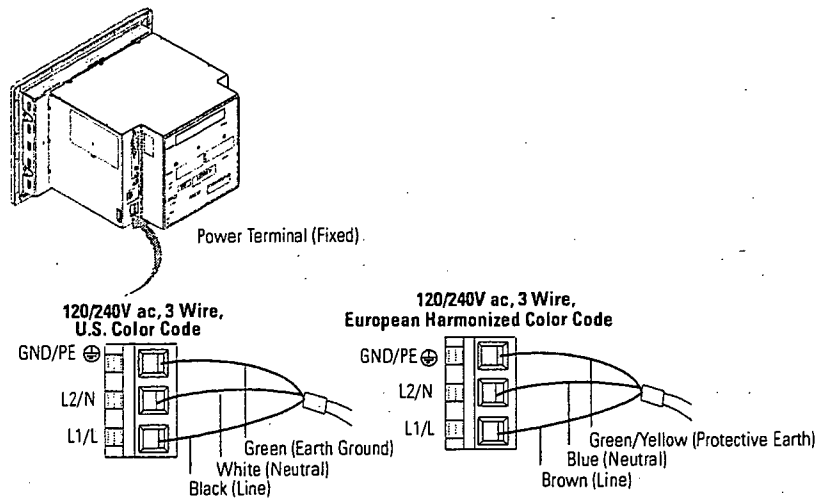
#### To connect power to the AC versions of the PanelView:

1. Secure AC power wires to the L1 and L2N terminal block screws.
2. Secure the Earth Ground/Protective Earth wire to the GND or the Ⓛ screw on the terminal block.

**ATTENTION**


Improper wiring of the power terminals may result in voltage at the communication connector shells. Refer to the figure below when wiring.

3. Apply power to the terminal.

**PanelView 550 Terminal****PanelView 900/1000 Terminal****PanelView 1400 Terminal**

Publication 2711-UM014B-EN-P

## 2-4 Applying Power and Resetting Terminal

## Connecting DC Power

The L1 versions (Cat. No. 2711-K5A1L1, -T9C1L1) of the PV300, PV300 Micro, PV550, PV600, PV900, and PV1000 terminals connect to a 24V dc power source.

The table below shows the electrical ratings for the DC versions of the terminals. Electronic circuitry and an internal fuse protect the terminals from reverse polarity and over-voltage conditions.

Terminal Type	Supply Voltage (24V dc nominal)	Power Consumption
PV300 Micro	11 to 30V dc	2.5 Watts max. (0.105A @ 24V dc)
PV300	18 to 32V dc	10 Watts max. (0.42A @ 24V dc)
PV550	18 to 30V dc	18 Watts max. (0.75A @ 24V dc)
PV550 (touch only)	18 to 32V dc	18 Watts max. (0.75A @ 24V dc)
PV600	18 to 32V dc	34 Watts max. (1.4A @ 24V dc)
PV600 (touch only)	18 to 32V dc	17 Watts max. (0.71A @ 24V dc)
PV900M	18 to 30V dc	58 Watts max. (2.5A @ 24V dc)
PV900C	18 to 32V dc	50 Watts max. (2.1A @ 24V dc)
PV1000G	18 to 32V dc	40 Watts max. (1.7A @ 24V dc)
PV1000C	18 to 32V dc	50 Watts max. (2.1A @ 24V dc)

**ATTENTION**

Do not connect a DC rated PanelView terminal to an AC power source. Connecting to an AC power source may damage the terminal.

**IMPORTANT**

The PanelView terminals are designed for safe use when installed in a NEMA Type 12, 13, NEMA 4X (indoor use only), IP54 or IP65 rated enclosure.

**ATTENTION**

Use only a safety extra-low voltage (SELV) power supply as a source for the PanelView 300 Micro, PanelView 300 or 550 touch screen terminal. A SELV power supply does not exceed 42.4V dc

## DC Power Connections

Connect the power source to the terminal at the 3-screw terminal block (PV300 Micro removable, all others fixed).

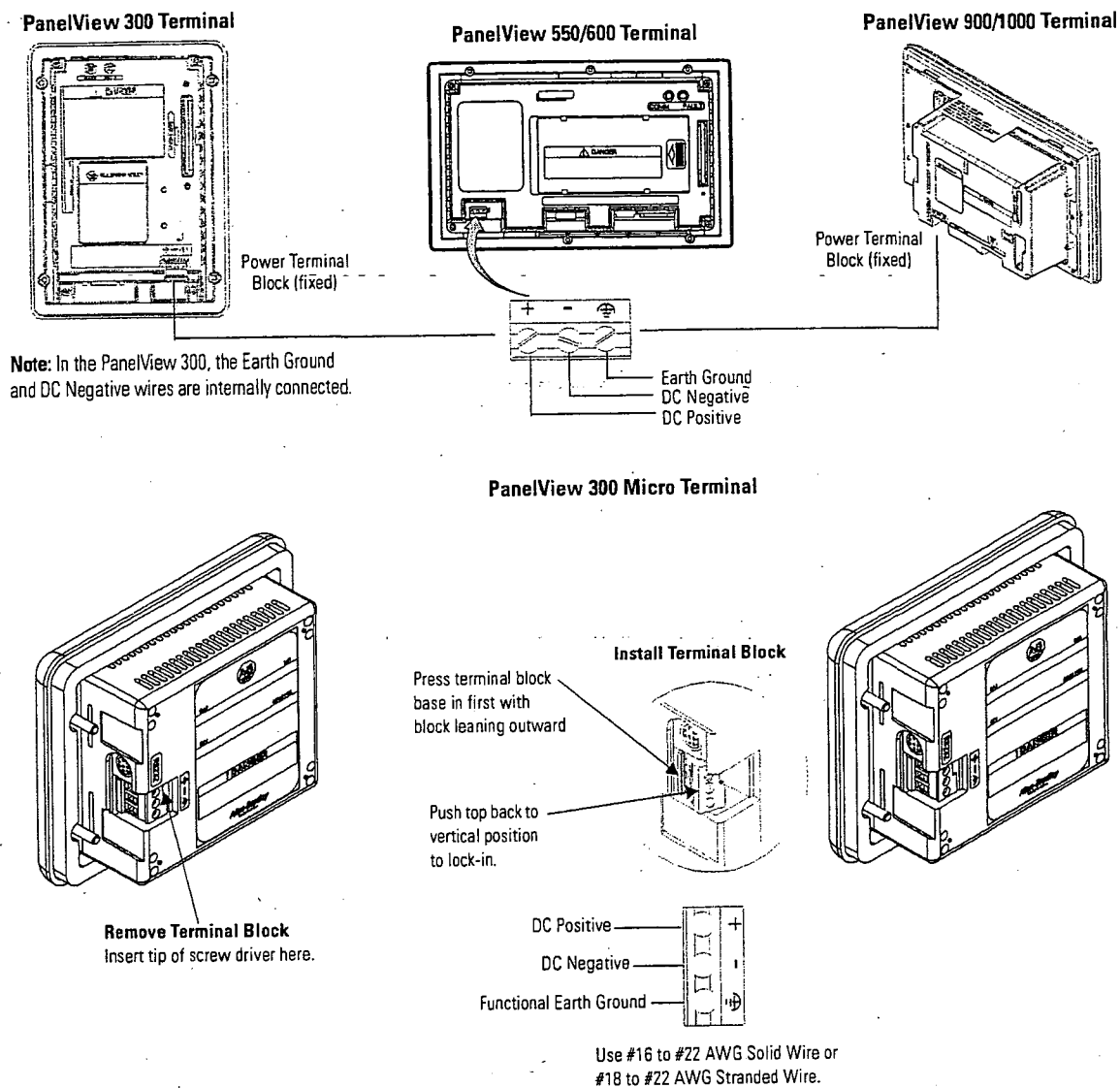
**DANGER****Explosion Hazard**

- Substitution of components may impair suitability for Class I, Division 2.
- Do not disconnect equipment unless power has been switched off and area is known to be non-hazardous.
- Do not connect or disconnect components unless power has been switched off.
- All wiring must comply with N.E.C. article 501-4(b).

## 2-6 Applying Power and Resetting Terminal

**To connect power to the DC versions of the PanelView:**

1. Secure the DC power wires to the terminal block screws.



2. Secure the Functional Earth Ground (FE) wire to the correct terminal block screw.

The DC negative and Functional Earth Ground wires are internally connected in the PanelView 300 Micro.

3. Apply 24V dc power to the terminal.

## Resetting the Terminal

Resetting the terminal re-initializes the PanelView terminal (same as cycling power).

### To reset the PV300, PV300 Micro, PV550 (keypad, keypad & touch) or the PV600 (keypad, keypad & touch):

- Simultaneously press the Left arrow ◀, Right arrow ▶, and Enter ↵ keys. The terminal performs its powerup sequence.

The sequence in which keys are pressed (while running an application), determines what appears after the reset.

- If you press the Left ◀ and Right ▶ arrow keys before the Enter ↵ key, the Configuration Mode menu appears.
- If you press the Enter ↵ key before the arrow keys, the terminal runs the loaded application.

#### TIP

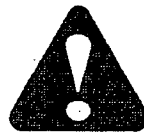


If the Left ◀ or Right ▶ arrow keys on the PanelView 300 Micro are assigned as function keys, you must use the GoTo Configuration Screen button.

### To reset the PV550 & PV600 (touch only)/PV900/PV1000/PV1400:

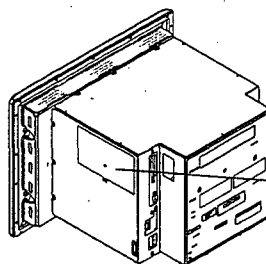
1. Use a narrow non-conductive tool to press the reset button shown below. The terminal performs its powerup sequence.

#### ATTENTION

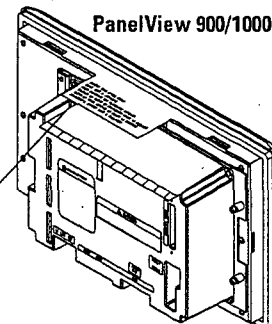


Use a nonconducting object to press the Reset button. **Do not** use a conducting object such as a paper clip which may damage the terminal. **Do not** use the tip of a pencil, graphite may damage the terminal.

PanelView 1400



PanelView 900/1000



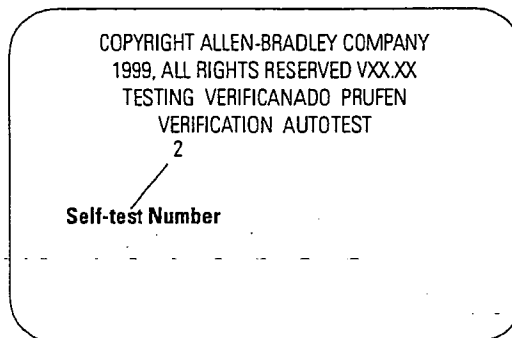
Reset Button

On the PV550/PV600 touch screen terminals, the Reset button is located on the right, below the Memory Card slot.

## 2-8 Applying Power and Resetting Terminal

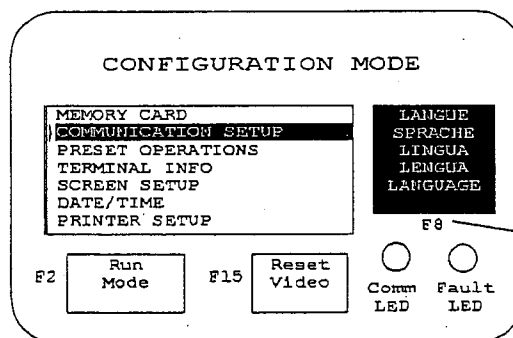
## Power-up Sequence

When resetting or applying power to a PanelView terminal, the terminal runs a series of self-tests. The initial display shows copyright information and the status of each self-test number. See Appendix B for a description of the self-test numbers.



### For DH-485 and RS-232 Terminals

- If an application is loaded, the terminal displays either the screen that was present prior to reset or power down, or the startup screen.
- If an application is not loaded, the Configuration Mode menu appears.



**PV900 Keypad Terminal**

Function keys do not appear on touch screen terminals.

Note: On PV550/600 terminals, the Reset Video is F9.  
On PV300 and PV300 Micro terminals, the Reset Video is F2.

## For Remote I/O Terminals

An out-of-box application screen opens allowing you to set Remote I/O parameters for the terminal. This screen is only available for initial setup. Once an application is downloaded, the Remote I/O setup screen is erased.

The table on the next page defines the Remote I/O Parameters.

**Remote I/O Setup**

Rack #:	<input type="text" value="1"/>	Octal	Rack Size:	<input type="text" value="1/4"/>	F1
Starting Module Group:	<input type="text" value="0.1"/>			<input type="text" value="0.1"/>	F2
Pass-Through Enabled:	<input type="text" value="Yes"/>			<input type="text" value="Yes"/>	F3
Last Chassis:	<input type="text" value="No"/>			<input type="text" value="No"/>	F4
Block Transfer Time out:	<input type="text" value="0"/>			<input type="text" value="0"/>	F5
Baud Rate:	<input type="text" value="57.6K"/>			<input type="text" value="57.6K"/>	F6

PV550 Terminal

**Remote I/O Setup**

Rack # (Octal):	<input type="text" value="2"/>			<input type="text" value="1"/>	F1
Rack Size:	<input type="text" value="1/4"/>			<input type="text" value="1/4"/>	F2
Starting Module Group:	<input type="text" value="0.1"/>			<input type="text" value="0.1"/>	F3
Pass-Through Enabled:	<input type="text" value="Yes"/>			<input type="text" value="Yes"/>	F4
Last Chassis:	<input type="text" value="No"/>			<input type="text" value="No"/>	F5
Baud Rate:	<input type="text" value="57.6K"/>			<input type="text" value="57.6K"/>	F6

PV900 Keypad Terminal

**2-10** Applying Power and Resetting Terminal

Press this function key on:		To set this RIO Parameter:	Description	Options
550/600	900/1000/1400			
↵	F1	Rack #	Rack address of terminal on RIO network. <b>On PV550/600:</b> Press ↵ to open the scratchpad. Enter the rack address and press ↵ again. <b>On PV900/PV1000/PV1400:</b> Press F1 to set the rack #, then use the up and down arrow keys to select an address.	0 to 76
F1	F2	Rack Size	Rack size of terminal. Each key press displays a different size. The terminal occupies a single rack.	1/4, 1/2, 3/4, Full
F2	F3	Starting Module Group	Starting module group number of the terminal in the assigned rack. Each key press displays a different module group.	0,1 2,3 4,5 6,7 - -
F3	F4	Pass-Through Enabled	Enables or Disables Pass-Through, which lets you transfer applications between a computer on a DH+ link and a terminal on a Remote I/O link. A PLC-5 controller passes data between the networks.	Yes or No
F4	F5	Last Chassis	Specifies whether the terminal occupies the last module group in the assigned rack (applies only to PLC2 controllers).	Yes or No
F5		Block Transfer Timeout	Timeout value for block transfers. Each key press toggles a value.	0 to 60 seconds (0 is the default)
F6	F6	Baud Rate	Baud rate at which the terminal will communicate on the RIO network.	BaudMax. Cable Length 57.6K 10,000 ft 115.2K 5,000 ft 230.4K 2,500ft

## Chapter 3

# Configuring the Terminal

### Chapter Objectives

This chapter shows how to use the Configuration Mode menu to configure terminal settings and perform operations including how to:

- access the Configuration Mode menu
- select a language
- use a memory card
- configure communications (DH485, DH+, Remote I/O, ControlNet, DeviceNet, DF1, EtherNet/IP)
- configure presets
- view terminal information
- set the time and date
- adjust display parameters
- set up the printer

### Application Settings

Configuration parameters are set from the terminal or from the PanelBuilder32 software when creating the application. Settings downloaded with the application have priority over terminal settings if the following option is enabled in the Terminal Setup dialog of the PanelBuilder32 software.

☒ Use Downloaded configuration settings

In addition, the application may allow the controller to change the following while the application is running:

- time and date
- current display screen
- piloted control lists

## 3-2 Configuring the Terminal

## Accessing the Configuration Mode Menu

The Configuration Mode menu appears on powerup if an application is not loaded or if the menu was last displayed prior to a reset or power down.

### To access Configuration Mode on keypad terminals:

- If an application is running, simultaneously press the Left ◀ and Right ▶ arrow keys on the terminal keypad.

#### TIP

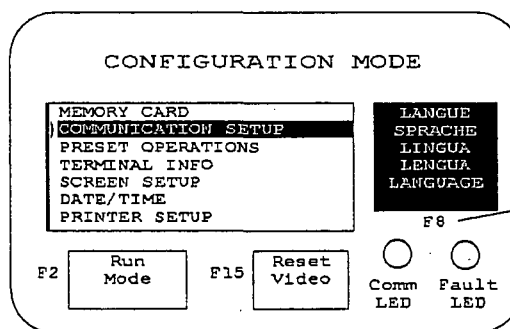
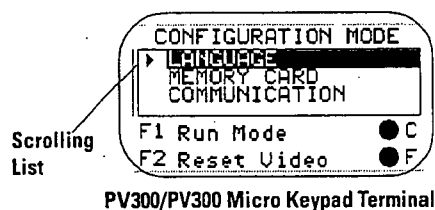


If the Left ◀ or Right ▶ arrow keys on the PanelView 300 Micro are assigned as function keys, you must use the GoTo Config. Screen button.

### To access Configuration Mode on touch screen terminals:

- press the GoTo Config. Screen button on application screen or
- press the filled box in the lower right corner of the screen during powerup.

**Note:** Most of the screens in this chapter are for the PanelView 900 keypad terminal. The screens for other terminals are similar. On keypad terminals you press terminal function keys to modify settings. These keys may differ between terminals depending on the screen size and function key placement. On touch screen terminals, you press the screen field or button.




Function keys do not appear on touch screen terminals.

On PV550/600 terminals, the Reset Video button is F9.

On PanelView 300, 300 Micro terminals, the Reset Video button is F2.

### Operations List

Select an operation using the Up ▲ or Down ▼ arrow keys. Press the Enter ↵ key (keypad terminals) or press  (touch screen terminals) to enter the selection.

#### Language

Displays the language menu.

#### Run Mode

Runs the loaded application.

**Reset Video**

Resets the video to default settings. The reset video function is useful if the screen is set to non-viewable settings.

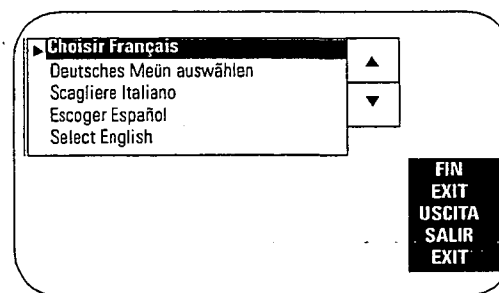
**Comm and Fault LED**

The 2 LEDs on the Configuration Mode menu indicate the operating state of the terminal. The operating states vary for each communication protocol (and the PV300 Micro). See Chapter 13.

## Selecting a Language

Press the Language button, [F8] key, from the Configuration Mode menu to display the Language Selection screen.

**Note:** On PV300 and PV300 Micro terminals, scroll down on the main configuration menu to select a language.



The terminal supports 5 languages:

- French
- German
- Italian
- Spanish
- English

**Language List**

Select a language using the up or down arrow keys. All configuration screens and terminal messages will be displayed in the selected language.

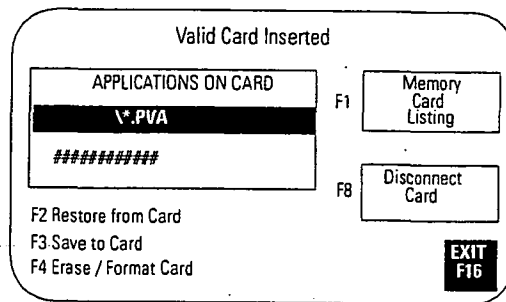
**Exit**

Returns to the Configuration Mode menu.

## 3-4 Configuring the Terminal

## Using a Memory Card

Select Memory Card from the Configuration Mode menu to transfer applications between a memory card and the terminal. The PanelView 300 Micro does not support a memory card. Chapter 4 describes the transfer procedure.



### Memory Card Listing

Displays the file names of applications on the memory card. Only 1 file name is displayed at a time. Press the Memory Card Listing button or [F1] to scroll through the file names. This button does not display the names of font files (\*.OTF).

### Disconnect Card

Closes all files on the memory card. Press Disconnect before removing the card from the slot to ensure all files are closed. A message appears when you can remove the card from the card slot. Failure to follow this procedure could damage the card.

### Applications on Card

Displays the selected application file stored on the memory card.

### Restore From Card

Transfers the application under Applications on Card to the terminal. Any application in the terminal is overwritten.

### Save to Card

Saves the current application in the terminal to the memory card.

### Erase/Format Card

Erases and formats a 2711-NM11, -12, -13, -14, 15 memory card. This function deletes all applications on the card. You can't delete individual files. Don't perform this operation on a 2711-NM2xx ATA card or the card will be inoperable.

### Exit

Returns to the Configuration Mode menu.

## Configuring Communications

Select Communication Setup from the Configuration Mode menu to display or change the communication settings for your PanelView terminal. The screen that appears depends on the communication protocol of the terminal.

### DH-485 Communications

The DH-485 screen lets you modify or display DH-485 settings for either a DH-485 or RS-232 PanelView terminal. Default settings are:

- Max Node Address = 31
- Node Address = 2
- Baud Rate = 19200

#### IMPORTANT

Settings downloaded with a DH-485 application take priority over terminal settings and take effect immediately after the download.

#### Max Node

Opens the numeric entry scratchpad. Enter the highest node number on the network (up to 31) and press the Enter ↵ key. (On touch screen terminals, press the ↵ key on the scratchpad). A change to the maximum node address takes effect immediately.

#### Node

Opens the numeric entry scratchpad. Enter the node address of the terminal (0 - 31) and press the Enter ↵ key. (On touch screen terminals, press the ↵ key on the scratchpad). If you enter a value greater than the maximum node address, the value is accepted and the maximum node address is updated. A node address change takes effect immediately.

#### Baud

Steps through the baud rates with each key press: 1200, 2400, 9600, 19200. The selected baud rate takes effect immediately.

### 3-5 Configuring the Terminal

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#### **Comm LED**

- solid fill - normal operating state
- blinking - no communications established
- no fill - hardware failure

#### **Fault LED**

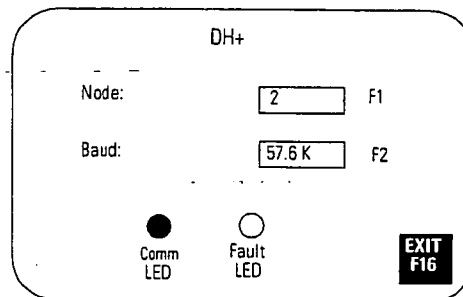
- no fill - normal operating state
- blinking - hardware is functioning but an application is not loaded or the current application is corrupted.
- solid fill - hardware failure

## DH+ Communications

The DH+ screen lets you display or modify communication settings for the DH+ version of the PanelView terminals.

### IMPORTANT

Settings downloaded with a DH+ application take priority over terminal settings and take effect immediately after the download.



### Node

Opens the numeric entry scratchpad. Enter the node address (0 - 77 octal) of the terminal on the DH+ link and press the Enter ↵ key. (On touch screen terminals, press the Enter key on the scratchpad). A node change takes effect immediately.

### Baud

Steps through the baud rates with each key press: 57.6K (default), 115.2K, 230.4K. The selected rate takes effect immediately. The maximum cable length is restricted at higher baud rates.

### Comm LED

- solid fill - normal operating state
- blinking - no communications established
- no fill - hardware failure

### Fault LED

- no fill - normal operating state
- blinking - hardware is functioning but an application is not loaded or the current application is corrupted.
- solid fill - hardware failure

### Exit

Returns to the Configuration Mode menu.

## 3-8 Configuring the Terminal

## Remote I/O Communications

The RIO Configuration screen lets you display communication settings for a Remote I/O terminal. Remote I/O settings are configured with the out-of-box application provided with the terminal or from the PanelBuilder32 software.

RIO Configuration

Rack Number:	3
Rack Size:	Full
Starting Group:	0,1
Pass-Through Enabled:	Yes
Last Chassis:	Yes
Baud:	115.2K F3

No PLC Communication

**EXIT**  
F16

Settings are **read only**, except for baud rate.

### Rack Number (read only)

Displays the current rack number (0 to 76 octal) of the terminal.

### Rack Size (read only)

Displays the current rack size (1/4, 1/2, 3/4 or Full) of the terminal.

### Starting Group (read only)

Displays the starting module group of the terminal: 0,1 2,3 4,5 6,7

### Pass-Through Enabled (read only)

Enables/disables Pass-Through which allows you to transfer applications between a computer on the Allen-Bradley DH+ network and a terminal on the Remote I/O link. A PLC-5 controller passes data between the two networks.

### Last Chassis (ready only)

Indicates whether the terminal occupies the last module group in its assigned rack.

### Baud

Steps through the baud rates with each key press: 57.6K (default), 115.2K, 230.4K. The selected rate takes effect immediately. The maximum cable length is restricted at higher baud rates.

### Exit

Returns to the Configuration Mode menu.

## ControlNet Communications

The ControlNet screen lets you display communications settings for a ControlNet terminal. You are only allowed to change the Node Address and Interscan Delay settings.

### IMPORTANT

Settings downloaded with a ControlNet application take priority over terminal settings and take effect immediately after the download.

The screenshot shows the ControlNet terminal screen with the following fields and buttons:

- New Node Address F2:** A numeric entry field showing "##".
- Active Node Address:** A numeric entry field showing "03".
- Interscan Delay F3:** A numeric entry field showing "100" followed by "ms".
- FW Revision: #####** and **Serial #: #####** (read-only fields).
- Channel Status:** Displays "Channel B" and "Comms Status" displays "Connected".
- Restart Terminal F1** button (top right).
- EXIT F16** button (bottom right).

### New Node Address

Opens the numeric entry scratchpad. Enter the node address (01 - 99 decimal) of the terminal and press the Enter  $\downarrow$  key. On touch screen terminals, press the  $\downarrow$  key on the scratchpad. The initial default is 3. The change takes effect after the terminal is reset. If you enter a value greater than the UMAX node address, the terminal will not go online with the network.

### Active Node Address (read only)

Displays the current address of the PanelView terminal.

### Interscan Delay

Opens the numeric entry scratchpad so you can change the Interscan Delay. Enter the delay (100 to 1000 milliseconds in multiples of 100) and press the Enter key. On touch screen terminals, press the  $\downarrow$  key on the scratchpad. The initial default is 100. A change takes effect immediately.

### FW Revision (read only)

Shows the revision # of the firmware in the ControlNet terminal.

### Serial Number (read only)

Displays a unique, 32-bit serial number for the PanelView terminal.

### Comms Status

Displays the current status of the communication card. *Connected* appears when the PanelView is connected to the network and operating properly.

**3-10** Configuring the Terminal**Channel Status**

Displays a value indicating the current status of channel A and B. The definition of each status condition follows the table. If multiple status conditions apply, the highest priority condition is displayed.

Displayed Value	Status AB	Displayed Value	Status AB	Displayed Value	Status AB	Displayed Value	Status AB
119	77	87	75	55	73	23	71
118	67	86	65	54	63	22	61
117	57	85	55	53	53	21	51
116	47	84	45	52	43	20	41
115	37	83	35	51	33	19	31
114	27	82	25	50	23	18	21
113	17	81	15	49	13	17	11
112	07	80	05	48	03	16	01
103	76	71	74	39	72	7	70
102	66	70	64	38	62	6	60
101	56	69	54	37	52	5	50
100	46	68	44	36	42	4	40
99	36	67	34	35	32	3	30
98	26	66	24	34	22	2	20
97	16	65	14	33	12	1	10
96	06	64	04	32	02	0	00

Status	Indicates	Priority
7	Terminal failure. Contact Allen-Bradley for technical support.	1 (Highest)
6	Self test being performed. Wait for end of test.	2
5	Incorrect node configuration. Check for duplicate nodes.	3
4	Incorrect network configuration (such as overflow/underflow if signaled by host, out-of-step). Check for a node greater than UMAX.	4
3	Cable fault or lonely connection (such as disconnected cable, redundancy warning).	5
2	Temporary network errors (such as bad MAC frame, screeners not programmed).	6
1	Channel ok.	7
0	Channel disabled.	8 (Lowest)

**Restart Terminal**

Resets the PanelView terminal. A new node address takes affect after a reset.

**Exit**

Returns to the Configuration Mode menu.

## DeviceNet Communications

The DeviceNet screen lets you display or modify communication settings for a DeviceNet terminal.

### IMPORTANT

Settings downloaded with a DeviceNet application take priority over terminal settings and take effect immediately after the download.

The screenshot shows the 'DeviceNet' configuration screen. It contains the following fields and controls:

- New Node Address F2:** An empty input box.
- Active Node Address:** A box containing the number '2'.
- New Baud F3:** A box containing '125K'.
- Active Baud:** A box containing '125K'.
- Bus-off Interrupt F4:** A box containing 'Hold in Reset'.
- Interscan Delay F5:** A box containing '500' followed by 'ms'.
- Comms Firmware Revision:** A label with no input field.
- Serial Number:** A label with no input field.
- Restart Terminal F1:** A button with the text 'Restart Terminal' and 'F1' below it.
- Mod/Net LED:** A label with the text 'Mod/Net LED:' and 'Not Connected' below it.
- EXIT F16:** A button with the text 'EXIT' and 'F16' below it.

### Restart Terminal

Resets the terminal.

### New Node Address

Opens the numeric entry scratchpad. Type the node address (0 - 63) of the PanelView on the DeviceNet link or enter 64 to use the address stored on the communications card (Program Mode "PGM" displayed). Press the Enter ↵ key to store the address. On touch screen terminals, press the ↵ key on the scratchpad. A node change takes effect on reset. If 64 is entered, the node address can be set from the network using a DeviceNet network configuration tool.

### Active Node Address (read only)

Displays the current network operating address of the PanelView terminal. The default is 63.

### New Baud

Step through the baud rates with each key press: 125K (default), 250K, 500K, AutoBaud, PGM. If you select AutoBaud, the terminal determines the baud rate on startup (provided there is sufficient network traffic). If you select PGM, the terminal uses the most recent baud rate stored on the communications card. The selected baud rate takes effect on reset. The maximum cable length is restricted at higher baud rates.

**3-12 Configuring the Terminal**

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**Active Baud (read only)**

Displays the current baud rate of the PanelView terminal. The new baud is displayed after a reset. If the baud rate was set to AutoBaud, active baud displays the rate set by the terminal. If the baud rate was set to PGM, the active baud displays the most recent baud stored on the communications card.

**Bus-off Interrupt**

Specifies what occurs when a CAN bus-off interrupt occurs on the DeviceNet network. The PanelView is not allowed network access when Hold on Reset is selected and a Bus-off Interrupt occurs.

- **Hold in Reset** holds the PanelView and waits for a communications reset or a terminal reset.
- **Reset and Continue Communications** resets DeviceNet communications and re-establishes the communications link.

**Interscan Delay**

Opens the numeric entry scratchpad so you can change the delay between scans of the Explicit-Client tags. Enter a value of 0 to 65535 milliseconds and press the Enter ↵ key. (On touch screen terminals, press the ↵ key on the scratchpad.) The default is 500 milliseconds.

This time delay is inserted between each full scan of the Explicit-Client tags in the current screen context. The value is initially set by the downloaded application but can be changed by an operator. The new value takes effect at the end of the current scan delay.

Explicit-Client mode will generate low priority, network messaging at intervals less than 500 milliseconds.

**Input Size**

Displays the number of words (0 to 64) sent by the PanelView in an I/O message. The default value is 0, which indicates that no input data is exchanged with the scanner. This value is set by the downloaded application.

**Output Size**

Displays the number of words (0 to 64) received by the PanelView in an I/O message. The default value is 0, which indicates no output data is exchanged with the scanner. This value is set by the downloaded application.

**Comm LED**

- solid fill - normal operating state
- blinking - no communications established
- no fill - hardware failure

**Exit**

Returns to the Configuration Mode menu.

## DF1 Communications

The DF1 screen lets you display or modify DF1/full duplex communication settings for a DF1 PanelView terminal.

### IMPORTANT

Settings downloaded with a DF1 application have priority over terminal settings and take effect immediately after the download.

#### Typical DF1 Setup Screens

#### Communication Parameters

Sets the communication parameters for the DF1 port on the PanelView terminal. The settings must match the target device. Each key press toggles through the available combinations for:

- Parity = None (default), Even or Odd
- Data Bits = 8
- Stop Bits = 1 (default) or 2

The DF1 port on the PLC-5 controllers allows a parity of Even or None parity with 8 Data Bits. For the SLC controllers, the parity is fixed at None and uses CRC error detection.

#### Baud Rate

Steps through the baud rates for the DF1 communications port with each key press: 1200, 2400, 4800, 9600, 19200. The initial default is 9600. The baud rate must match the baud rate of the target device.

#### Error Detection

Specifies the type of error checking performed on data. The default is CRC (Cyclic Redundancy Check).

- BCC (Block Check Character) - modulo-256 arithmetic sum of an array of data bytes used for medium-level data verification.
- CRC (Cyclic Redundancy Code) - calculated on an array of data bytes and used for high-level data verification.

**3-14 Configuring the Terminal**

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**Node**

Specifies the node number (0 - 254 decimal) for DF1 network communications. For point-to-point communications with an SLC, PLC, MicroLogix or a 1761-NET DNI module, the default node number of 64 is used.

When you press F4, the numeric entry scratchpad opens. Enter a node number and press the Enter  $\downarrow$  key. (On touch screen terminals, press the  $\downarrow$  key on the scratchpad.)

**Handshaking**

Specifies the type of handshaking used by the RS-232 port.

- On (CTS/RTS enabled)
- OFF (CTS/RTS disabled)

Press F5 or touch the box to select an option. The default is Off.

**Comm LED**

- solid fill - normal operating state
- blinking - no communications established with logic controller
- no fill - hardware failure

**Fault LED**

- no fill - normal operating state
- blinking - hardware is functioning but an application is not loaded or the current application is corrupted.

**Exit**

Returns to the Configuration Mode menu.

## EtherNet/IP Communications

The EtherNet/IP screen lets you display or modify some of the EtherNet/IP communication settings for an Ethernet PanelView terminal.

Additional parameters (Gateway Address, DNS Server and Domain Name, and Timeout values) are set in the Communications Setup dialog of the PanelBuilder32 software and downloaded with the application.

### IMPORTANT

Settings downloaded with an EtherNet/IP application have priority over terminal settings and take effect immediately after the download.

EtherNet/IP

DHCP/BootP Enable:

IP Address:

Subnet Mask:

Interscan Delay F3:  ms

FW Revision: ##### Serial #: #####

Ethernet Address: #####

Comms Status Attached

Restart Terminal F1

EXIT F16

### DHCP/BootP Enable

DHCP/BootP Enable (Dynamic Host Configuration Protocol) automatically allocates network devices and configurations to newly attached devices on a TCP/IP network. When DHCP/BootP Enable is enabled, the PanelView terminal is automatically assigned an IP Address and Subnet Mask. These fields will be read only. Select disable to manually enter an IP Address or Subnet Mask for the PanelView terminal.

### IMPORTANT

If DHCP/BootP is enabled in the downloaded application and then disabled on the terminal, the terminal will not have the necessary information (Gateway Address, IP address, Subnet Mask) to connect to the network on a restart. The Gateway Address cannot be entered at the the terminal; you must configure this address in the Communication Setup dialog of PanelBuilder32.

**3-16**    **Configuring the Terminal**

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**IP Address**

A unique address identifying the PanelView node on the EtherNet/IP network. The IP address is formatted as four sets of decimal numbers with periods between them (10.0.0.1). The range of values for the first set of decimal numbers is 1 - 255, unless all fields are set to 0.0.0.0. The range of values for the last three sets of decimal numbers is 0 - 255. The default value is 0.0.0.0. A change is not effective until you reset the terminal.

**Subnet Mask**

A 32-bit value forming the PanelView terminal's subnet mask. This parameter interprets IP addresses when the network is divided into multiple networks. The subnet mask is formatted as four sets of decimal numbers with periods between them (255.255.255.1). The range of values for the first set of decimal numbers is 1 - 255. The range of values for the last three sets of decimal numbers is 0 - 255. The value of 0.0.0.0 is not a valid subnet mask.

**Interscan Delay**

The length of time the PanelView terminal delays before re-reading data from the logic controller. Valid values range from 100 to 1,000 milliseconds. The default is 100.

**Restart Terminal**

Resets the terminal.

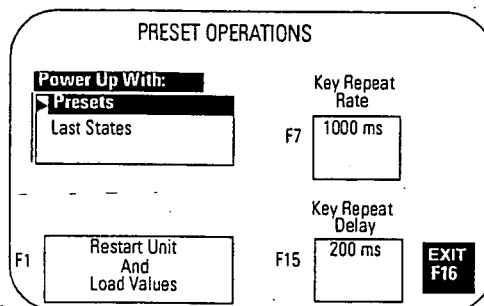
**Exit**

Returns to the Configuration Mode menu.

## Configuring Presets

Select Preset Operations from the Configuration Mode menu to set the values of control objects after a reset or power cycle. You can set presets to:

- values provided by the PanelView application or
- last values entered from terminal prior to a reset or power down.



### Power-Up with Presets or Last States

Displays the current power-up selection. Use the up and down arrow keys on keypad terminals (or the up and down keys on touch screen terminals) to select an option. The selection takes effect the next time the terminal is powered on.

- Select **Presets** to load initial values of control objects (into controller data tables) with values supplied by the application.
- Select **Last States** to load initial values of control objects (into controller data tables) with values entered at the terminal prior to a terminal reset or power down.

### Restart Unit and Load Values

Loads the values selected in the Power-Up With list and resets the terminal.

### Key Repeat Rate

Specifies the number of repeats that occur per second when a key is pressed and held. Steps through key repeat rates: 0 (disabled), 200ms (5 times/sec), 250ms (4 times/sec), 330ms (3 times/sec), 500ms (2 times/sec), 1000ms (1 time/sec).

### Key Repeat Delay

Specifies how long a key must be pressed before it is repeated. Steps through delay rates: 200ms, 400ms, 600ms, 800ms, 1000ms, 1500ms, 2000ms, 2500ms.

### Exit

Returns to the Configuration Mode menu.

## 3-18 Configuring the Terminal

## Viewing Terminal Information

Select Terminal Info from the Configuration Mode menu to display information about your terminal. This information may be needed when calling for technical support.

TERMINAL INFO	
Boot:	#####
Firmware:	#####
Hardware:	#####
Filename:	#####
Fontfile:	#####
#####	Bytes Used
#####	Bytes Free

EXIT  
F16

### Boot

Displays the boot code revision.

### Firmware

Displays the firmware revision.

### Hardware

Displays the hardware configuration.

Keypad (CPS)

Touch Screen (TS)

Keypad and Touch Screen (TS CPS)

Communications Port (P#.xxx, for example, P0.485 or P1.232)

Screen Size (SS5.5, SS6.0, SS9.0, SS10.0, SS14.0)

### Filename

Displays the name of the active application file. If the application file exists but is invalid, the file name appears as \*\*\*\*\*.

- **Bytes Used** displays the number of bytes used by the loaded application.
- **Bytes Free** displays the number of bytes available.

### Font File

Displays the name of the external font file used by the application.

### Exit

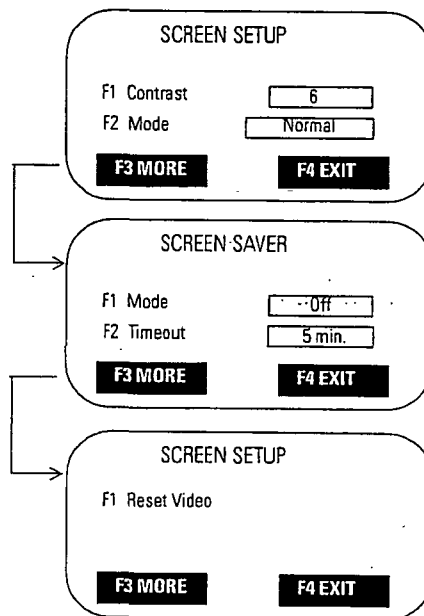
Returns to the Configuration Mode menu.

## Adjusting Screen Parameters

Select Screen Setup from the Configuration Mode menu to adjust settings of the terminal display. Changes take effect immediately.

### PanelView 300 Micro Screen Setup

The PanelView 300 Micro backlight is always on and intensity is not adjustable.



#### Contrast

Increases or decreases the display contrast. The contrast settings range from 0 to 10.

#### Video Mode

Toggles between normal video (dark text/graphics on a light background) and reverse video (light text/graphics on a dark background). Changes take effect immediately.

#### Screen Saver Mode

Mode - Select Timed or Off screen saver. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout

#### Timeout

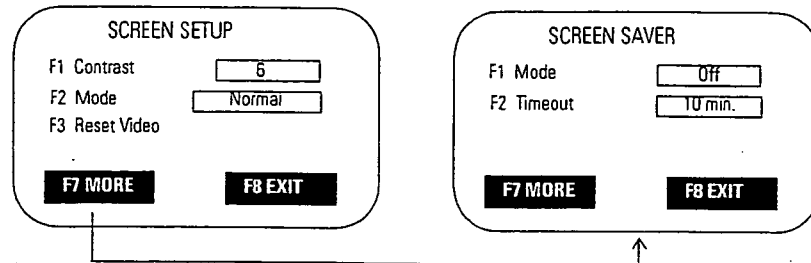
Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in steps with each key press: 5, 10, 15, 20, 25, or 30 minutes.

#### Reset Video

Resets the display to normal (default settings). If the screen is set to a non-viewable setting, press the Left ◀ and Right ▶ arrow keys simultaneously to enter the configuration mode and enter screen setup to reset the screen settings.

## 3-20 Configuring the Terminal

## PanelView 300 Screen Setup

**IMPORTANT**

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

**Contrast**

Increases or decreases the display contrast. The contrast settings range from 0 to 10.

**Video Mode**

Toggles between normal video (dark text/graphics on a light background) and reverse video (light text/graphics on a dark background). Changes take effect immediately.

**Reset Video**

Resets the display to normal (default settings). The [F3] key is also active on the Configuration Mode menu. If the screen is set to a non-viewable setting, press the Left ◀ and Right ▶ arrow keys simultaneously. Then press [F3] to reset the screen.

**Screen Saver Mode**

Mode - Select Timed or Off screen saver. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout

**Timeout**

Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in steps with each key press: 5, 10, 15, 20, 25, or 30 minutes.

**Exit**

Returns to the Configuration Mode menu.

## PanelView 550 Screen Setup

SCREEN SETUP					
F2	Backlight Off	F3	Contrast 10	F4	Video Mode Reverse
F7	Backlight Timeout 10 min.	F9	Reset Video	EXIT F10	

### IMPORTANT

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

### Backlight

Turns the backlight On, Off or to Timed mode. When set to Timed, the Backlight Timeout value determines when the backlight is turned off.

### Contrast

Increases or decreases the display contrast. The contrast settings range from 0 to 10.

### Video Mode

Toggles between normal video (dark text/graphics on a light background) and reverse video (light text/graphics on a dark background). Changes take effect immediately.

### Backlight Timeout

Specifies when the backlight turns off if user input or a controller screen change is not received. The timeout settings are 5, 10, 20, 25, or 30 minutes. The Backlight Timeout value is used when the Backlight parameter is set to Timed.

### Reset Video

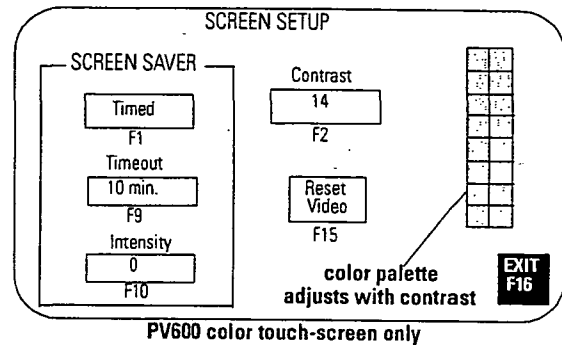
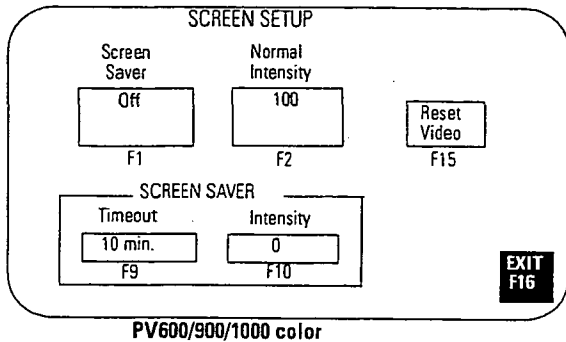
Resets the display to normal (default settings). The reset video [F9] key is also active on the Configuration Mode menu. If the screen is set to a non-viewable setting, press the Left ◀ and Right ▶ arrow keys simultaneously. Then press [F9] to reset the screen.

### Exit

Returns to the Configuration Mode menu.

## 3-22 Configuring the Terminal

## PanelView 600/900/1000 Color - Screen Setup

**IMPORTANT**

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

**Normal Intensity**

Adjusts the intensity of the display with each key press. PV600/1000 settings are 10 - 100, in 10 step increments. PV900 settings are 50 - 100, in 10 step increments.

**Contrast (PV600 touch-screen only)**

Adjusts the contrast of the display with each key press. Valid settings are 1 - 32. The initial default is 14.

**Screen Saver Mode**

Sets the screen saver to Timed or Off. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout box.

**Screen Saver Timeout**

Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in steps with each key press: 5, 10, 15, 20, 25, or 30 minutes.

**Screen Saver Intensity**

Adjusts the intensity of the display during screen saver mode. PV600/1000 settings are 0 - 100, in 10 step increments. PV600 touch-screen only settings are 0 or 100. PV900 settings are 0, and 50 - 100, in 10 step increments. It is recommended that you set the intensity to a value less than 100 to prolong the life of the backlight.

**Reset Video**

Resets the display to normal video (default settings). The reset video [F9] and [F15] keys are active on the Configuration Mode menu. If the screen is non-viewable, press the left ◀ and right ▶ arrow keys simultaneously. Then press [F9] or [F15] to reset the screen.

**Exit**

Returns to the Configuration Mode menu.

## PanelView 900 Monochrome - Screen Setup

SCREEN SETUP		
Normal Intensity	SCREEN SAVER	SCREENCONDITIONER
80	Mode	Mode
F1	Timed	Disabled
Video Mode	F3	F6
Normal	Timeout	Hour Minute
F2	10 min.	## : 0#
Reset Video	F4	F7 F8
F15	Intensity	
	80	
	F5	
		EXIT F16

### IMPORTANT

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

### Normal Intensity

Adjusts the intensity of the display with each key press: 35, 40, 50, 60, 70, 80, 90, 100. A new setting takes effect immediately.

### Video Mode

Toggles between normal video (light text/graphics on a dark background) and reverse video (dark text/graphics on a light background). The change takes effect immediately. Normal video is recommended.

### Screen Saver Mode

Sets the screen saver to Timed or Off. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout box.

### Screen Saver Timeout

Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in steps with each key press: 5, 10, 15, 20, 25 or 30 minutes.

### Screen Saver Intensity

Adjusts the intensity of the display during screen saver mode. The intensity is adjusted with each key press: 0, 35, 40, 50, 60, 70, 80, 90, 100.

**3-24 Configuring the Terminal**

---

**Screen Conditioner Mode**

Enables or disables the screen conditioner. This parameter sets a daily schedule for conditioning the display of a PV900 monochrome terminal to prevent image burn-in.

The conditioning process takes approximately 30 minutes and will not start until the terminal is inactive and in screen saver mode. You can interrupt the screen saver or conditioner at any time by pressing a key or the touch screen. If the screen conditioner is interrupted, it will resume when the screen saver is reactivated.

If you do not use the conditioner, random pixels will illuminate around objects after a period of time (approximately one year).

**Screen Conditioner Hour**

Specifies the hour at which to start the screen conditioner. The numeric entry scratchpad opens. Enter a value between 0 - 23, then press the Enter ↵ key (on touch screen terminals, press the Enter Key on the scratchpad).

**Screen Conditioner Minute**

Specifies the minute at which to start the screen conditioner. The numeric entry scratchpad opens. Enter a value between 0-59, then press the Enter ↵ key (on touch screen terminals, press the Enter key on the scratchpad).

**Reset Video**

Resets the display to normal video (default settings).

On keypad terminals, the reset video [F15] key is also active on the Configuration Mode menu. If the screen is non-viewable, press the Left ◀ and Right ▶ arrow keys simultaneously. Then press [F15] to reset the screen.

**Exit**

Returns to the Configuration Mode menu.

**PanelView 1000 Grayscale -Screen Setup**

SCREEN SETUP		
Screen Saver	Video Mode	Reset Video
Off	Normal	F15
F1	F2	
SCREEN SAVER		
Timeout	Intensity	
10 min.	0	
F9	F10	
		<b>EXIT</b> F16

**IMPORTANT**

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

**Video Mode**

Toggles between normal video (darker text/graphics on a light background) and reverse video (lighter text/graphics on a dark background). The change takes effect immediately. Normal video is recommended.

**Screen Saver Mode**

Sets the screen saver to Timed or Off. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout box.

**Screen Saver Timeout**

Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in 5 minute increments with each key press, from 5 to 30 minutes.

**Screen Saver Intensity**

Adjusts the intensity of the display during screen saver mode. Settings are 0 (lowest intensity) or 100 (highest intensity). 0 is recommended to prolong the display life.

**Reset Video**

Resets the display to normal video (default settings).

On keypad terminals, the reset video [F15] key is also active on the Configuration Mode menu. If the screen is non-viewable, press the Left ◀ and Right ▶ arrow keys simultaneously. Then press reset video [F15] to reset the screen.

**Exit**

Returns to the Configuration Mode menu.

## 3-26 Configuring the Terminal

## PanelView 1400 Color Setup

SCREEN SETUP			
SCREEN SAVER Mode	DEGAUSS Auto	Normal Intensity	
Off	Enabled	100	
F1	F4	F8	
Timeout	Hour	Minute	Reset Video
5 min.	##	0#	F15
F2	F5	F6	
Intensity	Manual Degauss		ALIGN TOUCH GRID
100	F7		EXIT F16
F3			

Touch Screen only

**IMPORTANT**

Certain settings may make viewing the screen difficult. Do not exit this screen until viewing adjustments are acceptable.

**Screen Saver Mode**

Sets the screen saver to Timed or Off. When Timed, the screen intensity is reduced if user input or a controller screen change is not received within the time specified in the Screen Saver Timeout box.

**Screen Saver Timeout**

Specifies when an inactive screen enters screen saver mode. The timeout is adjusted in 5 minute increments with each key press, from 5 to 30 minutes.

**Screen Saver Intensity**

Adjusts the intensity of the display during screen saver mode. The intensity is adjusted with each key press: 0, 25, 50, 75, 100.

**Degauss Auto**

Enables or disables automatic degaussing. The degauss process takes a few seconds and will not start until the terminal is inactive. Automatic degaussing occurs at midnight unless you adjust the hour and time parameters.

**Degauss Hour**

Specifies the hour to start automatic degaussing. The numeric entry scratchpad opens. Enter a value between 0 - 23, then press the Enter ↵ key (on touch screen terminals, press the Enter key on the scratchpad).

**Degauss Minute**

Specifies the minute to start automatic degaussing. The numeric entry scratchpad opens. Enter a value between 0 - 59, then press the Enter ↵ key (on touch screen terminals, press the Enter key on the scratchpad).

**Manual Degauss**

Allows you to manually degauss the display. When you press [F7], the display is degaussed immediately.

**Normal Intensity**

Adjusts the intensity of the display with each key press: 25, 50, 75, 100. The new setting takes effect immediately.

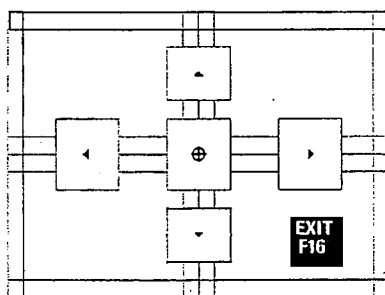
**Reset Video**

Resets the display to normal video (default settings).

On keypad terminals, the reset video [F15] key is also active on the Configuration Mode menu. If the screen is non-viewable, press the Left ◀ and Right ▶ arrow keys simultaneously. Then press [F15] to reset the screen.

**Align Touch Grid - PV1400 Touch Screen only**

Opens the touch alignment screen, which lets you realign the screen with the touch grid. This function is useful when the terminal is positioned at an angle and viewing the screen is difficult unless you realign the screen.



Move the screen until it aligns with the touch cells. Alignment changes are permanent.

Press:	To:
▲	Move the screen up one pixel.
▼	Move the screen down one pixel.
▶	Move the screen to the right 2 pixels.
◀	Move the screen to the left 2 pixels.
⊕	Move the screen to its factory default position.
Exit	Exit the touch alignment screen and return to Screen Setup.

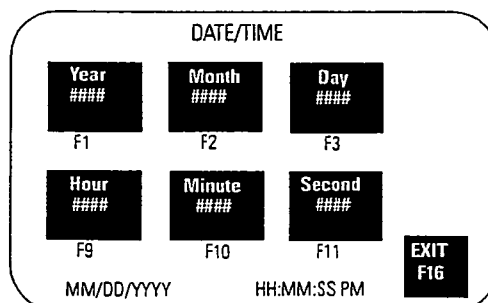
**Exit**

Returns to the Configuration Mode menu.

## 3-28 Configuring the Terminal

## Setting the Time and Date

Select Date/Time from the Configuration Mode menu to reset the date and/or time.



### Setting the Time

Use screen buttons (touch screens) or function keys to set the time.

On PV300, PV300 Micro:	On PV550/PV600 Press:	On PV900/1000/1400 Press:	To:
Use the left and right cursor keys to select the time or date item you want to change. Use the up and down cursor keys to adjust the selected date or time variable.	Hours button [F6]	Hour button [F9] key	Set current hour
	Minute button [F7]	Minute button [F10]	Set minutes
	Second button [F8]	Second button [F11]	Set seconds

The scratchpad opens to enter each setting. Use the terminal keypad to enter the values. Press **↵** after each entry. Changes take effect immediately.

Use screen buttons (touch screens) or function keys to set the date.

Press:	To:
Year button [F1] key	Set current year
Month button [F2]	Set month (1 to 12)
Day button [F3]	Set day (1 to 31)

The scratchpad opens to enter each setting. Use the terminal keypad to enter the values. Press **↵** after each entry. Changes take effect immediately.

### Exit

Returns to the Configuration Mode menu.

## Setting up the Printer

Select Printer Setup from the Configuration Mode menu to set parameters for those terminals equipped with an RS-232 printer port. Any printer that supports the IBM enhanced character set can be connected to the RS-232 printer port.

PRINTER SETUP		
Handshaking	Communication Parameters	Baud Rate
XON/XOFF F1	No Parity 8 Data Bits 1 Stop Bit F2	19200 F3
Top Of Form F9	Port Mode Printing Enabled F10	EXIT F16

### IMPORTANT

The PanelView 300 Micro does not support printer functions.

Printer settings are maintained between power cycles.

Page format parameters for printing are defined in the Terminal Setup dialog of PanelBuilder32 and downloaded with the application.

### Handshaking

Specifies the type of handshaking used by the RS-232 port.

- None (initial default)
- Hardware
- XON/XOFF

If you change the type of handshaking used, you must reset your PanelView before the change takes effect.

### Communication Parameters

Sets the communication parameters for the printer port. Each key press toggles through the available combinations for:

- Parity (None, Even or Odd)
- Data Bits (7 or 8)
- Stop Bits (1 or 2)

### Baud Rate

Sets the baud rate of the printer port. The baud rate must match the baud rate of the printer. The baud rate is adjusted with each key press: 1200, 2400, 4800, 9600, 19200. The initial default is 9600.

**3-30 Configuring the Terminal**

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**Top of Form**

Notifies the PanelView terminal the printer is at the top of a page.

Manually adjust the printer to the top of the page before pressing the Top of Form button. The printer also uses the Perforation Skip Value (if defined in the Printer Setup of the PanelBuilder32 software) when the Top of Form button is pressed.

On powerup, the terminal assumes the printer is at the top of a page. We recommend that you also set the PanelView terminal to the top of the page so that the printer and PanelView are at the same starting point. Otherwise your printout may not start at the top of the page.

**Port Mode**

Enables or disables printing for the RS-232 port.

The RS-232 port on some terminals supports both printing and application transfers. If you disable printing, the port is used for application transfers.

**Exit**

Returns to the Configuration Mode menu.

---

## Using a Memory Card

### Chapter Objectives

This chapter describes:

- supported memory cards
- using the memory card retainer
- loading application from a memory card
- loading application on a memory card
- storing font files on a memory card
- removing a memory card

### Supported Memory Cards

Memory cards are available to transfer application files to/from a PanelView terminal with a memory card slot. The PanelView 300 Micro does not support a memory card.

PanelView terminals running firmware 3.0 (or later) and computers with an ATA card drive support the following cards.

- 4M flash ATA card (Catalog No. 2711-NM24)
- 8M flash ATA card (Catalog No. 2711-NM28)
- 16M flash ATA card (Catalog No. 2711-NM216)

All PanelView terminals and computers with a DataBook TMB240 or TMB250 card drive support these cards:

- 256K flash memory card (Catalog No. 2711-NM11)
- 1M flash memory card (Catalog No. 2711-NM12)
- 2M flash memory card (Catalog No. 2711-NM13)
- 4M flash memory card (Catalog No. 2711-NM14)
- 10M flash memory card (Catalog No. 2711-NM15)

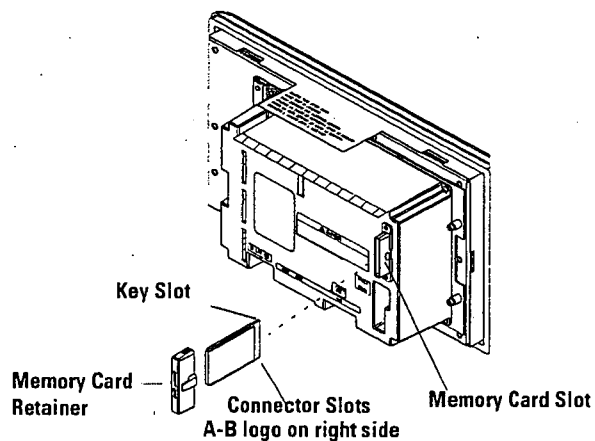
## 4-2 Using a Memory Card

## Using the Memory Card Retainer

A Memory Card Retainer (Catalog No. 2711-NMCC, -NMCD, -NMCE) is shipped with all PanelView terminals, except the PV300 Micro and the PV1400. It is required for:

- UL508 installations
- vibration/mechanical shock environments
- CE certified installations
- installations where the application uses a font file on a memory card, and the card must remain in the terminal during operation.

The following illustration shows the memory card and the memory card retainer. The card loads in the back of the terminal with the key slot on top.



**Note:** The back of the PanelView 900 terminal is shown above. The location of the card slot will vary between the different terminals.

The Memory Card Retainer protects against:

- electrical shock from loose high voltage wires in an electrical enclosure per UL508

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**ATTENTION**

When permanently installing a memory card in an electrical enclosure, the memory card retainer must be used to avoid accidental contact of high voltage leads to metal surfaces on the card. Failure to use the retainer could result in physical injury or damage to the terminal.

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- electrostatic discharge (ESD) up to 15KV

---

**ATTENTION**

Without the memory card retainer installed, electrostatic discharge could reset or damage the PanelView terminal.

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- accidental removal or ejection of the memory card from the card slot.

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**ATTENTION**

Accidental removal of an ATA flash card from the card slot could result in damage to the card.

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## 4-4 Using a Memory Card

## Loading Application from a Memory Card

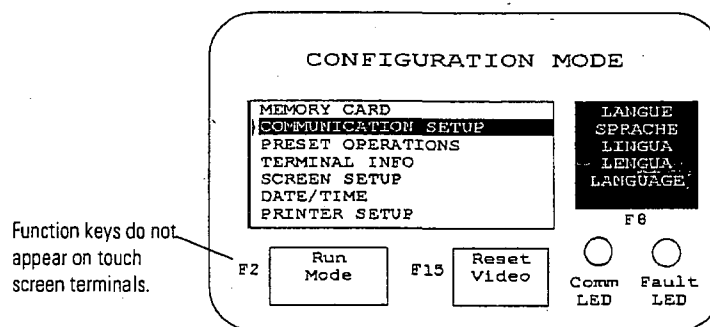
The procedure below shows how to load an application on a memory card into the PanelView terminal.

**ATTENTION**

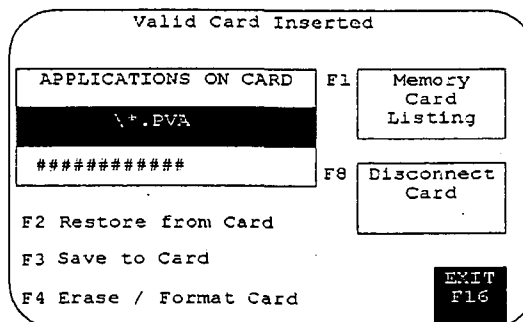

Explosion Hazard - Do not install or remove memory card unless power has been switched off or the area is known to be non-hazardous.

**To load an application from a memory card:**

1. Insert the memory card in the card-slot of the terminal.  
If the terminal does not have an application loaded, the Configuration Mode menu appears. Skip step 2.
2. Open the Configuration Mode menu by simultaneously pressing the Left ◀ and Right ▶ arrows (on keypad terminals), or the Goto Config. Screen button (on touch screen terminals).



3. Select Memory Card and press the Enter ↵ key.



4. Press Memory Card Listing, [F1] on keypad terminals, until the application file you want to load is displayed.

5. Press Restore From Card, [F2] on keypad terminals, to begin the transfer.

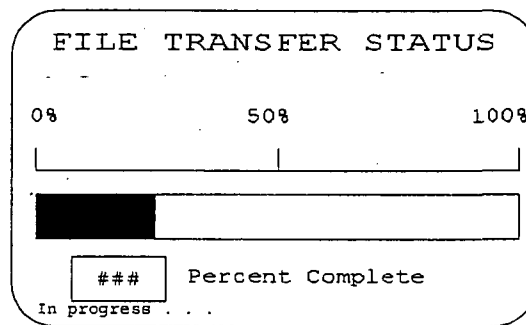
Because this operation overwrites the current application in the terminal, you are prompted to abort or continue.

Proceed with download?

F1 - Abort

F2 - Continue

The terminal displays the status of the transfer.



6. When the transfer is complete, the PanelView terminal checks the validity of the application, resets and runs the application.

## 4-6 Using a Memory Card

## Loading Application on a Memory Card

The steps below show how to load an application in the terminal onto a memory card.

### ATTENTION

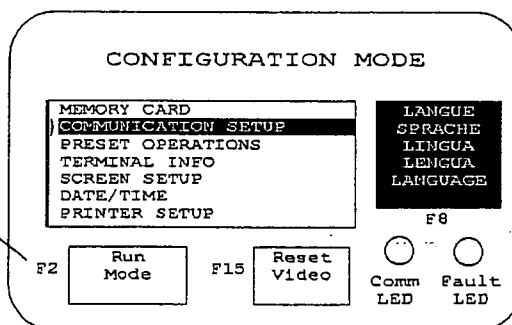


Explosion Hazard - Do not install or remove memory card unless power has been switched off or the area is known to be non-hazardous.

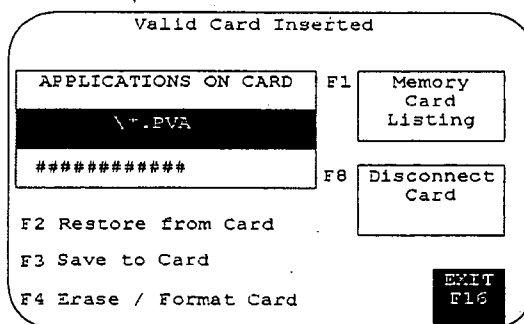
### To transfer an application to a memory card:

1. Insert the memory card into the card slot of the terminal.
2. Open the Configuration Mode menu by simultaneously pressing the Left ◀ and Right ▶ arrows (on keypad terminals), or the Goto Config. Screen button (on touch screen terminals).

Function keys do not appear on touch screen terminals.



3. Select Memory Card and press the Enter ↵ key.



4. If necessary, press Erase/Format Card, [F4] key on keypad terminals, to format or erase a 2711-NM11, -12, -13, -14, -15 memory card.

**IMPORTANT**

Do not perform this operation on a 2711-NM2xx ATA card (where xx is size in megabytes). The card becomes inoperable.

Because this operation erases all data on the memory card, you are prompted to abort or continue.

Format erases entire card?

F1 - Abort

F2 - Continue

5. Press Save to Card, [F3] on keypad terminals, to transfer the application in the terminal to the card.

If the application already exists on the memory card, you are prompted to abort or continue.

The .PVA file exits:

F1 - Abort

F2 - Upload with new PVA file

The terminal displays the status of the transfer.

FILE TRANSFER STATUS		
0%	50%	100%
<div style="border: 1px solid black; width: 100%; height: 20px; position: relative;"> <div style="background-color: black; width: 25%; position: absolute; left: 0;"></div> </div>		
<div style="border: 1px solid black; display: inline-block; padding: 2px;">###</div> Percent Complete		
In progress . . .		

6. When the transfer is complete, the application file name appears in the Applications on Card list. Press Memory Card Listing, [F1] key on keypad terminals, to scroll through the list.

**Note:** If you upload a file that exists on the memory card, the uploaded file name is altered with a sequential digit as a suffix. For example, Control.pva becomes Control0.pva.

For files with eight character names, a digit overwrites the last character. For example, Motorcon.pva becomes Motorco0.pva.

**4-8 Using a Memory Card**

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**Storing Font Files  
on a Memory Card**

Memory cards also store font files for languages used by PanelView applications. The font file contains the character set for the language.

The memory card containing the font file must be inserted in the PanelView terminal while the application is running. The terminal uses the font file to display characters on the application screen.

To view the name of the font file used by an application, select Terminal Info from the Configuration Mode menu.

Because the memory card must remain in the terminal while the application is running, it is recommended that you use the Memory Card Retainer (Cat. No. 2711-NMCC, -NMCD, -NMCE) to secure the card in the card slot. The retainer ensures the card is not accidentally removed or dislodged during terminal operation.

**Removing a Memory Card**

Follow the procedure below to remove a memory card from the PanelView terminal. Failure to follow this procedure may result in damage to the card.

1. Select Memory Card from the Configuration Mode menu.
2. Press the Disconnect Card button. This ensures that all files are closed on the card.  
A message prompts you to remove the card from the slot. You can continue or abort the operation.
3. Press the Continue button.
4. Remove the memory card from the card slot.

On PV1400 terminals, press the Memory Card Eject button.

## Chapter 5

# Running Applications

### Chapter Objectives

This chapter describes operating procedures common to most applications:

screen security	alarms
push button operation	printing
control lists	time or date
numeric entry controls	message displays
ASCII entry controls	numeric data displays
screen selectors	bar graphs
list indicators	analog gauges
multistate indicators	

### Application Information

The application designer is responsible for documenting the operation of an application. Before running the application, you should understand what processes are being controlled and monitored.

#### ATTENTION



Do not press multiple touch screen objects at the same time. Pressing multiple objects simultaneously may result in unintended operation.

### Important Information for PanelView 300 Micro Operations

The Up/Down and Left/Right cursor keys on the PanelView 300 Micro may be assigned as additional function keys. It is the responsibility of the application designer to inform the operator of the assigned functions.

If cursor keys are assigned as function keys, the following (applies to the currently active screen):

- List Selectors and Increment / Decrement objects are disabled if the Up or Down cursor keys are used as function keys.
- Simultaneous pressing of Left and Right cursor keys does not cause the terminal to enter Configuration Mode if the Left and Right cursor keys are assigned as function keys anywhere in the application.
- If both the Left/Right cursor keys are used on a screen and more than one cursor operated object is present on the screen, all of the cursor operated objects must be assigned to a function key.

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## 5-2 Running Applications

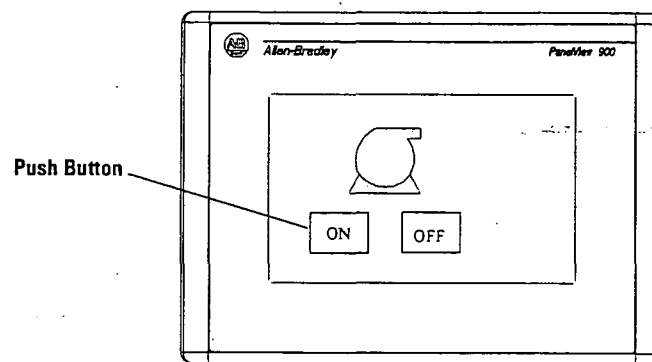
## Screen Security

Access to some application screens (including the terminal configuration screens) may be restricted. Secured screens require you to enter a password before the screen is displayed. It is the responsibility of the application designer to provide operators with required passwords.

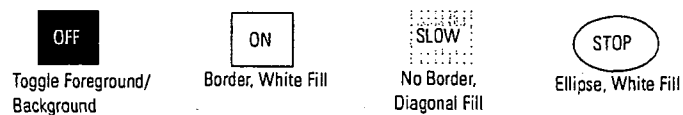
Other screens may allow an authorized operator to select and change the passwords of operators at the terminal.

## Push Button Operation

Screen push buttons function like mechanical push buttons.



Push buttons have a variety of appearances. Push buttons may change their inner text, fill pattern, border or shape when pressed (each state assigned different attributes).

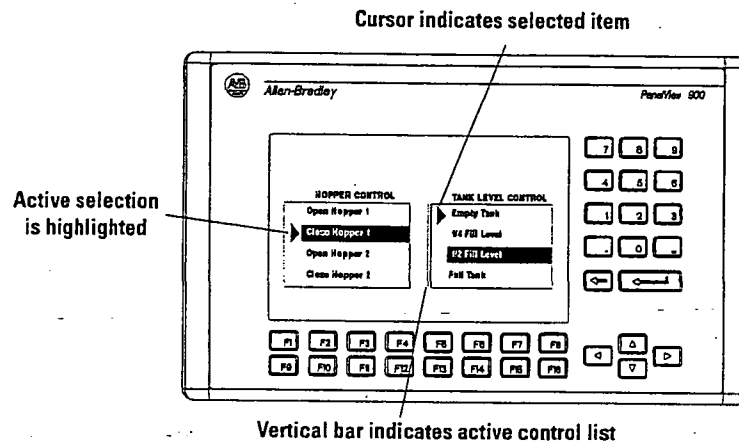


The following are common to most push buttons:

- All push buttons are momentarily disabled (0.5 second) after a screen change. This prevents multiple buttons, in the same location on different screens, from being pressed inadvertently.
- All push buttons must be released on the previous screen before buttons can be pressed on the new screen.
- Momentary push buttons are assigned a hold time. The hold time maintains the pressed state so that each change of state can be read by the controller at least once. The hold time varies between 0 and 1 second depending on the configured setting.

## Control Lists

Control lists perform functions similar to push buttons. They can modify either individual bits or values at a controller address.



### Active List Item

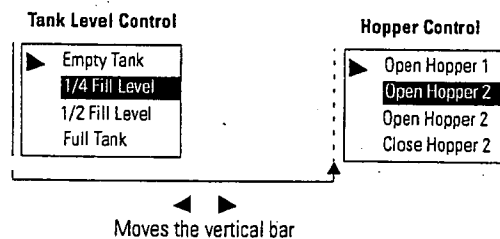
Active item is highlighted.

### Active Control List

Has a vertical indicator bar on the left side of the list. Only one control list or numeric entry cursor point can be active on a screen.

To activate a control list:

- touch the object (touch screen terminals only)
- or press the assigned function key
- or on a screen with multiple control lists or numeric entry cursor points, press the Left ◀ or Right ▶ arrows to move the indicator bar between the objects.

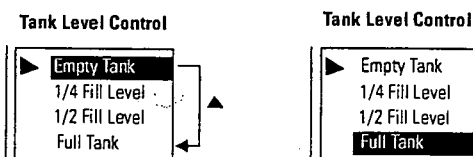


## 5-4 Running Applications

**Cursor**

Indicates the selected item. Move the cursor up or down the control list using the Up ▼ and Down ▲ arrow keys. Cursor operation is configured by the application designer. If the cursor is at the first or last item in a control list pressing the Up arrow (when at the top) or the Down arrow (when at the bottom) will either:

- cause no movement of the cursor, or
- move the cursor to the top or bottom of the list.



If the list contains more items than can appear at one time, the list scrolls. If the cursor is at the top or bottom of a scrolling list, the list scrolls one row at a time as the arrow keys are pressed.

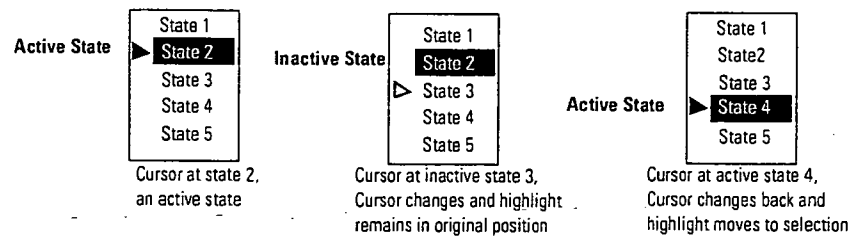
**List Keys**

Touch screen terminals require list keys on the screen to move the cursor in a control list and select entries. The following table shows the list keys.

List Key	Type	Description
	<b>Move Up</b>	Moves the cursor to the previous item in the list.
	<b>Move Down</b>	Moves the cursor to the next item in the list.
	<b>Home</b>	Moves the cursor to the first item in the list.
	<b>End</b>	Moves the cursor to the last item in the list.
	<b>Page Up</b>	Moves the cursor up one page in a scrolling list.
	<b>Page Down</b>	Moves the cursor down one page in a scrolling list.
	<b>Backspace</b>	Returns the cursor to the currently highlighted selection.
	<b>Enter</b>	Confirms a selection and sends the value to the controller if Write on Enter was configured for the control list.

**Cursor - Piloted Control Lists**

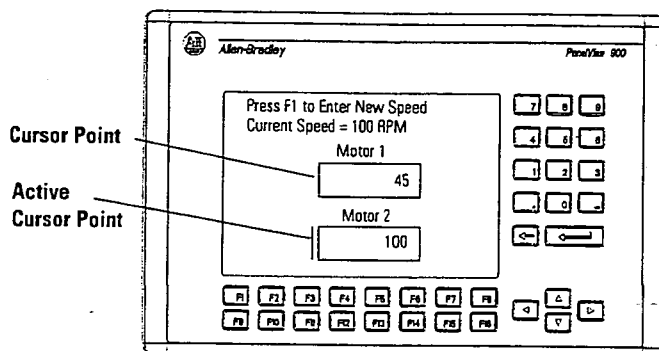
On a piloted control list, some items are under controller operation only. In addition, some items may be designated as inactive. You cannot select controller items or inactive items. In both cases, the cursor is hollow when you select the item.

**To select an item on a control list:**

1. Select the control list by:
  - touching the screen object (touch screen terminals only)
  - or pressing its function key
  - or pressing the Left ◀ or Right ▶ arrow keys until the control list has a vertical bar indicating it is active
2. Move the cursor up or down the list using the Up ▲ or Down ▼ arrows. If the cursor is hollow, the item cannot be selected.
3. Depending on the application design, you may or may not have to press ↵ to enter the selection indicated by the cursor.

## 5-6 Running Applications

Two types of controls allow a numeric value at a controller address:  
Cursor Point and Keypad Enable button.



### Numeric Entry Cursor Point

34962

Cursor points appear as a box. A vertical line on the left side of the box appears when the cursor point is selected. Data is entered in a numeric entry scratchpad.

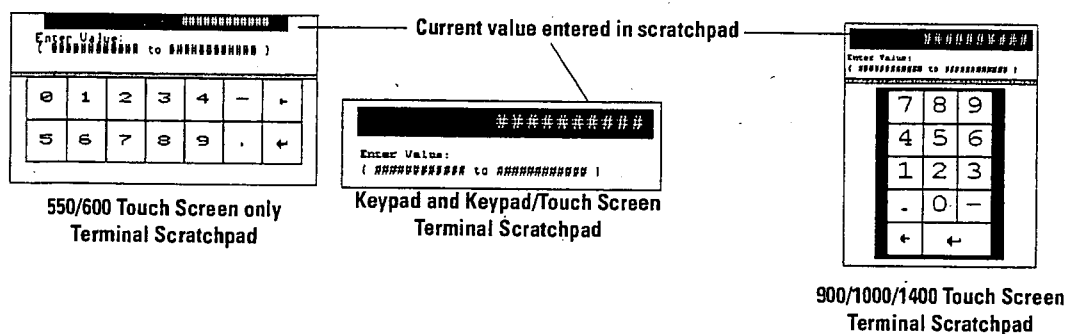
### Keypad Enable Button

Enter Value  
367

A keypad enable button appears like a standard push button. The data displayed in the button is the last value sent to the button's tag address. When selected, a numeric entry scratchpad opens.

### Scratchpad

Both controls display a numeric entry scratchpad in the center of the screen. The scratchpad shows the current value entered and the range of possible values you can enter.



During data entry, wait until the number you enter appears in the scratchpad before entering the next number.

**To enter a cursor point:**

1. Select the cursor point by:
  - touching the object (touch screen terminal only)
  - pressing the associated function key
  - press the Left ◀ or Right ▶ arrows until the cursor point shows a vertical bar
2. Press Enter ↵ or type the first digit of the number you want to enter.  
The scratchpad opens.
3. Enter the value using the terminal keypad and press Enter ↵.

**To enter a value using the keypad enable button:**

1. Press the keypad enable button.  
The scratchpad opens.
2. Enter the value using the terminal keypad and press Enter ↵.

**To change an entry on a scratchpad:**

1. Press the backspace ← key to delete one character at a time.
2. Enter a new value and press Enter ↵.

**To cancel a scratchpad:**

1. Press the Backspace ← key to delete one character at a time.  
When pressing the Backspace ← key in an empty scratchpad

## 5-8 Running Applications

**PanelView 300, 300 Micro Thumbwheel Scratchpad**

The thumbwheel scratch pad allows an operator to enter values on terminals without a numeric keypad or touch screen by cycling through the available characters one position at a time. Use the Up ▲ and Down ▼ cursors to cycle through the available characters. The thumbwheel scratchpad shows:

- display area where the value is entered or modified
- ESC - F1 key to exit the scratchpad without saving any changes or sending a value.

Scroll through and select digits 0-9. You can select the sign (+, -) from the leftmost column. If the decimal point is keypad controlled, you can also select a decimal point (if one has not been previously selected).

Keys	Function
Left / Right Cursor ◀ ▶	Moves the cursor one position to the left or right in the display area. The cursor wraps around to the opposite side when reaching the leftmost or rightmost character,
Up /Down Cursor ▲ ▼	Cycles through the available characters at the cursor position.
Enter Key	Send the numeric value to the logic controller. Leading and trailing spaces are removed.

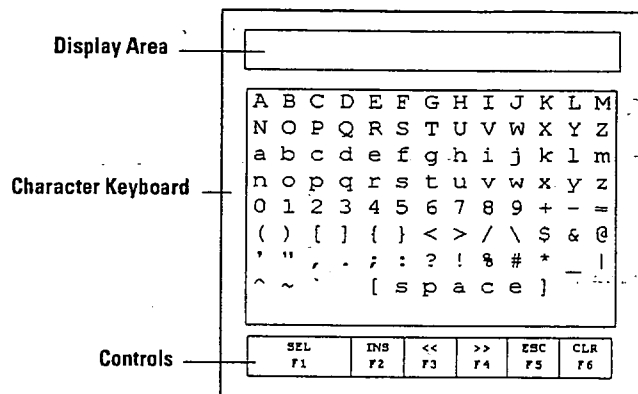
**TIP**

The Up/Down/Left/Right cursor keys can have an autorepeat configured. If you hold down the key, the key is repeated at the set key repeat rate.

## ASCII Entry Controls

ASCII entry controls allow you to send an alphanumeric string (up to 128 characters) to a controller. Like numeric entry controls, the ASCII entry control can appear on a screen as a keypad enable button or a cursor point. When either object is activated, the ASCII scratchpad opens. The look of the scratchpad depends on the terminal.

### ASCII Scratchpad - Keypad or Keypad/Touch Screen Terminals



Select characters from the Character Keyboard by moving the cursor (with the keypad arrows) over a character and pressing the Sel-F1 function key. The character appears in the Display Area. This area scrolls so you can enter a string that is longer than the Display Area. All characters are sent to the controller even if not visible.

After entering characters, press ↵ to send the string to the controller. The leftmost character is placed in the high byte of the first word (of the write tag), the next character in the low byte, and so on.

**Note:** DeviceNet ASCII entry allows for byte swapping.

Controls	Location	Function
⬅➡⬆⬇	Terminal Keypad	Moves the cursor up, down, left, or right in the Character Keyboard.
←	Terminal Keypad	Deletes the character to the left of the cursor in the Display Area. If the cursor is at the leftmost position when you press ←, the scratchpad closes.
↵	Terminal Keypad	Sends the character string to the assigned write tag address in the controller. When opening the ASCII scratchpad, the string is highlighted. If you select a character immediately, the terminal clears the Display Area and displays the selected character. If you press a control key, the terminal continues to display the existing string, allowing you to edit it.
SEL F1	Function Keys	Selects the highlighted character and places it at the cursor position in the Display Area.
INS F2	Function Keys	Toggles between Insert and Overstrike mode. Overstrike mode appears in reverse video. In Insert mode, the selected character is inserted before the cursor in the Display Area. If the maximum number of characters is entered in the Display Area, new characters are ignored. In Overstrike mode, the selected character replaces the character at the cursor in the Display Area.
<< F3	Function Keys	Moves the cursor one character to the left in the Display Area.
>> F4	Function Keys	Moves the cursor one character to the right in the Display Area.
ESC 5	Function Keys	Closes the scratchpad without making any changes.
CTRL F6	Function Keys	Clears the string in the Display Area.

## ASCII Scratchpad - 300 Micro/300 Terminals

The thumbwheel scratch pad allows an operator to enter values on terminals without a numeric keypad or touch screen by cycling through the available characters one position at a time. This is the character sequence:

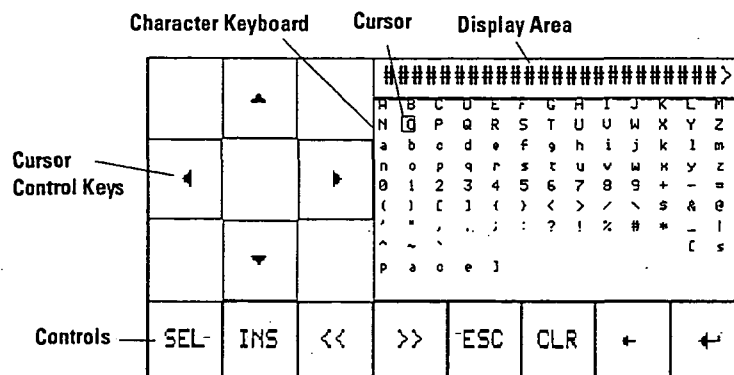
<space> A-Z, a-z, +-=()[]{}<>/\ \$ & @ ' " , . ; ? ! % # \* \_ ^ ~ ` ' | ¢  
 ß ° £ ¤ Ç µ à á â ä Å ê ë é Ê Ì Í Î Ñ Ò Ó Ô Ö Ø Ù Ú Û Ü Ü, 0-9

The default scratchpad indicates <space>. Pressing the Up or Down cursor keys on a <space> cycles through the available characters beginning at A. Pressing the Down cursor cycles back through the list beginning at 9.

The scratchpad has the following function keys:

Keys	Function
F1 - ESC	Exits the scratchpad without saving any changes or sending characters to the logic controller.
F2 - Clear	Clears all characters in the display area.
F3 - INS	Inserts a space at the current cursor position.
F4 - DEL	Deletes the character at the current cursor position.

## ASCII Scratchpad - 550/600 Touch Screen Terminals



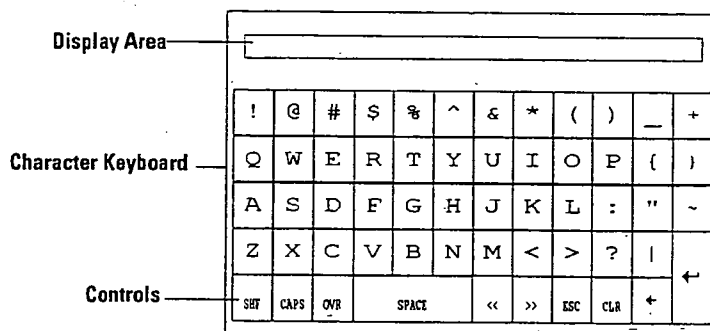
To select characters from the Character Keyboard, press the cursor control keys to move the cursor over a character and then press the SEL key. The character is entered in the Display Area. This area scrolls so you can enter a string that is longer than the Display Area. All characters are sent to the controller even if not visible.

After entering the characters, press ↵ to send the string to the controller. The leftmost character is placed in the high byte of the first word (of the write tag), the next character in the low byte, and so on.

**Note:** DeviceNet ASCII entry allows for byte swapping.

Controls	Function
⬅➡⬆⬇	Moves the cursor up, down, left, or right in the Character Keyboard.
SEL	Selects the highlighted character and places it at the cursor position in the Display Area.
INS	Toggles between Insert and Overstrike mode. Overstrike mode appears in reverse video. In Insert mode, the selected character is inserted before the cursor in the Display Area. If the maximum number of characters is entered in the Display Area, new characters are ignored. In Overstrike mode, the selected character replaces the character at the cursor in the Display Area.
<<	Moves the cursor one character to the left in the Display Area.
>>	Moves the cursor one character to the right in the Display Area.
ESC	Closes the scratchpad without making any changes
CLR	Clears the string in the Display Area.
←	Deletes the character to the left of the cursor in the Display Area.
↵	Sends the character string to the assigned write tag address in the controller. When opening the ASCII scratchpad, the string is highlighted. If you select a character immediately, the terminal clears the Display Area and displays the selected character. If you press a control key, the terminal continues to display the existing string so you can edit it.

## ASCII Scratchpad - 900/1000/1400 Touch Screen Terminals



Select characters by touching the Character Keyboard on the screen. The character is entered in the Display Area. This area scrolls so you can enter a string that is longer than the Display Area. All characters are sent to the controller even if not visible.

After entering the characters, press **↵** on the scratchpad to send the characters to the controller. The leftmost character is placed in the high byte of the first word (of the write tag), the next character in the low byte, and so on.

**Note:** DeviceNet ASCII entry allows for byte swapping.

Controls	Function
SHF (Shift)	By default this function is off and keys are in unshifted state. When you press SHF, the button appears in reverse video. All character keys, including numbers and symbols, appear in the shifted state. For example, a becomes A; 2 becomes @.
CAPS	By default, keys appear in lowercase. When you press CAPS, the button appears in reverse video. Letters appear and are entered in uppercase but numbers and symbols are not shifted. This state is maintained between power cycles.
INS	Toggles between Insert and Overstrike mode. Overstrike mode appears in reverse video. In Insert mode, the selected character is inserted before the cursor in the Display Area. If the maximum number of characters is entered in the Display Area, new characters are ignored. In Overstrike mode, the selected character is replaced at the cursor in the Display Area.
<<	Moves the cursor one character to the left in the Display Area.
>>	Moves the cursor one character to the right in the Display Area.
ESC	Closes the scratchpad without making any changes.
CLR	Clears the string in the Display Area.
←	Deletes the character to the left of the cursor in the Display Area.
↵	Sends the character string to the assigned write tag address in the controller. After pressing ↵ to open the ASCII scratchpad, the string is highlighted. If you select a character immediately, the terminal clears the Display Area and displays the selected character. If you press a control key, the terminal continues to display the existing string so you can edit it.

## ASCII Scratchpads in Other Languages

The ASCII Scratchpad is available with character keyboards in:

- French
- German
- Italian
- Spanish

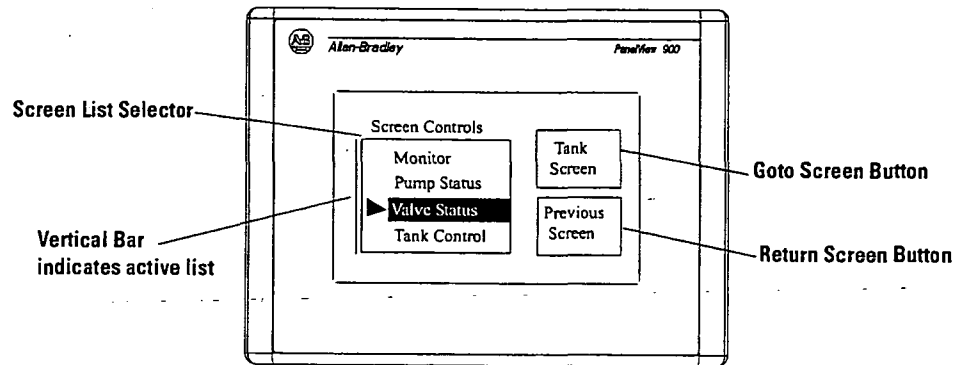
If the PanelView terminal is configured for operation in one these languages, the ASCII scratchpad will display the appropriate Character Keyboard.

The SHF control toggles between SHF/SHF2. In SHF mode, the Character Keyboard displays the shifted state characters (e.g., a to A, and 3 to #). In SHF2 mode, the Character Keyboard displays additional characters available for the language.

## 5-14 Running Applications

## Screen Selectors

The 2 types of screen selector controls are Screen List Selectors and Screen buttons.



Goto and Return screen buttons can have a variety of appearances such as unique inner text, fill pattern, border or shape. Return screen buttons display the previous screen. Goto screen buttons display the assigned screen.

Screen lists display a list of application screens. The selected screen is highlighted.

**To activate a screen list:**

- touch the object (touch screen only)
- or press the assigned function key
- or on a screen with multiple screen lists, press the Left ◀ or Right ▶ arrow key until a vertical bar appears.

**To select an item on a screen list:**

1. Move the cursor up or down the list using the Up ▲ or Down ▼ arrow keys.

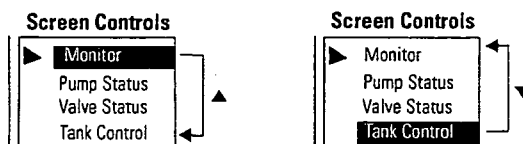
2. Press Enter ↵ to enter the selection.

The selected screen is displayed.

### Cursor Operation

Cursor operation is configured by the application designer. If the cursor is at the first or last item in a screen list, pressing the Up ▲ arrow (when at top) or Down ▼ arrow (when at bottom) will either:

- cause no movement of the cursor, or
- move the cursor to the top or bottom of the list



If a screen list contains more items than can appear at one time, the list scrolls. If the cursor is at the top or bottom of a scrolling list, the list scrolls one row at a time as the Up/Down arrows are pressed.

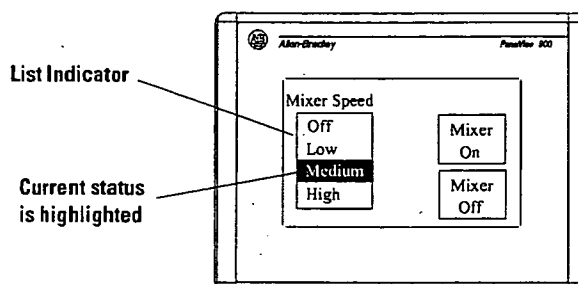
### List Keys

Touch screen terminals require list keys on the screen to move the cursor in a screen list and select an entry. The following table shows the list keys.

List Key	Type	Description
	Move Up	Moves the cursor to the previous item in the list.
	Move Down	Moves the cursor to the next item in the list.
	Home	Moves the cursor to the first item in the list.
	End	Moves the cursor to the last item in the list.
	Page Up	Moves the cursor up one page in a scrolling list.
	Page Down	Moves the cursor down one page in a scrolling list.
	Backspace	Returns the cursor to the currently highlighted selection.
	Enter	Confirms a selection and displays the screen.

## List Indicators

List indicators highlight an item from a list depending upon the status of either a bit or value at a controller address.



An indicator list may have a maximum of 255 entries. The list automatically scrolls to display the status of an item. **Note:** List indicators do not have a cursor ► like control or screen selector lists.

## Multistate Indicators

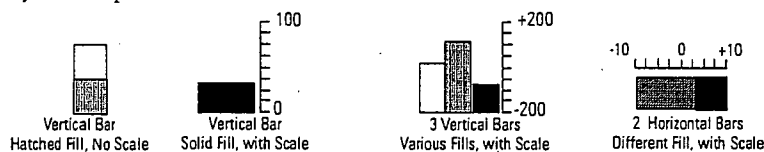
Multistate indicators display the status of either a bit or value at a controller address.

Multistate indicators can have a variety of appearances. In addition, multistate indicators may change their inner text, fill pattern, or graphic with each state (each state assigned different attributes). Each indicator may have up to 2,000 states.



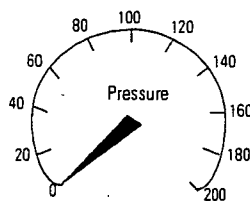
## Bar Graph Displays

Bar graphs provide a graphical representation of a variable value. Bar graphs can appear with or without scales and border, and can have a variety of fill patterns.



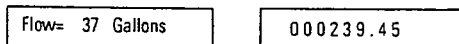
## Analog Gauges

The analog gauge uses a rotating needle to display a process variable such as speed, temperature or pressure. The gauge consists of a circular scale with tick-marks, 1 to 4 needles, and a label with text or variable data. The circular scale is an integral part of the gauge but can be created separately.



## Numeric Data Displays

Numeric Data Displays may appear with or without supporting text.



Depending on the application design, displayed data may have these properties:

- zero fill
- fixed, floating or no decimal point
- different field widths (number of digits)
- various text sizes
- scaled

## Message Displays

Message displays contain alphanumeric characters and are displayed when triggered by a controller. The message display can be any size and will not overlap other controls. Messages may contain:

- alphanumeric text
- variable data
- graphics
- time and date

## Time or Date

Time and date information can appear as a separate item or in some control/display objects (push buttons, multistate indicators, message displays or data displays). A time and date can appear with or without supporting text.

The date can have a variety of formats.

Month/Day/Year 7/3/01	With Leading Zeroes 07/03/01
Day/Month/Year 3/7/01	With 4 Digit Year 3/7/2001
Year/Month/Day 01/7/3	With User-Defined Separator 7*3*01

The time can also have a variety of formats.

12 Hour Format 2:56	With Time Zone & Time Standard Designations 07/03/00
24 Hour Format 14:56	With Leading Zeroes 02:56
with Seconds 14:56:29	With User-Defined Separator 14*56*29

## Printing

Terminals equipped with an RS-232 printer port can print:

- triggered messages in a message display
- triggered states of a multistate indicator
- alarm messages
- alarm list

Text is printed without formatting options. Print attributes for objects and alarms are defined in the application.

Printing is a background operation. While printing, the terminal continues to update and you can perform other terminal operations.

The terminal prints messages in the order they are received. If the print buffer is full, the terminal displays a queue full warning message. New print requests are aborted.

The print queue is not maintained between power cycles. Any messages in the queue when the terminal is reset are cleared.

## Alarms

Applications that support alarms may contain:

- Alarm Banner display that pops up when an alarm is triggered
- Alarm buttons that enable the operator to act on an alarm (Print Alarm, Acknowledge Alarm, Clear Alarm, Acknowledge All)
- Alarm List which stores information on triggered alarms (Print Alarm List or Clear Alarm List button)

Alarm configurations are application dependent. Consult your application designer for details on how to handle alarms for your application.

## Chapter 6

# Installing the PV300 Micro Terminal

## Chapter Objectives

This chapter shows how to install the PanelView 300 Micro terminal and covers:

- hazardous locations
- enclosures
- required tools
- mounting dimensions
- clearances
- cutout dimensions
- installing the PV300 micro terminal in a panel

## Hazardous Locations

This equipment is suitable for use in Class 1, Division 2, Groups A, B, C, D or non-hazardous locations only. The following DANGER statement applies to use in hazardous locations.

### DANGER



#### Explosion Hazard

- Substitution of components may impair suitability for Class I, Division 2.
- Do not disconnect equipment unless power has been switched off and area is known to be non-hazardous.
- Do not connect or disconnect components unless power has been switched off.
- All wiring must comply with N.E.C. article 501-4(b).

Use only the following communication cables in Class 1, Division 2, Hazardous Locations.

Environmental Classification	Communication Cable
Class I, Division 2, Hazardous Locations	1761-CBL-PM01, Series C
	1761-CBL-HM02, Series C
	1761-CBL-AM00, Series C
	1761-CBL-AP00, Series C
	2711-CBL-PM05, Series C
	2711-CBL-HM05, Series C
	2711-CBL-PM10, Series C
	2711-CBL-HM10, Series C

Publication 2711-UM014B-EN-P

## 6-2 Installing the PV300 Micro Terminal

## Enclosures

Mount the PanelView 300 Micro terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA 12/13, 4X (indoor use), IP54 or IP65 ratings only when properly mounted in a panel or enclosure with the equivalent rating. Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the PanelView 300 Micro terminal must be between 0° and 55° C (32° and 131° F).

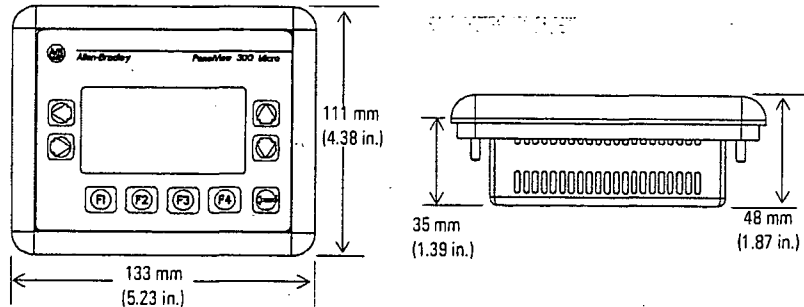
Make provisions for accessing the side panel of the terminal for wiring, maintenance and troubleshooting.

## Required Tools

Other than the tools required to make panel or enclosure cutouts, the tools required for installation are:

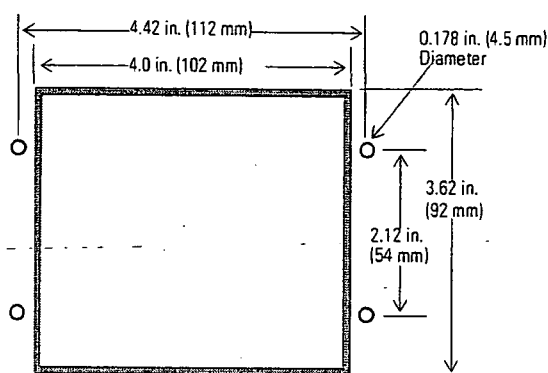
- 7mm (M4) deep well socket wrench or nut driver
- small slotted screwdriver
- torque wrench (in/lbs)

## Mounting Dimensions



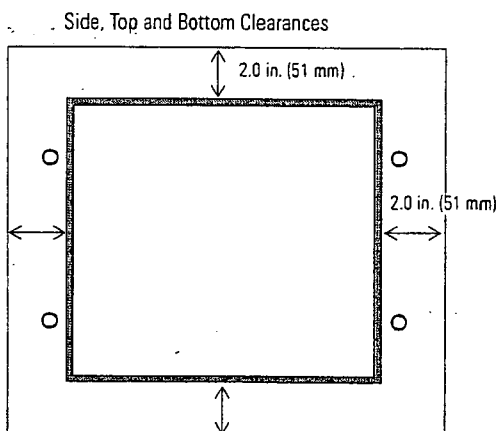
## Cutout Dimensions

Use the full size template shipped with the PV300 Micro to mark the cutout dimensions. The figure below shows a reduced scale cutout. A full scale template is also available inside the back cover of this document.



## Clearances

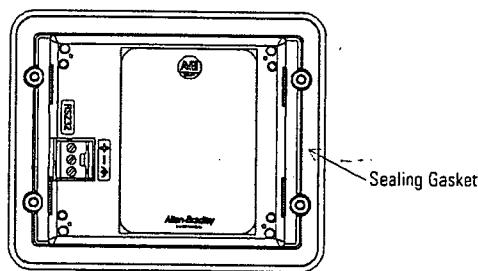
Allow 51 mm (2.0 inches) of space on all sides of the terminal for adequate ventilation and maintenance.



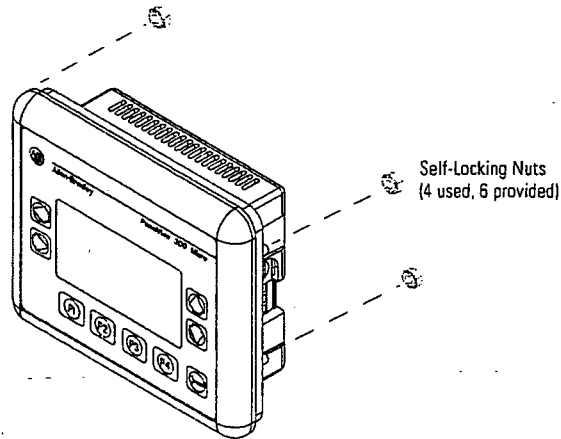
**6-4** Installing the PV300 Micro Terminal**Installing Terminal in Panel** To install the PV300 Micro in a panel:**ATTENTION**

- Disconnect all electrical power from the panel before making cutout.
- Make sure area around the panel cutout is clear.
- Take precautions so that metal cuttings do not enter any components already installed in panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

3. Cut an opening in the panel using the panel cutout provided with the terminal. Remove sharp edges or burrs.
4. Make sure the sealing gasket is properly positioned on the terminal (as shown below). This gasket forms a compression type seal. Do not use sealing compounds.



5. Place the terminal in the panel cutout.
6. Install the 4 self-locking nuts, hand tight.



7. Alternately tighten the self-locking nuts until the terminal is held firmly against the panel. Tighten the nuts to a torque of 10 inch-pounds. Do not overtighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

## 6-6 Installing the PV300 Micro Terminal

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## Chapter 7

# Installing the PV300 Terminal

### Chapter Objectives

This chapter shows how to install the PanelView 300 terminal and covers:

- hazardous locations
- enclosures
- required tools
- mounting dimensions
- clearances
- cutout dimensions
- installing the PV300 terminal in a panel

### Hazardous Locations

See the nameplate label on terminal for hazardous location certifications.

#### DANGER



#### Explosion Hazard

- Substitution of components may impair suitability for Class I, Division 2.
- Do not disconnect equipment unless power has been switched off and area is known to be non-hazardous.
- Do not connect or disconnect components unless power has been switched off.
- All wiring must comply with N.E.C. article 501-4(b).

The PV300 terminals have an operating temperature code of T4 (maximum operating temperature of 135° C or 275° F). **Do not** install these terminals in environments where atmospheric gases have ignition temperatures less than 135° C (275° F).

**7-2 Installing the PV300 Terminal**

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**Enclosures**

Mount the PV300 terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA Type 12/13 and 4X (indoor use) ratings only when mounted in a panel or enclosure with the equivalent rating.

Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the terminals must be between 0° and 55° C (32° and 131° F).

Make provisions to access the back panel of the terminal for wiring, maintenance, installing a memory card and troubleshooting.

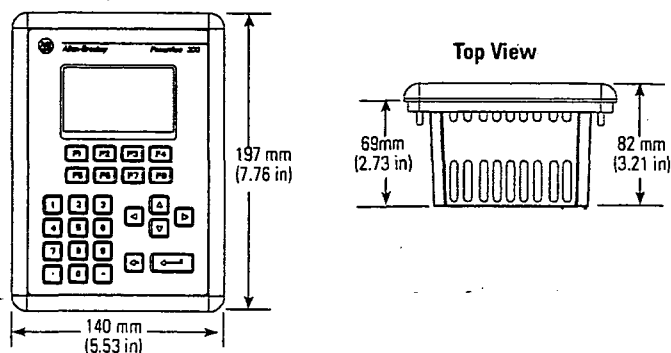
**Required Tools**

Other than the tools required to make the PV300 panel cutout, the tools required for installation are:

- 7 mm (M4) deep well socket wrench or nut driver
- small slotted screwdriver
- torque wrench (in / lbs)

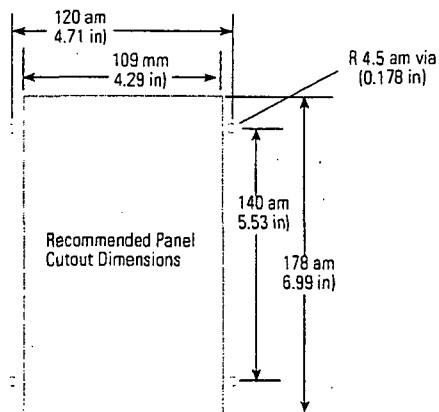
## Mounting Dimensions

The illustration below shows mounting dimensions for the PV300 keypad terminals.



## Cutout Dimensions

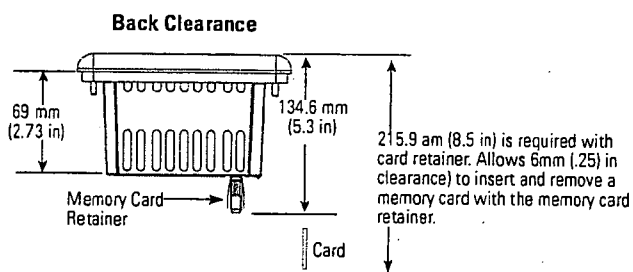
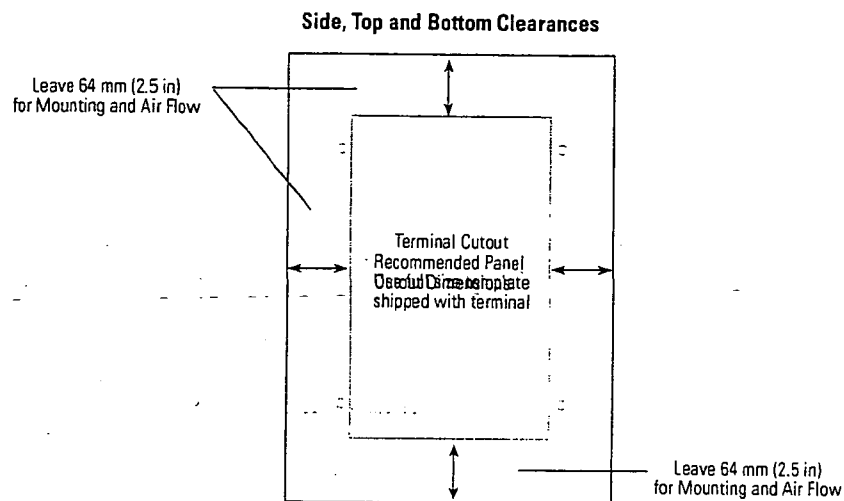
Use the full size template shipped with the PV300 terminal to mark the cutout dimensions. Below is a reduce size cutout.



## 7-4 Installing the PV300 Terminal

**Clearances**

When installing the PV300 terminal, allow space for mounting, air flow, maintenance, memory card and legend strip installation.



## Installing the PV300 in a Panel

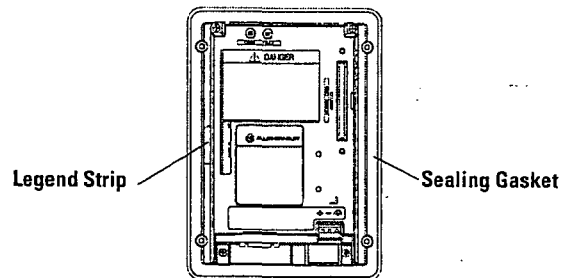
To install the PV300 terminal in a panel:

### ATTENTION



- Disconnect all electrical power from the panel before making the cutout.
- Make sure the area around the panel cutout is clear.
- Do not allow metal cuttings to enter any components that may already be installed in the panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

1. Cut an opening in the panel using the panel cutout provided with the terminal. Remove any sharp edges or burrs.
2. Make sure the terminal sealing gasket is properly positioned on the terminal as shown below. This gasket forms a compression type seal. Do not use sealing compounds.

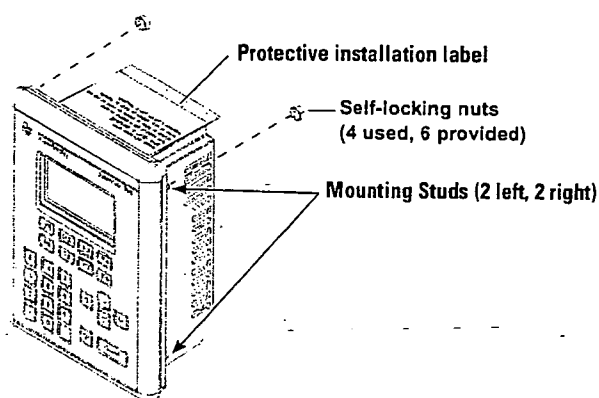


3. Verify that the end of the legend strip is fully inserted and does not interfere with the sealing gasket.
4. Place the terminal in the panel cutout.
5. Verify that the opening is the proper size to clear the bezel and to allow the gasket to contact the panel.

**7-6** Installing the PV300 Terminal

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6. Install the self-locking nuts hand tight.



7. Alternately tighten the self-locking nuts until the terminal is held firmly against the panel. Tighten nuts to a torque of 10 inch-pounds. Do not over-tighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

8. Remove the protective installation label covering the top vents of the terminal.

**ATTENTION**

Failure to remove the protective installation label covering the top vents could result in overheating and damage to the terminal.

## Chapter 8

# Installing the PV550 Terminal

## Chapter Objectives

This chapter describes how to mount the PV550 terminal in a panel or enclosure including:

- hazardous locations
- enclosures
- required tools
- mounting dimensions
- clearances
- cutout dimensions
- installing the PV550 terminal in a panel

## Hazardous Locations

See the nameplate label on terminal for hazardous locations certifications.

### ATTENTION



In Class 1, Division 2 Hazardous locations, the PanelView 550 terminal must be wired per the National Electric Code as it applies to hazardous locations. Peripheral equipment must also be suitable for the location in which it is installed.

The following PV550 terminals have an operating temperature code of T2 (maximum operating temperature of 300° C or 572° F).

- keypad terminals (series C or higher)
- keypad & touch screen terminals (series C or higher)
- all touch screen only terminals

**Do not** install these terminals in environments where atmospheric gases have ignition temperatures less than 300° C (572° F).

## 8-2 Installing the PV550 Terminal

## Enclosures

Mount the PV550 terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA Type 12/13 and 4X (indoor use) ratings only when mounted in a panel or enclosure with the equivalent rating.

Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the terminals must be between 0° and 55° C (32° and 131° F).

Make provisions to access the back panel of the terminal for wiring, maintenance, installing a memory card and troubleshooting.

## Required Tools

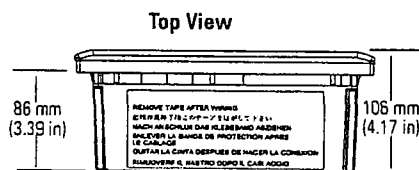
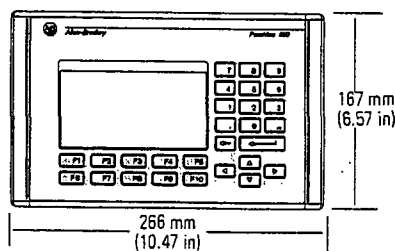
Other than the tools required to make the PV550 panel cutout, the tools required for installation are:

- 7 mm (M4) deep well socket wrench or nut driver
- small slotted screwdriver
- torque wrench (in / lbs)

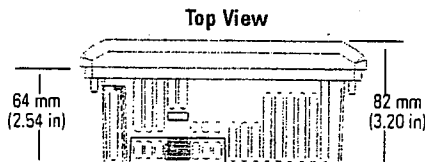
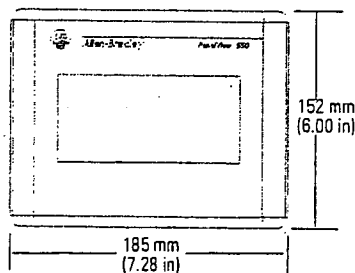
## Mounting Dimensions

The illustration below shows mounting dimensions for the PV550 terminals.

### *PV550 Keypad, Keypad & Touch Screen Terminals*



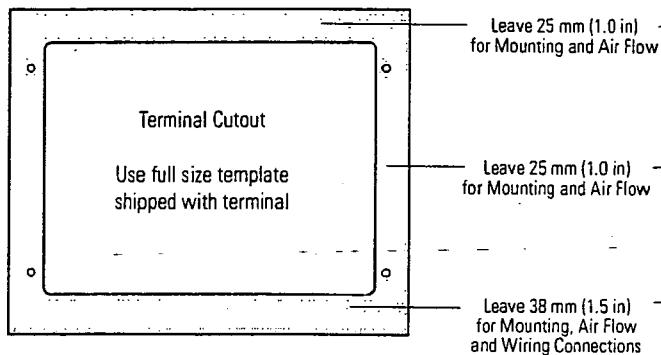
### *PV550 Touch Screen Terminals*



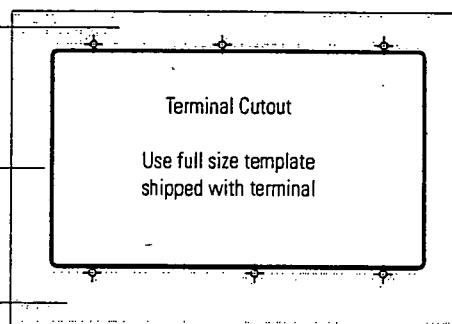
## Clearances

When installing the PV550 terminal, allow space for mounting, air flow, maintenance, memory card and legend strip installation.

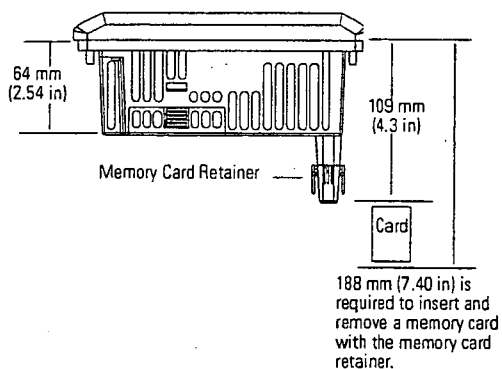
**PV550 Touch Screen Terminals**



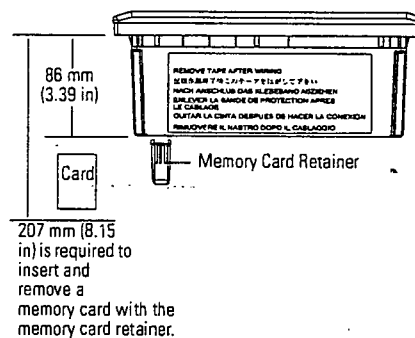
**PV550 Keypad, Keypad & Touch Screen Terminals**



**Back Clearance**



**Back Clearance**





## Installing the PV550 in a Panel

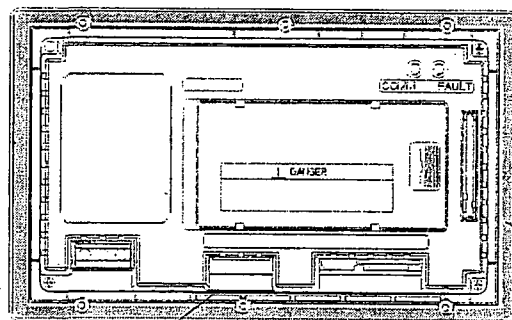
### To install the PV550 terminal in a panel:

#### ATTENTION



- Disconnect all electrical power from the panel before making the cutout.
- Make sure the area around the panel cutout is clear.
- Do not allow metal cuttings to enter any components that may already be installed in the panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

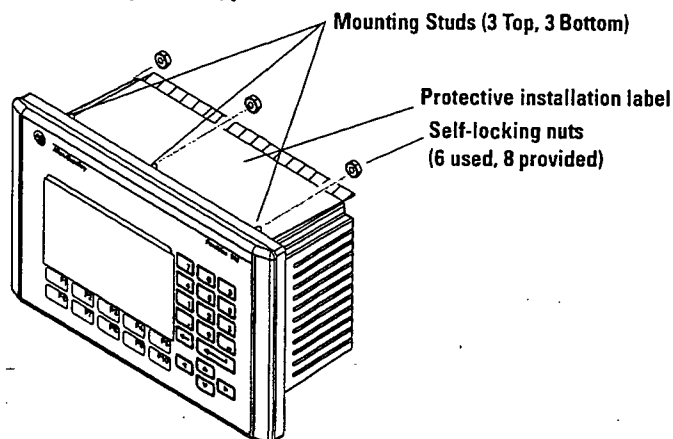
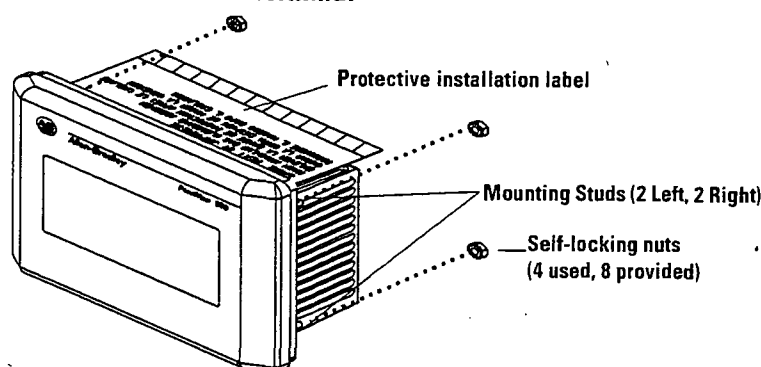
1. Cut an opening in the panel using the panel cutout provided with the terminal. Remove any sharp edges or burrs.
2. Make sure the terminal sealing gasket is properly positioned on the terminal as shown below. This gasket forms a compression type seal. Do not use sealing compounds.



**Adhesive Legend Strip**  
(Keypad and Keypad & Touch Screen Terminals only)

3. On the keypad and keypad & touch screen terminals, secure the ends of the legend strips to the legend strip adhesive.
4. Place the terminal in the panel cutout.
5. Verify that the opening is the proper size to clear the bezel and to allow the gasket to contact the panel.
6. On the keypad and keypad & touch screen terminals, position the ends of the legend inserts behind the panel cutout.
7. Install the self-locking nuts hand tight.

## 8-6 Installing the PV550 Terminal

**PV550 Keypad, Keypad & Touch Screen Terminals****PV550 Touch Screen Terminal**

8. Alternately tighten the self-locking nuts until the terminal is held firmly against the panel. Tighten nuts to a torque of 10 inch-pounds. Do not over-tighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

9. Remove protective installation label from top vents of terminal.

**ATTENTION**

Failure to remove the protective installation label covering the top vents could result in overheating and damage to the terminal.

## Chapter 9

# Installing the PV600 Terminal

## Chapter Objectives

This chapter describes how to mount the PV600 terminal in a panel or enclosure including:

- hazardous locations
- enclosures
- required tools
- mounting dimensions
- cutout dimensions
- clearances
- installing the PV600 terminal in a panel

## Hazardous Locations

See the nameplate label on terminal for certifications on hazardous locations.

### ATTENTION



In Class 1, Division 2 Hazardous locations, the PanelView terminal must be wired per the National Electric Code as it applies to hazardous locations. Peripheral equipment must also be suitable for the location in which it is installed.

The PV600 terminals have an operating temperature code of T4 (maximum operating temperature of 135° C or 275° F). **Do not** install the terminals in environments where atmospheric gases have ignition temperatures less than 135° C (275° F).

## Enclosures

Mount the PV600 terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA Type 12/13 and 4X (indoor use) ratings only when mounted in a panel or enclosure with the equivalent rating:

Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the terminals must be between:

- 0° and 55° C (32° and 131° F) for the PV600 keypad or keypad & touch screen terminal
- 0° and 50° C (32° and 122° F) for the PV00 touch screen only terminal

Make provisions to access the back panel of the terminal for wiring, maintenance, installing a memory card and troubleshooting.

Publication 2711-UM014B-EN-P

## 9-2 Installing the PV600 Terminal

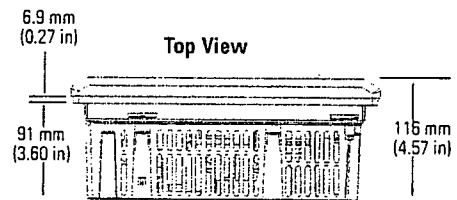
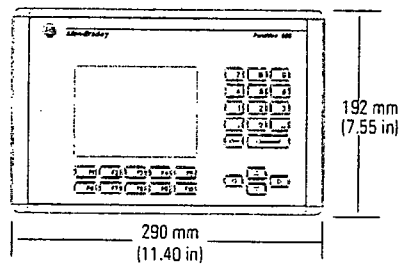
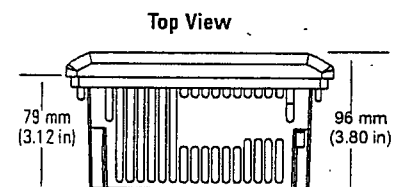
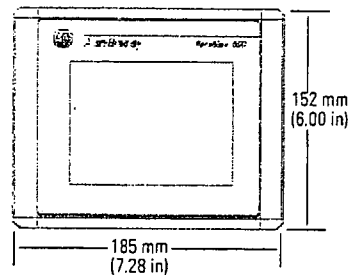
**Required Tools**

Other than the tools required to make the PV600 panel cutout, the tools required for installation are:

- small slotted screwdriver
- torque wrench (in. / lbs)
- #2 phillips screwdriver
- #2 phillips bit for torque wrench

**Mounting Dimensions**

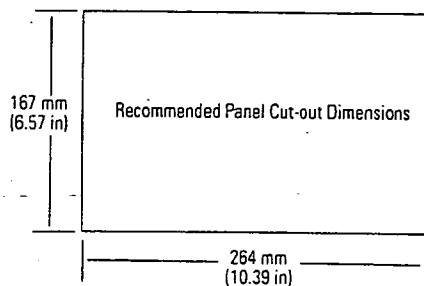
The illustration below shows mounting dimensions for the PV600 terminals.

***PV600 Keypad, Keypad & Touch Screen Terminals******PV600 Touch Screen Terminals***

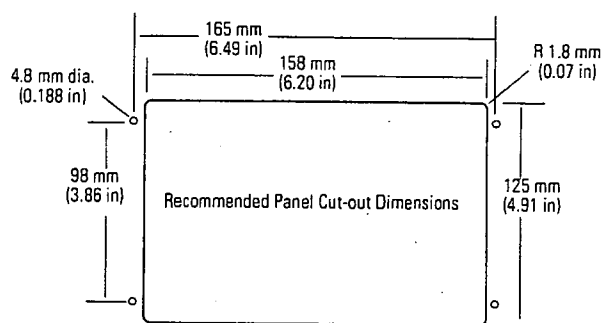
## Cutout Dimensions

Use the full size template shipped with the PV600 terminal to mark the cutout dimensions. Below is a reduce size cutout.

### *PV600 Keypad, Keypad & Touch Screen Terminals*



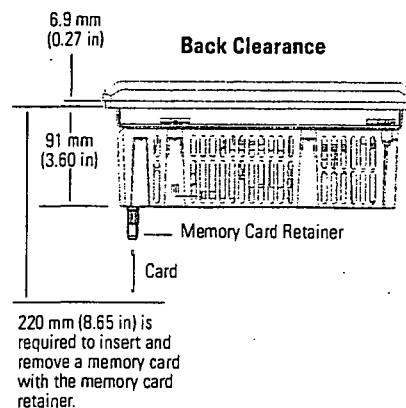
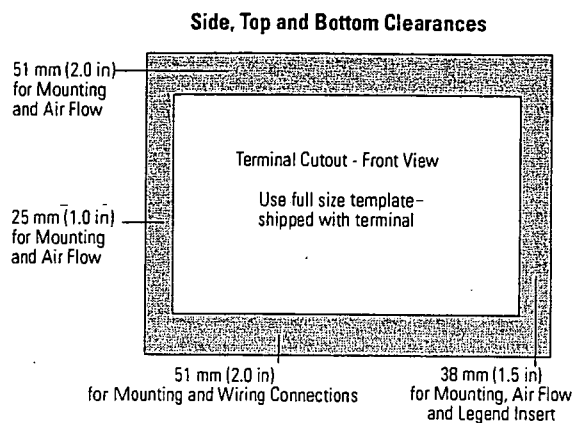
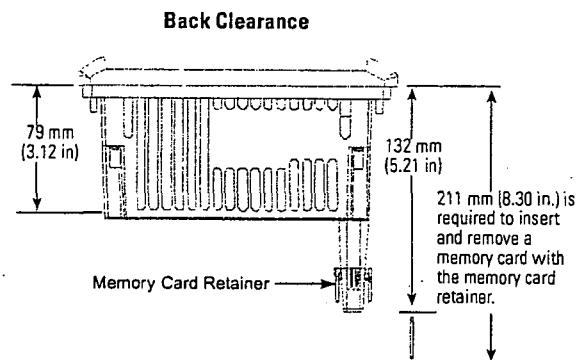
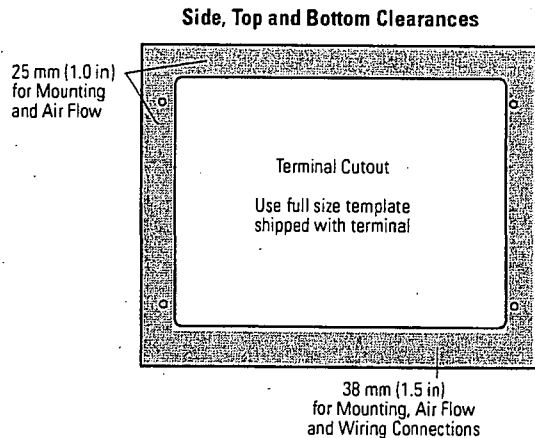
### *PV600 Touch Screen Terminals*



## 9-4 Installing the PV600 Terminal

**Clearances**

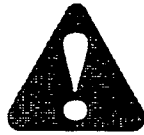
When installing the PV600 terminal, allow adequate space for mounting, air flow, maintenance, memory card and legend strip installation.

***PV600 Keypad and Keypad & Touch Screen Terminals******PV600 Touch Screen Terminals***

## Installing the PV600 in a Panel

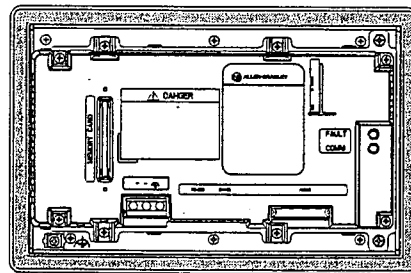
### To install the PV600 terminal in a panel:

#### ATTENTION



- Disconnect all electrical power from the panel before making the cutout.
- Make sure the area around the panel cutout is clear.
- Do not allow metal cuttings to enter any components that may already be installed in the panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

1. Cut an opening in the panel using the panel cutout provided with the terminal. Remove any sharp edges or burrs.
2. Make sure the terminal sealing gasket is properly positioned on the terminal as shown below. This gasket forms a compression type seal. Do not use sealing compounds.



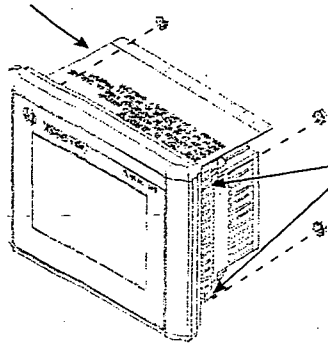
3. Although the keypad legend strip can be installed on the keypad and keypad & touch screen terminals at any time, we recommend that you install the strip after the terminal is installed.
4. Place the terminal in the panel cutout.

## 9-6 Installing the PV600 Terminal

5. Install the 4 mounting clips (2 on top, 2 on bottom). The ends of the clips slide into the slots on the terminal. Tighten the clip mounting screws by hand until the gasket seal contacts the mounting surface uniformly.

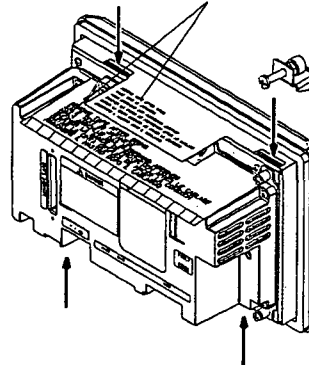
PV600 Touch Screen Terminal

1 Protective installation label

Self-Locking Nuts  
(4 used, 8 provided)Mounting Studs  
(2 left / 2 right)

PV600 Keypad, Keypad &amp; Touch Screen Terminal

2 Protective installation labels

Install 4 mounting clips:  
Top - left and right slots  
Bottom - left and right slots

6. Alternately tighten the self-locking nuts or mounting clip screws until the terminal is held firmly against the panel. Tighten the nuts or screws to a torque of 10 inch-pounds. Do not over-tighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

7. Remove protective installation labels over top vents of terminal.

**ATTENTION**

Failure to remove the protective installation label covering the top vents could result in overheating and damage to the terminal.

## Chapter 10

# Installing the PV900/1000 Terminals

### Chapter Objectives

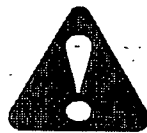
This chapter describes how to mount the PV900 and PV1000 terminals in a panel or enclosure including:

- hazardous locations and enclosures
- required tools
- mounting dimensions
- clearances
- cutout dimensions
- installing the PV900/PV1000 terminal in a panel

### Hazardous Locations

See the nameplate label on terminal for certifications on hazardous locations.

#### ATTENTION



In Class 1, Division 2 Hazardous locations, the PanelView terminal must be wired per the National Electric Code as it applies to hazardous locations. Peripheral equipment must also be suitable for the location in which it is installed.

The PV900/PV1000 terminals have an operating temperature code of T4 (maximum operating temperature of 135° C or 275° F). **Do not** install the terminals in environments where atmospheric gases have ignition temperatures less than 135° C (275° F).

### Enclosures

The PV900/PV1000 terminal must be mounted in an environment that provides IEC-1131-2 Pollution degree 2 protection.

Mount the terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA Type 12/13 and 4X (indoor use) ratings only when mounted in a panel or enclosure with the equivalent rating.

Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the terminals must be between 0° and 55° C (32° and 131° F).

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## 10-2 Installing the PV900/1000 Terminals

### Required Tools

Other than the tools required to make the panel cutout, the tools required for installation are:

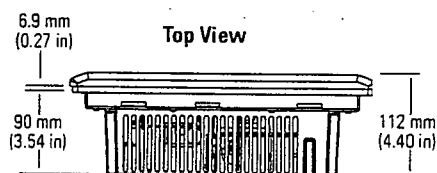
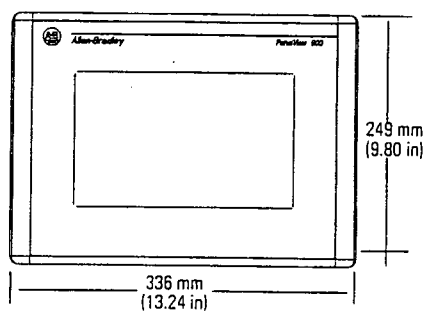
- small slotted screwdriver
- torque wrench (in. / lbs) with slotted or phillips head driver

### Mounting Dimensions

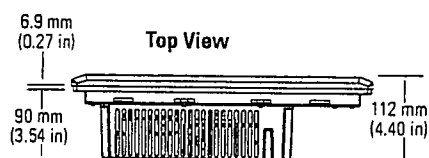
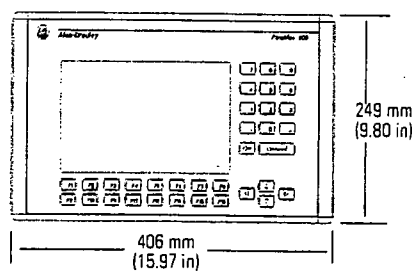
#### PV900 Terminals

The illustrations below show mounting dimensions for the PV900 monochrome and color terminals.

##### *PV900 Touch Terminal Mounting Dimensions*



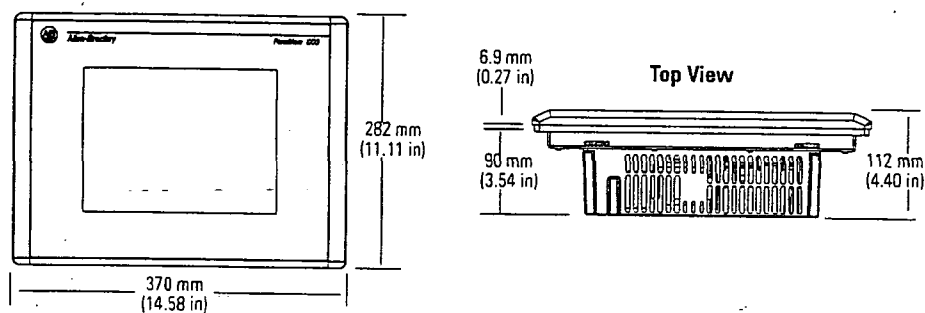
##### *PV900 Keypad Terminal Mounting Dimensions*



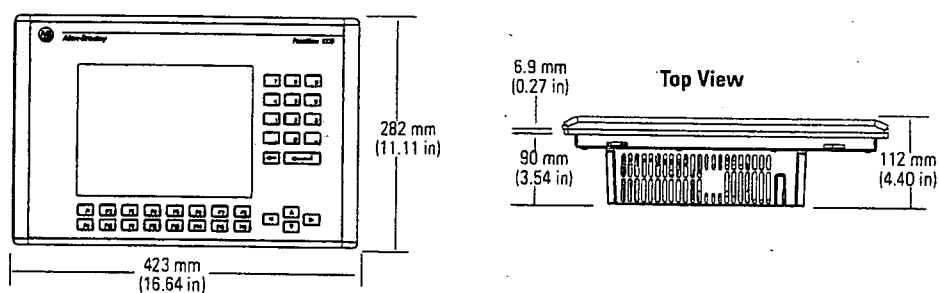
## PV1000 Terminals

The illustrations below show the mounting dimensions for the PV1000 grayscale and color terminals.

### PV1000 Touch Terminal Mounting Dimensions



### PV1000 Keypad Terminal Mounting Dimensions



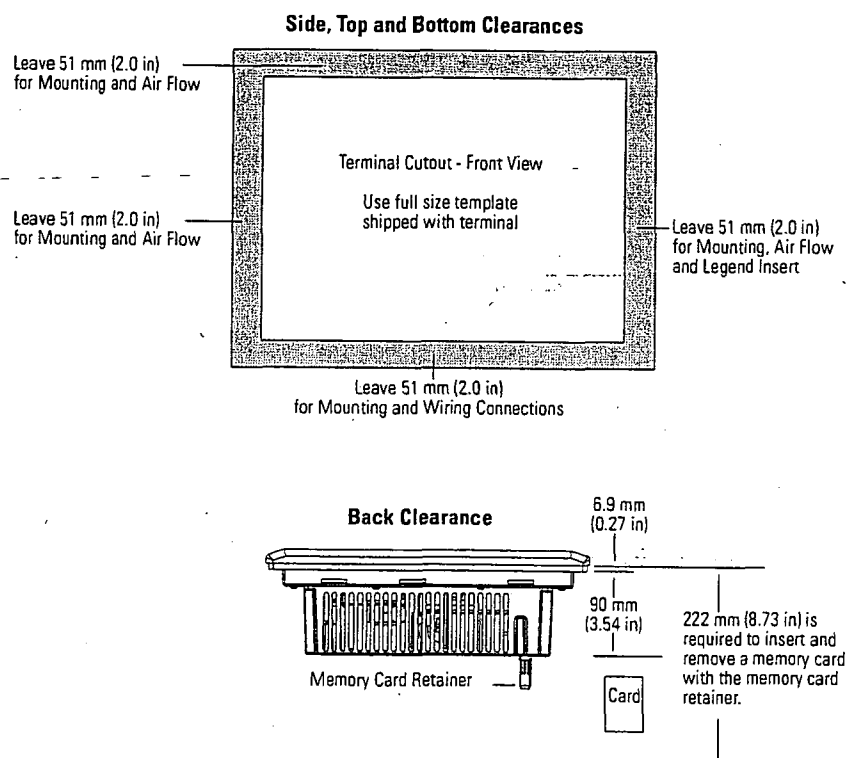
## 10-4 Installing the PV900/1000 Terminals

**Clearances**

Allow adequate space for mounting, air flow, maintenance, memory card and legend strip installation.

**IMPORTANT**

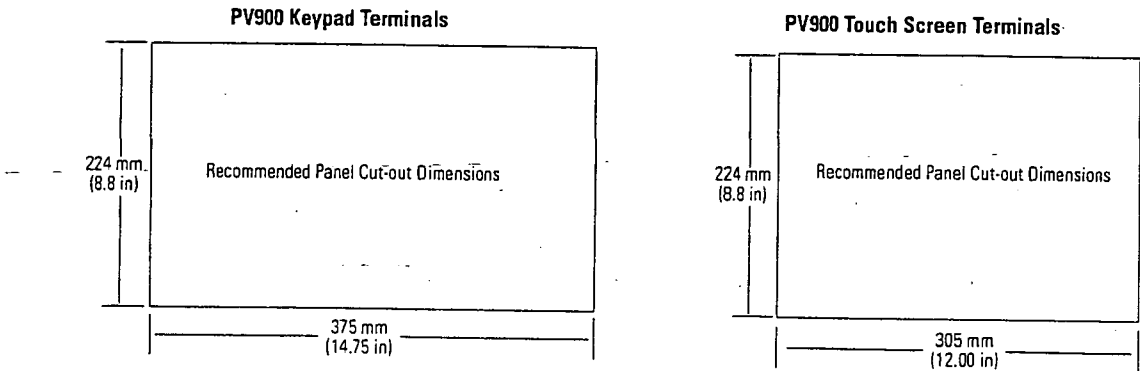
If using a memory card and/or memory card retainer, allow a back clearance to load the card.



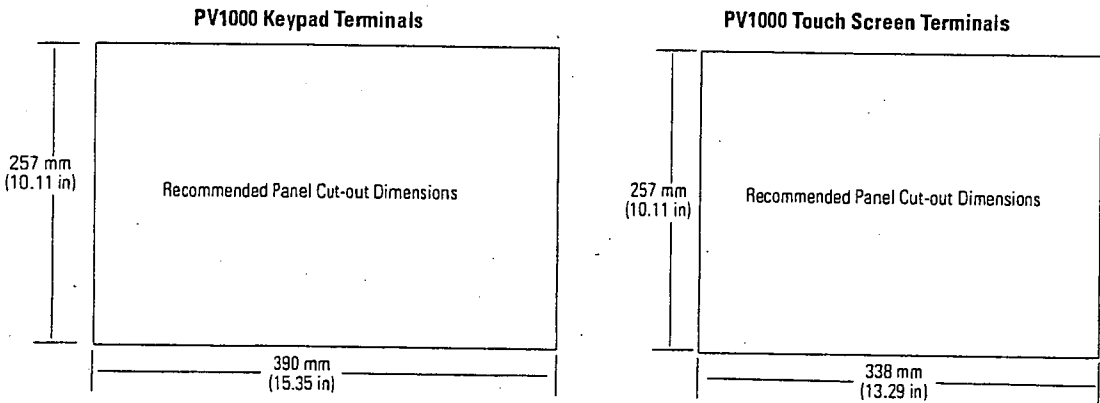
Cutout Dimensions

Use the full size template shipped with the PV900 and PV1000 terminals to mark the cutout dimensions. The following illustrations show reduced cutouts for these terminals with dimensions.

PV900 Panel Cutout Dimensions



PV1000 Panel Cutout Dimensions



## 10-6 Installing the PV900/1000 Terminals

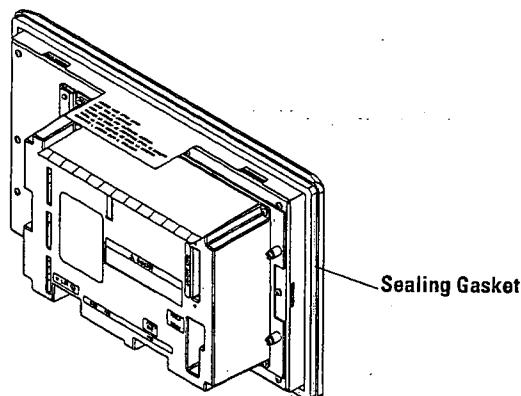
## Installing the PV900/PV1000 in a Panel

To install the PV900/PV1000 terminal in a panel:

**ATTENTION**

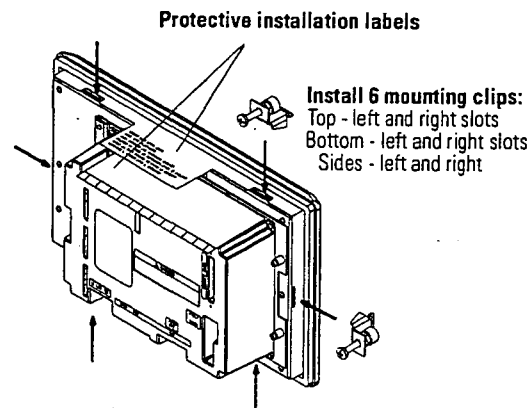
- Disconnect all electrical power from the panel before making the cutout.
- Make sure the area around the panel cutout is clear.
- Do not allow metal cuttings to enter any components that may already be installed in the panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

1. Cut an opening in the panel using the panel cutout provided with the terminal. Remove any sharp edges or burrs.
2. Make sure the terminal sealing gasket is properly positioned on the terminal as shown below. This gasket forms a compression type seal. Do not use sealing compounds.



3. Although the keypad legend strip can be installed any time, we recommend that you install it after the terminal is installed.
4. Place the terminal in the panel cutout.

5. Install the 6 mounting clips (2 on top, 2 on bottom, 1 on each side). The ends of the clips slide into the slots on the terminal. Tighten the clip mounting screws by hand until the gasket seal contacts the mounting surface uniformly.



6. Alternately tighten the mounting clip screws to a torque of 10 inch-pounds. Do not over-tighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

7. Remove the 2 protective labels covering the top vents of the terminal.

**ATTENTION**

Failure to remove the protective installation label covering the top vents could result in overheating and damage to the terminal.

## 10-8 Installing the PV900/1000 Terminals

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## Chapter 11

# Installing the PV1400 Terminal

### Chapter Objectives

This chapter describes how to mount the PV1400 terminal in a panel or enclosure including:

- enclosures
- recommended tools
- mounting dimensions
- clearances
- cutout dimensions
- installing the PV1400 terminal in a panel

### Enclosures

The PV1400 terminal must be mounted in an environment that provides IEC-1131-2 Pollution degree 2 protection.

Mount the PV1400 terminal in a panel or enclosure to protect the internal circuitry. The terminal meets NEMA Type 12/13 and 4X (indoor use) ratings only when mounted in a panel or enclosure with the equivalent rating.

Allow enough space within the enclosure for adequate ventilation. Consider heat produced by other devices in the enclosure. The ambient temperature around the terminals must be between 0° and 55° C (32° and 131° F).

Make provisions to access the back sides of the terminal. Access is required for wiring, routine maintenance, adjusting brightness/contrast, installing a memory card and troubleshooting.

### Required Tools

In addition to the tools required to make the panel cutout, you need the tools below.

For clip mounting:

- socket screwdriver (phillips head or slotted)
- 16-inch (406 mm) extension rod (minimum)
- socket driver (in/lab torque wrench recommended)

For stud mounting:

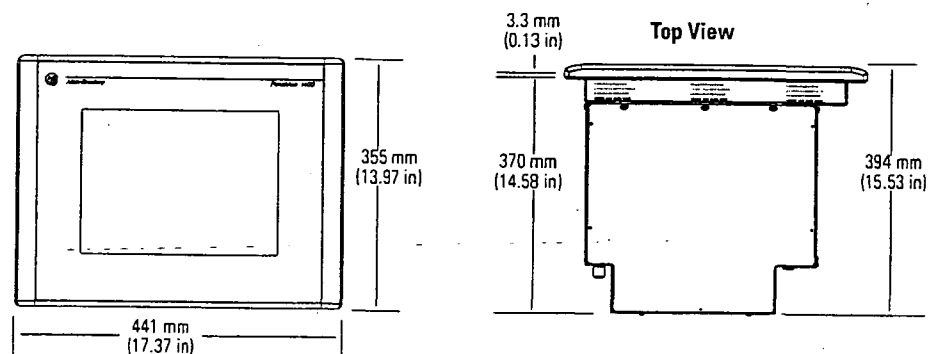
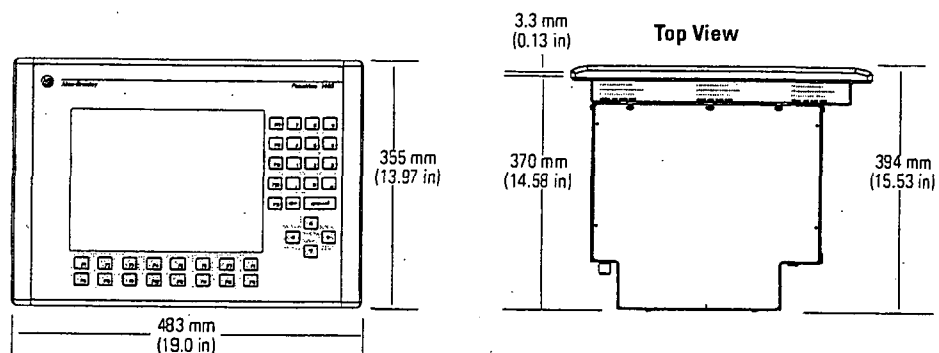
- 7/32 and 3/8 inch socket
- 16-inch (406 mm) extension rod (minimum)
- socket driver (in/lb torque wrench recommended)

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## 11-2 Installing the PV1400 Terminal

**Mounting Dimensions**

The illustrations below show mounting dimensions for the PV1400 terminals.

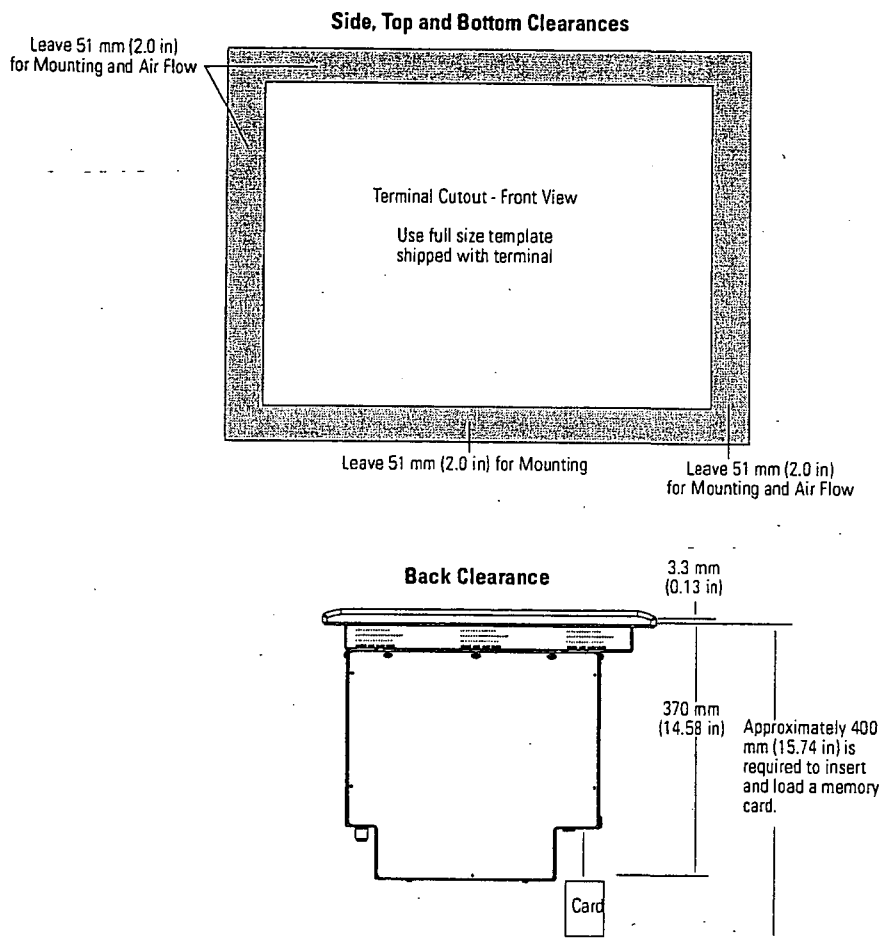
**PV1400 Touch Terminal Mounting Dimensions****PV1400 Keypad Terminal Mounting Dimensions**

## Clearances

Allow adequate space for mounting, air flow, maintenance, adjusting brightness/contrast, memory card and legend strip installation.

**IMPORTANT**

If using a memory card, allow a back clearance to load the card.





## Installing the PV1400 in a Panel

This section gives procedures for mounting a PV1400 using:

- mounting clips (10 shipped with terminal, 10 required)
- mounting studs (ordered separately, Catalog No. 2711-NP3)

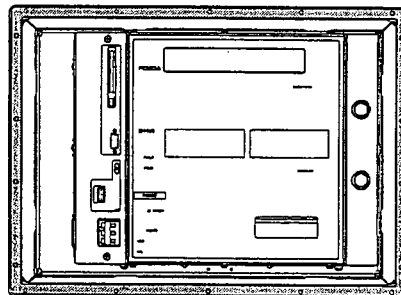
### ATTENTION



- Disconnect all electrical power from the panel before making the cutout.
- Make sure the area around the panel cutout is clear.
- Do not allow metal cuttings to enter any components that may already be installed in the panel.
- Failure to follow this warning may result in personal injury or damage to the panel components.

### To install the PV1400 terminal in a panel using clips:

1. Cut an opening in the panel using the panel cutout provided with the terminal. Remove any sharp edges or burrs. Do not drill the mounting stud holes if you are using clips.
2. Make sure the sealing gasket is properly positioned on the terminal as shown below. This gasket forms a compression type seal. Do not use sealing compounds.

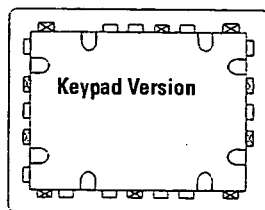


3. Although the keypad legend strip can be installed any time, we recommend that you install them after the terminal is installed.
4. Place the PV1400 in the panel cutout. The terminal will snap into the panel as the temporary retaining tabs lock against the panel.

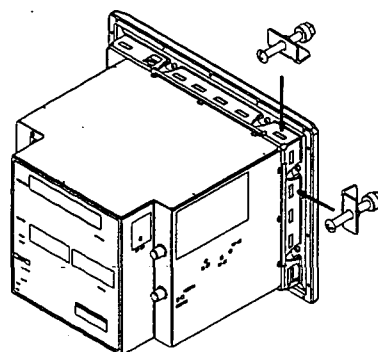
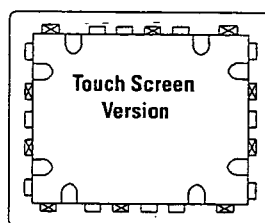
**Note:** The PV1400 has 2 metal tabs (on bottom edge) that temporarily lock the terminal against the panel. These tabs only facilitate installation of the mounting hardware. The tabs are not designed to provide permanent mounting.

**11-6** Installing the PV1400 Terminal

5. Install the 10 mounting clips (3 on top, 3 on bottom, 2 on each side). The ends of the clips slide into slots on the terminal. Tighten the clip mounting screws hand tight.

**Install 10 Mounting Clips**

☒ = Recommended  
Placement of  
Mounting Clips



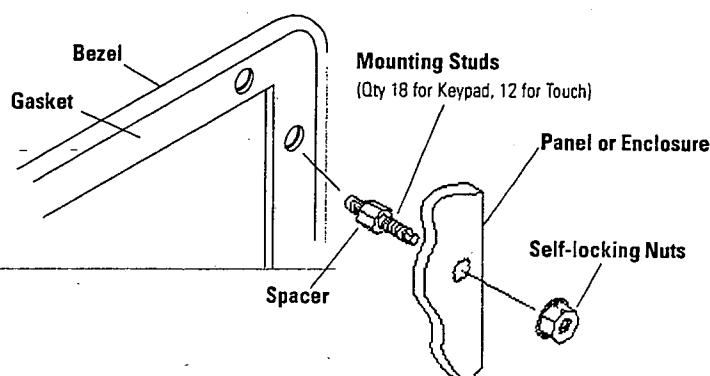
6. Alternately tighten the mounting clip screws until the terminal is held firmly against the panel. Tighten mounting screws to a torque of 10 inch-pounds. Do not over-tighten.

**ATTENTION**

Mounting nuts must be tightened to a torque of 10 inch-pounds to provide a proper seal and to prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

**To install the PV1400 terminal in a panel using mounting studs:**

1. Cut an opening in the panel using the panel cutout shipped with the terminal. Carefully drill 5.56 mm (7/32 inch) holes for studs as indicated.
2. Install the mounting studs (Catalog No. 2711-NP3) using a 7/32-inch socket on the end of the stud. Turn stud clockwise and tighten to approximately 10-inch pounds (1.1 N•m).



3. Make sure the sealing gasket is properly positioned on the terminal. This gasket forms a compression type seal (NEMA Type 4). Do not use sealing compounds.

**ATTENTION**

Be careful not to damage the sealing gasket when installing or removing studs. A damaged seal may result in damage to the PanelView terminal and other panel components due to a leaking seal.

4. Place the PV1400 in the panel cutout aligning the studs with the mounting holes.
5. Install the self-locking nuts hand tight.

**ATTENTION**

Tighten mounting nuts to a torque of 10 inch-pounds (1.1 N•m) to provide a proper seal and prevent potential damage to the terminal. Allen-Bradley assumes no responsibility for water or chemical damage to the terminal or other equipment within the enclosure because of improper installation.

**11-8** Installing the PV1400 Terminal

6. Alternately tighten the self-locking nuts (use 3/8 inch socket) until the PV1400 is held firmly against the panel. (The recommended tightening sequence is shown below).

The studs have an integral spacer that prevents the gasket from being over-compressed. The amount of torque required increases significantly as the gasket reaches the proper compression. Tighten nuts to a torque of 10 inch-pounds (1.1 N•m).

18	9	1	5	13
16				15
4	Recommended Torque Sequence Keypad Terminals			3
7				8
12				11
17	10	2	6	14

	9	1	5	
7				8
4	Recommended Torque Sequence Touch Terminals			3
12				11
	10	2	6	

Note the sequence starts at center studs and continues to the corner studs.

---

## Terminal Connections

### Chapter Objectives

This chapter describes network and device connections for PanelView terminals.

- wiring and safety guidelines
- Cable charts
- Remote I/O connections
- DH+ connections
- DH-485 connections
- RS-232 (DH-485) connections
- RS-232 (DF1) connections
- ControlNet connections
- DeviceNet connections
- EtherNet/IP connections
- PanelView 300 Micro connections
- Computer or printer connection to RS-232 serial port

### Wiring and Safety Guidelines

Use publication NFPA 70E, Electrical Safety Requirements for Employee Workplaces when wiring the PanelView terminals. In addition to the NFPA general guidelines:

- route communication cables to terminal by a separate path from incoming power.

---

**IMPORTANT**

Do not run signal wiring and power wiring in the same conduit.

---

- where power and communication lines must cross, they should cross at right angles. Communication lines can be installed in the same conduit as low level DC I/O lines (less than 10 volts).
- grounding minimizes noise from Electromagnetic Interference (EMI) and is a safety measure in electrical installations.
- use the National Electric Code published by the National Fire Protection Association as a source for grounding.

## 12-2 Terminal Connections

## Cable Charts

Refer to the following charts for a summary of PanelView terminal connections to controllers and network interface modules.

## Runtime Communication Cables - To Processors

Protocol	PanelView Standard Comm Port	Cables: PanelView to Processor				
		SLC-500, 5/01, 5/02 CH1 RJ45 (DH-485)	SLC-5/03, 5/04, 5/05 CH0 (9-pin RS-232) (DF1 or DH-485)	SLC 5/03 CH1 (RJ45) (DH-485)	SLC 5/04 CH1 (DH+)	SLC 5/05 CH1 (ENET)
DF1 xxx16 xxx17 xxx18	RS-232 (DF1) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx18	N/A	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (18ft/5m) 2711-CBL-PM10 (32ft/10m)	N/A	N/A	N/A
	RS-232 (DF1) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx16, 2711-xxx17	N/A	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	N/A	N/A	N/A
DH-485 xxx2 xxx3 xxx5 xxx9 xxx19	RS-232 (DH-485) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx19	use AIC+ Module (1761-NET-AIC) Connect to Port 1 or 2	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (18ft/5m) 2711-CBL-PM10 (32ft/10m)	use AIC+ Module (1761-NET-AIC) Connect to Port 1 or 2	N/A	N/A
	RS-232 (DH-485) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx5, 2711-xxx9	use AIC+ Module (1761-NET-AIC) Connect to Port 1 or 2	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	use AIC+ Module (1761-NET-AIC) Connect to Port 1 or 2	N/A	N/A
	DH-485 Communication Port (RJ45) PanelView 300 - 1400 2711-xxx2, 2711-xxx3	1747-C10 (6ft/2m) 1747-C11 (1ft/0.3m) 1747-C20 (20ft/6m)	use AIC+ Module (1761-NET-AIC) Connect to Port 3	1747-C10 (6ft/2m) 1747-C11 (1ft/0.3m) 1747-C20 (20ft/6m)	N/A	N/A
DeviceNet xxx10	DeviceNet Communication Port PanelView 300 - 1400 2711-xxx10	to SLC 5/02 with 1747-SDN and DeviceNet cable	use 1747-SDN Module with DeviceNet cable			
ControlNet xxx15	ControlNet Communication Port PanelView 550T - 1400 2711-xxx15	N/A	not applicable - PanelView does not support SLC ControlNet configurations			
EtherNet/IP xxx20	Ethernet Comm Port PanelView 550T - 1400 2711-xxx20	N/A	N/A	N/A	N/A	Ethernet cable

Protocol	PanelView Standard Comm Port	Cables: PanelView to Processor		
		PLC-5, PLC-5C, PLC-5E CH0 (25-pin RS-232) (DF1)	ControlLogix CH0 (9-pin RS-232) (DF1)	MicroLogix 1000, 1200, 1500LSP CH0 (8-pin Mini DIN) (DF1 or DH-485)
DF1 xxx16 xxx17 xxx18	RS-232 (DF1) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx18	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m) (9-to-25 pin adapter required)	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AM00 (1.5ft/0.5m) 1761-CBL-HM02 (6.5ft/2m) 2711-CBL-HM05 (16ft/5m) 2711-CBL-HM10 (32ft/10m)  ** See Note 1 **
	RS-232 (DF1) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx16, 2711-xxx17	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m) (9-to-25 pin adapter required)	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC21 (16ft/5m) 2711-NC22 (49ft/15m) (null modem not required)  ** See Note 1 **
DH-485 xxx2 xxx3 xxx5 xxx9 xxx19	RS-232 (DH-485) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx19	N/A	N/A	1761-CBL-AM00 (1.5ft/0.5m) 1761-CBL-HM02 (6.5ft/2m) 2711-CBL-HM05 (16ft/5m) 2711-CBL-HM10 (32ft/10m)  ** See Note 1 **
	RS-232 (DH-485) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx5, 2711-xxx9	N/A	N/A	2711-NC21 (16ft/5m) 2711-NC22 (49ft/15m) (null modem not required)  ** See Note 1 **
	DH-485 Communication Port (RJ45) PanelView 300 - 1400 2711-xxx2, 2711-xxx3	N/A	N/A	use AIC+ Module (1761-NET-AIC) Connect to Port 3
DeviceNet xxx10	DeviceNet Communication Port PanelView 300 - 1400 2711-xxx10	use 1771-SDN Module with DeviceNet cable	use 1756-DN8 Module with DeviceNet cable	use 1761-NET-DNI Module with DeviceNet cable
ControlNet xxx15	ControlNet Communication Port PanelView 550T - 1400 2711-xxx15	to PLC-5C with ControlNet cable	use 1756-CN8 Module with ControlNet cable	N/A
EtherNet/IP xxx20	Ethernet Communication Port PanelView 550T - 1400 2711-xxx20	to PLC-5E with Ethernet cable	Use 1756-ENET Module with Ethernet cable	Use 1761-NET-ENI Module with Ethernet cable
Remote I/O xxx1	Remote I/O Communication Port PanelView 550T - 1400 2711-xxx1	shielded twinaxial cable (1770-CD)	use 1756-DHRIO Module with shielded twinaxial cable (1770-CD)	N/A
DH+ xxx8	DH+ Communication Port PanelView 550T - 1400 2711-xxx8	shielded twinaxial cable (1770-CD)	use 1756-DHRID Module with shielded twinaxial cable (1770-CD)	N/A

Note 1: AIC + Module recommended for isolation purposes when PanelView and controller are not on same power supply

## 12-4 Terminal Connections

Protocol	PanelView Standard Comm Port	Cables: PanelView to Processor		
		MicroLogix 1500LRP CH1 (9-pin RS-232) (DF1 or DH-485)	CompactLogix CH0 (9-pin RS-232) (DF1 or DH-485)	FlexLogix CH0 (9-pin RS-232) (DF1)
DF1 xxx16 xxx17 xxx18	RS-232 (DF1) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx18	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)
	RS-232 (DF1) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx16, 2711-xxx17	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)
DH-485 xxx2 xxx3 xxx5 xxx9 xxx19	RS-232 (DH-485) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx19	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	N/A
	RS-232 (DH-485) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx6, 2711-xxx9	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	N/A
	DH-485 Communication Port (RJ45) PanelView 300 - 1400 2711-xxx2, 2711-xxx3	use AIC+ Module (1761-NET-AIC) Connect to Port 3	use AIC+ Module (1761-NET-AIC) Connect to Port 3	N/A
DeviceNet xxx10	DeviceNet Communication Port PanelView 300 - 1400 2711-xxx10	use 1761-NET-DNI Module with DeviceNet cable		N/A
ControlNet xxx15	ControlNet Communication Port PanelView 550T - 1400 2711-xxx15	N/A	N/A	use 1788-CNC module with ControlNet cable
EtherNet/IP xxx20	Ethernet Communication Port PanelView 550T - 1400 2711-xxx20	use 1761-NET-ENI Module with Ethernet cable	use 1761-NET-ENI Module with Ethernet cable	use 1761-NET-ENI Module with Ethernet cable
Remote I/O xxx1	Remote I/O Communication Port PanelView 550T - 1400 2711-xxx1	N/A	N/A	N/A
DH+ xxx8	DH+ Communication Port PanelView 550T - 1400 2711-xxx8	N/A	N/A	N/A

## Runtime Communication Cables - to Network Interface Module

Protocol	PanelView Standard Comm Port	Cables: PanelView to Interface Module				
		1747-AIC	1761-NET-AIC			1761-NET-DNI or 1761-NET-ENI
			Port 1 9-pin	Port 2 8-pin Mini DIN	Port 3 (DH-485)	
DF1 xxx16 xxx17 xxx18	RS-232 (DF1) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx18	N/A	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AM00 (1.5ft/0.5m) 1761-CBL-HM02 (6.5ft/2m) 2711-CBL-HM05 (16ft/5m) 2711-CBL-HM10 (32ft/10m)	N/A	1761-CBL-AM00 (1.5ft/0.5m) 1761-CBL-HM02 (6.5ft/2m) 2711-CBL-HM05 (16ft/5m) 2711-CBL-HM10 (32ft/10m)
	RS-232 (DF1) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx16, 2711-xxx17	N/A	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC21 (16ft/5m) 2711-NC22 (49ft/15m) (null modem not required)		1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)
DH-485 xxx2 xxx3 xxx5 xxx9 xxx19	RS-232 (DH-485) Comm Port (8-pin Mini Din) PanelView 300 Micro 2711-xxx19	N/A	1761-CBL-AP00 (1.5ft/0.5m) 1761-CBL-PM02 (6.5ft/2m) 2711-CBL-PM05 (16ft/5m) 2711-CBL-PM10 (32ft/10m)	1761-CBL-AM00 (1.5ft/0.5m) 1761-CBL-HM02 (6.5ft/2m) 2711-CBL-HM05 (16ft/5m) 2711-CBL-HM10 (32ft/10m)	N/A	N/A
	RS-232 (DH-485) Communication Port (9-pin) PanelView 300 - 1400 2711-xxx5, 2711-xxx9	N/A	2711-NC13 (16ft/5m) 2711-NC14 (32ft/10m) 2706-NC13 (10ft/3m)	2711-NC21 (16ft/5m) 2711-NC22 (49ft/15m) (null modem not required)	N/A	N/A
	DH-485 Communication Port (RJ45) PanelView 300 - 1400 2711-xxx2, 2711-xxx3	1747-C10 (6ft/2m) 1747-C11 (1 ft/0.3m) 1747-C20 (20ft/6m)	N/A	N/A	1761-CBL-AS03 (10ft / 3m) 1761-CBL-AS09 (30ft / 9m)	N/A

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### Application File Upload/Download (Direct) Cables

PanelView Standard Type	Cable to Personal Computer
PanelView 300 Micro 2711-M3A18L1, -M3A19L1	1761-CBL-PM02 (6.5 ft/2 m) 2711-CBL-PM05 (16 ft/5 m) 2711-CBL-PM10 (32 ft/10 m)
DH-485 Comm Port only or DH-485 Comm Port & RS-232 Printer Port PanelView 300, 550/550T, 600/600T 2711-KxA2, -KxC2, -BxA2, -BxA3, -TxA2, -TxC2, 2711-KxA3, -KxC3, -KxG3, -BxA3, -BxC3, -TxA3, -TxG3	1747-PIC
RS-232 (DH-485) Comm Port only or RS-232 (DH-485) Comm Port & RS-232 Printer Port PanelView 300, 550/550T, 600/600T 2711-KxA5, -KxC5, -BxA5, -BxC5, -TxA5, -TxG5, 2711-KxA9, -KxC9, -KxG9, -BxA9, -BxC9, -TxA9, -TxG9	2711-NC13 (16 ft/5 m) 2711-NC14 (32 ft/10 m) 2706-NC13 (10 ft/3 m)
RS-232 (DF1) Comm Port only PanelView 300 2711-K3A17	
RS-232 (DF1) Comm Port & RS-232 Printer/Download Port PanelView 550T - 1400 2711-KxA16, -KxC16, -KxG16, -BxA16, -BxC16, -TxA16, -TxG16	
DeviceNet Comm Port & RS-232 Printer Port PanelView 300 - 1400 2711-KxA10, -KxC10, -KxG10, -BxA10, -BxC10, -TxA10, -TxG10	
ControlNet Comm Port & RS-232 Printer Port PanelView 550T - 1400 2711-KxA15, -KxC15, -KxG15, -BxA15, -BxC15, -TxA15, -TxG15	
Remote I/O Comm Port & RS-232 Printer Port PanelView 550T - 1400 2711-KxA1, -KxC1, -KxG1, -BxA1, -BxC1, -TxA1, -TxG1	
Ethernet Comm Port and RS-232 Printer Port PanelView 550T - 1400 2711-KxA20, -KxC20, -KxG20, -BxA20, -BxC20, -TxA20, -TxG20	
DH+ Comm Port & RS-232 Printer Port PanelView 550T - 1400 2711-KxA8, -KxC8, -KxG8, -BxA8, -BxC8, -TxA8, -TxG8	
Profibus Comm Port & RS-232 Printer Port PanelView 550T - 1400 2711-KxA12, -KxC12, -KxG12, -BxA12, -BxC12, -TxA12, -TxG12	
Modbus Comm Port & RS-232 Printer Port PanelView 550T - 1400 2711-KxA14, -KxC14, -KxG14, -BxA14, -BxC14, -TxA14, -TxG14	

## 12-6 Terminal Connections

## Remote I/O Terminal Connections

This section describes connections for the Remote I/O PanelView terminals including:

- Remote I/O port
- supported controllers
- making Remote I/O connections
- Remote I/O Pass-Through

### Remote I/O Terminal Ports

The Remote I/O versions of the PanelView terminal (catalog numbers ending in 1) have a Remote I/O port and an RS-232 port.

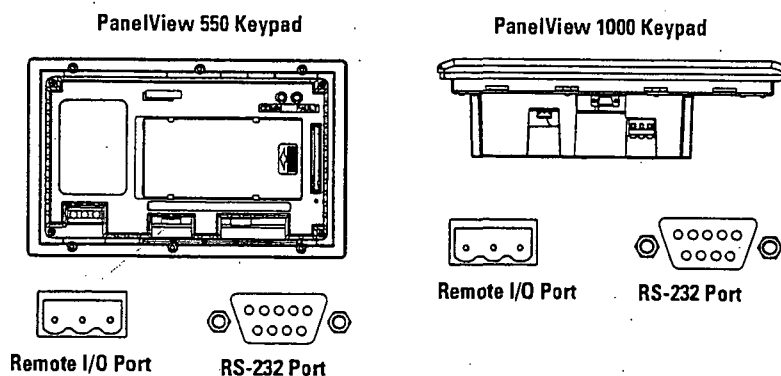
#### Use the Remote I/O port to:

- communicate with the Remote I/O scanner port on a PLC controller.
- communicate with SLC controllers using a 1747-SN Remote I/O scanner module.
- communicate with other Remote I/O scanners.
- transfer applications using Remote I/O Pass-Through.

#### Use the RS-232 Port to:

- transfer PanelView applications between a computer and the terminal.
- connect a printer.

For details on connecting to the RS-232 port, see the last section in this chapter.



## Supported Controllers

The Remote I/O terminal connects to any Allen-Bradley 1771 Remote I/O link. Applicable host controllers include almost all Allen-Bradley PLCs, computers, VME controllers, and DEC Q-Bus controllers with a Remote I/O scanner module. New PLC product releases that support 1771 Remote I/O will also work with PanelView.

When connecting a PanelView terminal to a controller refer to the user manual for your controller or scanner module for connection diagrams and any Remote I/O limitations. The table below provides a summary of possible connections.

Controller	Scanner	Comments
ControlLogix	1756-DHRIO	Connect PanelView terminals through the 1756-DHRIO module.
PLC-5/11, 5/15 <sup>1</sup> , 5/20, 5/25, 5/30, 5/60, 5/80, 5/250	PLC Integral 1771-SN	Connect PanelView terminals directly to the Remote I/O port (scanner mode). Connect PanelView terminals through the 1771-SN subscanner module.
PLC-5/10, 5/12	1771-SN	Connect PanelView terminals through the 1771-SN subscanner module.
PLC-2	1771-SN or 1772-SD2 <sup>2</sup>	Connect PanelView terminals to the PLC-2 family of processors through a 1771-SN I/O subscanner module.
PLC-3 and PLC-3/10	None PLC-3/10 Remote I/O Scanner <sup>3</sup>	Connect PanelView terminals directly to a PLC-3. Connect PanelView terminals to the PLC-3/10 through the Remote I/O scanner.
SLC-5/02, 5/03, 5/04, 5/05	1747-SN	Connect PanelView terminals through the 1747-SN subscanner module. Each module provides an additional Remote I/O link for up to 4 racks. <b>Important:</b> Only Series B and later versions of the 1747-SN subscanner support block transfers.
IBM PC	6008-SI	6008-SI I/O scanner is compatible with IBM PC or compatible computers. The scanner provides a computer access to the 1771 Remote I/O link.
VME	6008-SV	6008-SV I/O scanner provides access to the 1771 Remote I/O link for VME controllers.
DEC Q-BUS	6008-SQ	6008-SQ I/O scanner provides access to the 1771 Remote I/O link for DEC Q-BUS controllers.

<sup>1</sup> If using a PLC-5/15 with partial rack addressing and block transfers, you must use Series B, Rev. J or later.

<sup>2</sup> If using a 1772-SD2 Remote Scanner/Distribution Panel, use revision 3 or later.

<sup>3</sup> If using a 1775-S4A Remote Scanner/Distribution Panel, use Series B or later.

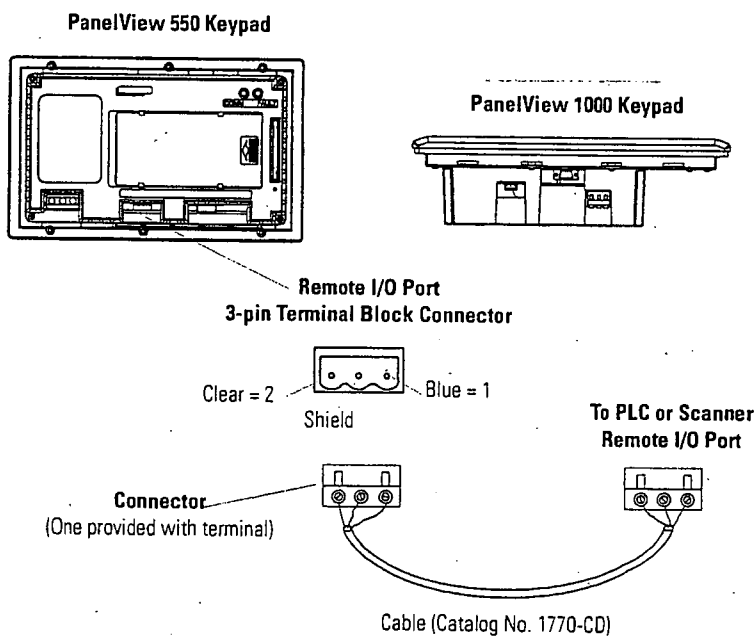
## 12-8 Terminal Connections

## Making Remote I/O Connections

To connect a PanelView terminal to a Remote I/O scanner, use cable Catalog No. 1770-CD (equivalent to Belden 9463). The maximum cable length (link distance) is determined by the baud rate.

- 2,800 meters (10,000 feet) for 57.6K baud
- 1,400 meters (5,000 feet) for 115.2K baud
- 700 meters (2,500 feet) for 230.4K

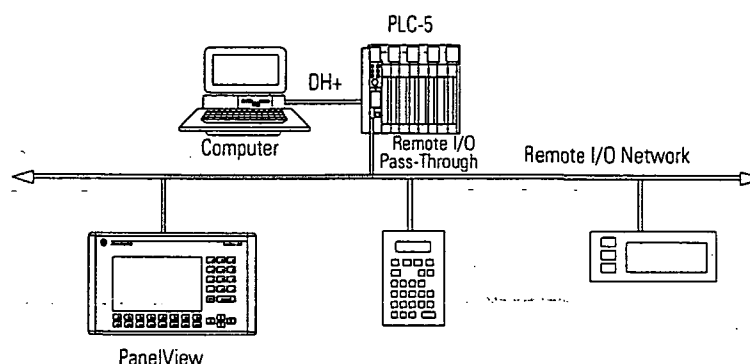
See Programmable Controller Wiring and Grounding Guidelines (Publication 1770-4.1). The user manual for the I/O scanner module also provides cabling information.



**Note:** The polarity of the Remote I/O Connector on the PanelView terminal is reversed from the PLC Scanner connector. However, the polarity is the same as the scanner card connection to the SLC.

## Remote I/O Pass-Through using DH+

Remote I/O terminals allow the transfer of applications from a computer on the Allen-Bradley DH+ link to a PLC-5 or SLC-5/04 controller. The controller passes data to the PanelView terminal over the Remote I/O network.



### To transfer an application using Remote I/O Pass-Through:

1. A Data Highway Plus Interface Module must be installed in the computer. Allen-Bradley offers a variety of interface cards for a DH+ connection between a computer and a controller.
2. The appropriate communication driver must be configured on the computer.
3. Connect the computer to the PLC. See the instruction sheets provided with the communication module or card to select the proper cable. Connect the cable between the computer and the controller.
4. Pass-Through must be enabled for the terminal. Check the RIO Configuration screen on the terminal's Configuration Mode menu. Pass-Through is enabled using the out-of-box application provided with the terminal or when defining Remote I/O parameters in the PanelBuilder32 software.
5. Refer to the online help in the PanelBuilder32 software for procedures on how to transfer applications using Pass-Through.

## 12-10 Terminal Connections

**DH+ Terminal Connections**

This section describes connections for the DH+ PanelView terminals including:

- DH+ ports
- typical DH+ system configuration
- making DH+ connections

**DH+ Terminal Ports**

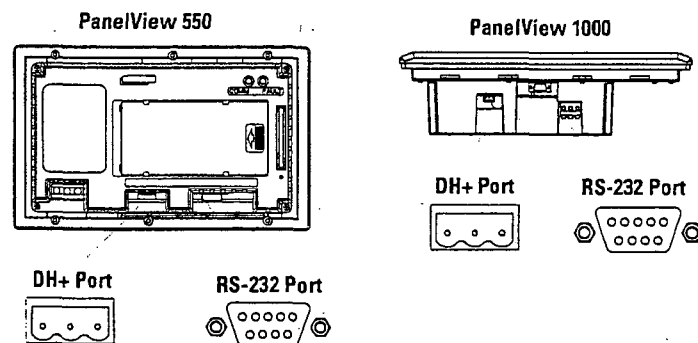
The DH+ versions of the PanelView terminals (catalog numbers ending in 8) have a DH+ port and an RS-232 port.

**Use the DH+ port to:**

- communicate with a PLC-5 controller on the Allen-Bradley DH+ link via the processor's DH+ port.
- communicate with an SLC 5/04 controller (Channel 1 port) on the Allen-Bradley DH+ link via the processor's DH+ port.
- communicate with a ControlLogix controller on the Allen-Bradley DH+ link via the 1756-DHRIO module.
- transfer applications over the DH+ link from a computer with a DH+ connection.

**Use the RS-232 port to:**

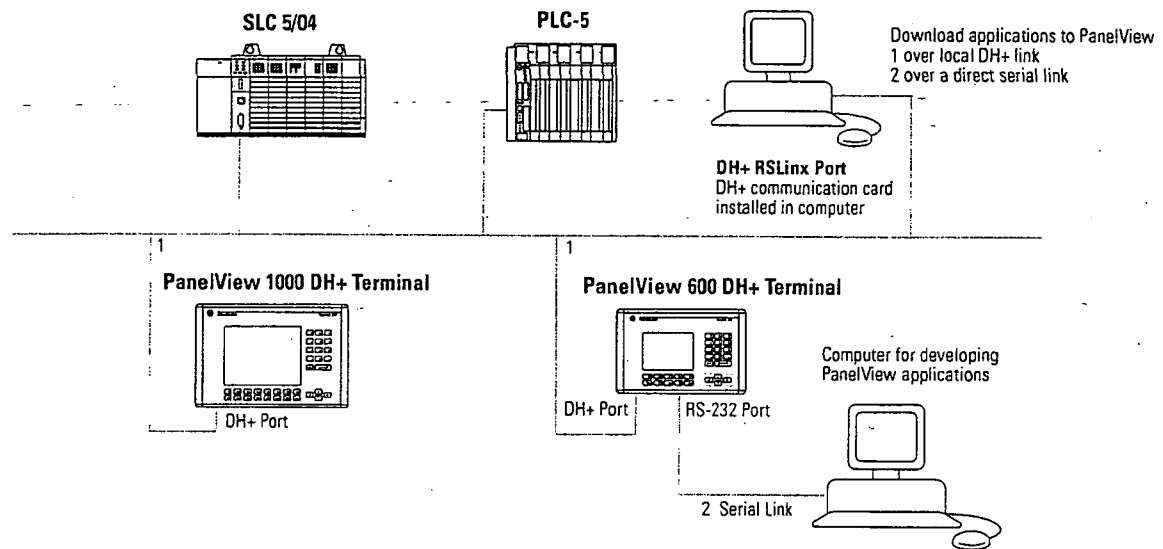
- transfer PanelView applications between a computer and the DH+ terminal using a direct connection.
- connect a printer. For connection details, see the last section in this chapter.



## Typical DH+ System Configuration

For more information on the Allen-Bradley DH+ link, refer to:

- 1785-5.7 Enhanced PLC-5 Programmable Controllers Installation Instructions
- 1770-6.2.2 Data Highway/Data Highway Plus/Data Highway II/Data Highway 485 Cable Installation Manual.



## 12-12 Terminal Connections

## Making DH+ Connections

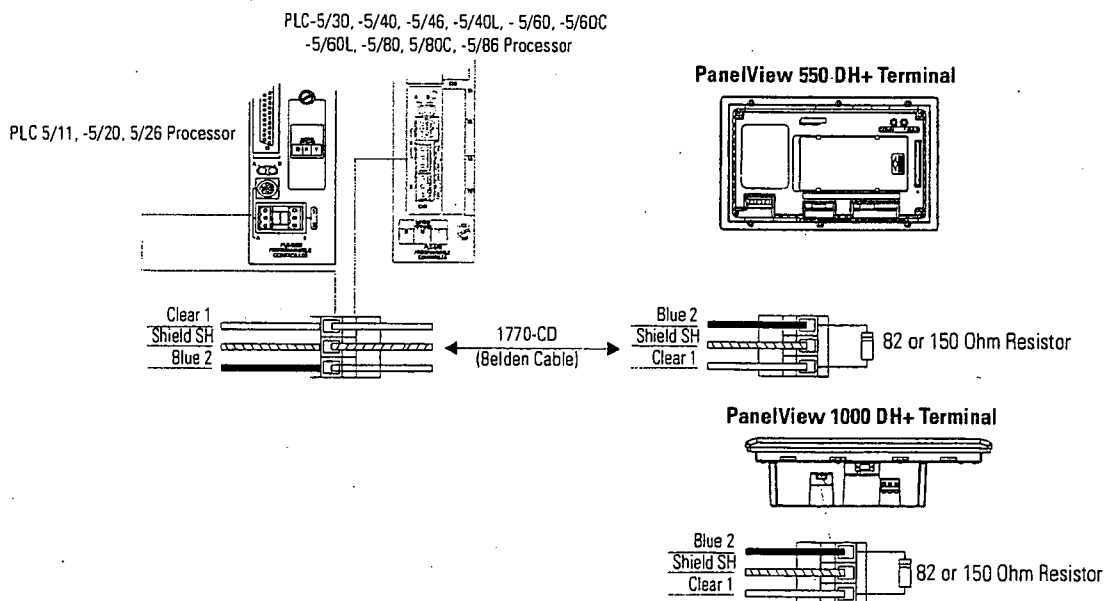
Use the Belden 9463 twin axial cable (1770-CD) to connect a DH+ PanelView terminal to the DH+ link.

You can connect a DH+ link in 2 ways:

- trunk line/drop line - from the drop line to the connector screw terminals on the DH+ connectors of the processor
- daisy chain - to the connector screw terminals on the DH+ connectors on the processor

Follow these guidelines when installing DH+ communication links.

- do not exceed these cable lengths:
  - trunk line-cable length: 3,048 m (10,000 cable ft)
  - drop-cable length: 30.4 m (100 cable-ft)
- do not connect more than 64 stations on a single DH+ link



## DH-485 Terminal Connections

This section describes connections for the DH-485 PanelView terminals.

- DH-485 terminal ports
- Connecting to a single SLC controller (Point-to-Point)
- Connecting to a DH-485 network
- Connecting a computer
- Connecting a Hand-held terminal

**Note:** For PanelView 300 Micro terminals, refer to page 12-39.

### DH-485 Terminal Ports (RJ45)

DH-485 PanelView terminals with catalog numbers ending in 2 have two DH-485 ports. Terminals with catalog numbers ending in 3 also have an RS-232 printer port.

#### Use the DH-485 Communications port to:

- communicate with a single or multiple SLC controllers over a DH-485 network.

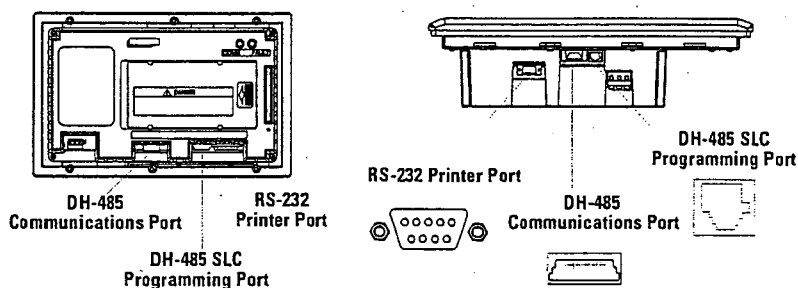
#### Use the DH-485 SLC Programming connector to:

- upload/download PanelView applications.
- monitor SLC operation, enter/modify SLC programs, test network devices.

#### Use the RS-232 Printer port to:

- connect a printer that supports the IBM enhanced character set. For details on connecting to the RS-232 port, see the last section in this chapter.

The DH-485 communications port and programming connector may appear in different locations on specific terminals. Identify the ports by their size and shape or by the port labels.

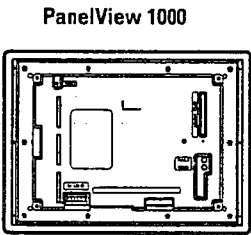


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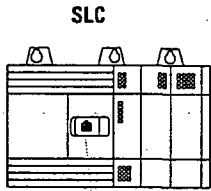
Connecting to a Single SLC Controller (Point-to-Point)

To connect a DH-485 terminal to a single SLC controller use one of these cables:

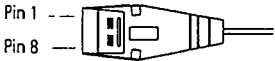
- 0.3 meter (1 foot) Catalog No. 1747-C11
- 1.83 meter (6 foot) Catalog No. 1747-C10
- 6.1 meter (20 foot) Catalog No. 1747-C20



DH-485 Communications Port

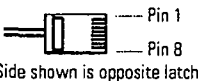


SLC 500 Communications Connector



To PanelView Terminal  
8-pin Female Plug

Cable, Catalog No. 1747-C10  
Cable, Catalog No. 1747-C11  
Cable, Catalog No. 1747-C20



To SLC Communications Connector  
8-pin, Male, Modular Plug

Connection Diagram		
Pin #	Connect to:	Pin #
1	_____	1
2	_____	2
3	_____	3
4	_____	4
5	_____	5
6	_____	6
7	_____	7
8	_____	8

The DH-485 connectors are not electrically isolated. If electrical isolation is required, use Link Couplers (Catalog No. 1747-AIC) as shown on next page.

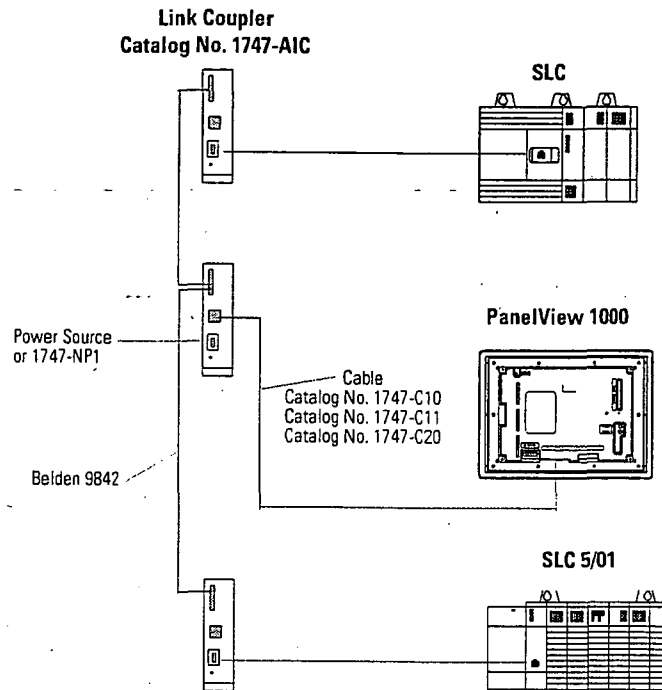


Electrical isolation using Link Couplers (Catalog No. 1747-AIC) is required where the distance between the PanelView terminal and the SLC is greater than 6.1 meters (20 feet).

## Connecting to a DH-485 Network

This section shows how to connect a DH-485 terminal to multiple SLC controllers on a DH-485 network through the AIC Link Coupler.

**Note:** For PanelView 300 Micro terminals, refer to page 12-39.

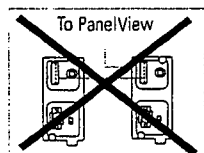
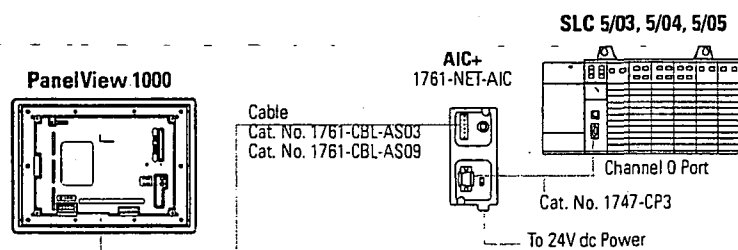
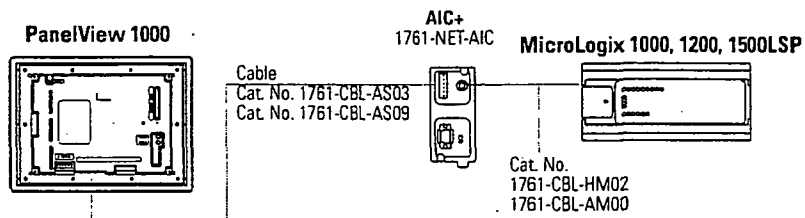


### IMPORTANT

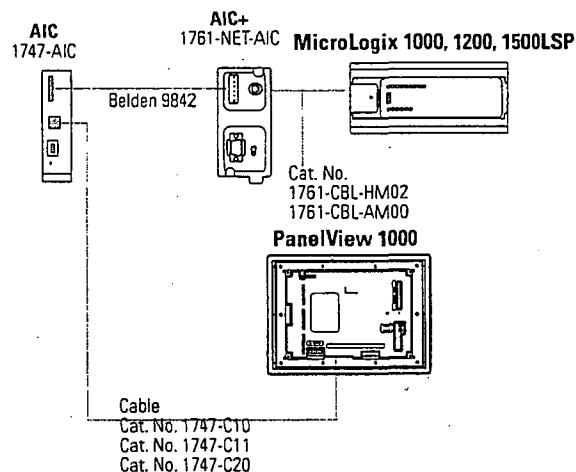
The DH-485 network cable requires proper shielding, grounding and termination. Refer to Data Highway / Data Highway Plus / Data Highway-485 Cable Installation Manual (Publication No. 1770-6.2.2).

## 12-16 Terminal Connections

The illustration below shows how to connect a DH-485 terminal to a MicroLogix or SLC controller using the AIC+ Link Coupler (Catalog No. 1761-NET-AIC).



Do not connect the PanelView to Port 3 of the AIC+ when Port 3 is networked to other devices.



## Connecting a Computer

On DH-485 terminals, PanelView applications are transferred:

- through the DH-485 programming connector to the terminal.
- through any node on a DH-485 network.

To connect a computer to the PanelView terminal, you need:

- a cable (same cables used to transfer applications from APS software to SLC)
  - 0.3 meter (1 foot) cable, Catalog No. 1747-C11
  - 1.83 meter (6 foot) cable, Catalog No. 1747-C10
  - 6.1 meter (20 foot) cable, Catalog No. 1747-C20
- Personal Computer Interface Converter (PIC), Catalog No. 1747-PIC. The PIC connects to the computer. The cable connects the PIC to the DH-485 programming connector.

### Personal Computer Interface Converter (PIC)

The Personal Computer Interface Converter (PIC) receives power from a controller through DH-485 connections. When connecting a computer directly to a PanelView terminal without a controller connected, you need to use a power supply (Catalog No. 1747-NP1). The power supply connects to the DH-485 communications connector with the same cables used to connect an SLC.

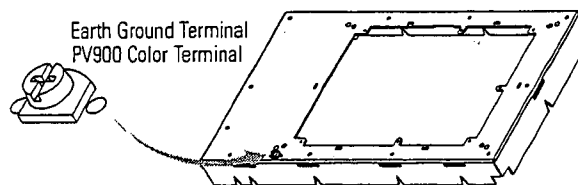
### IMPORTANT

The terminal must be connected to an SLC, DH-485 network, or power supply (Catalog No. 1747-NP1). This connection provides power to the PIC.

### Connecting Earth Ground to PanelView Terminals

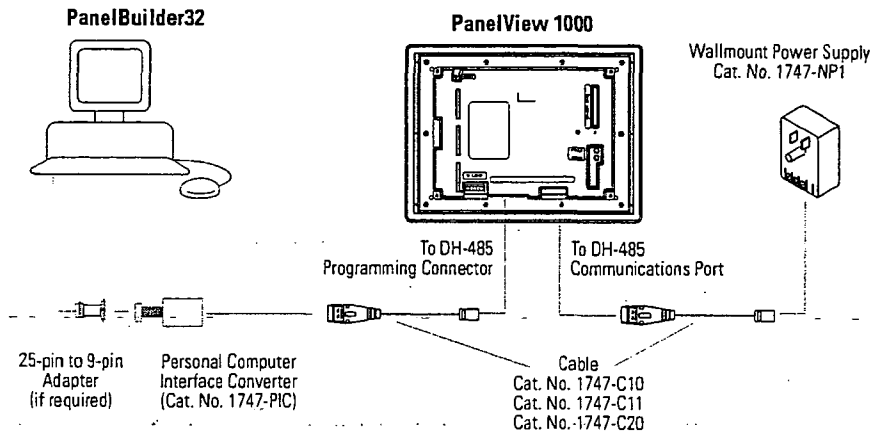
When using the 1747-PIC converter with the PV600, PV900, PV1000 color and PV1000 grayscale terminals, you must connect the Earth Ground terminal on the back of the terminal to Earth Ground.

Connect the Earth Ground terminal using 14-gauge, stranded wire no longer than 1 meter (40 inches).

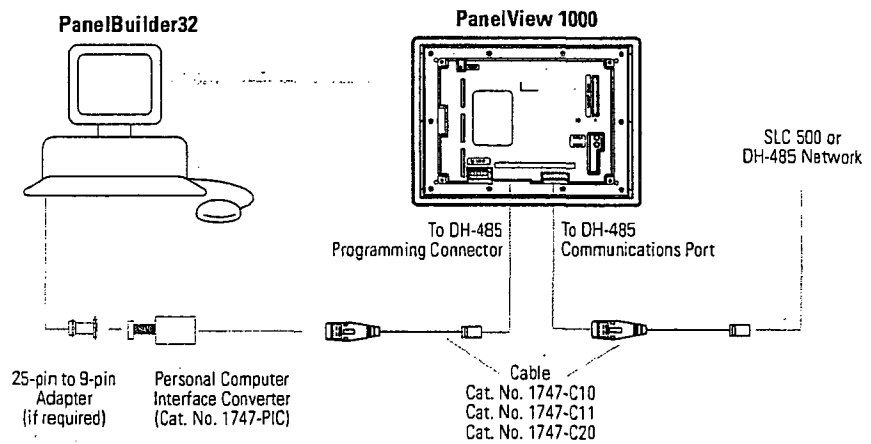


## 12-18 Terminal Connections

## Connecting a Computer to DH-485 Connector Using a Power Supply



## Connecting a Computer to DH-485 Connector Using a DH-485 Powered Device



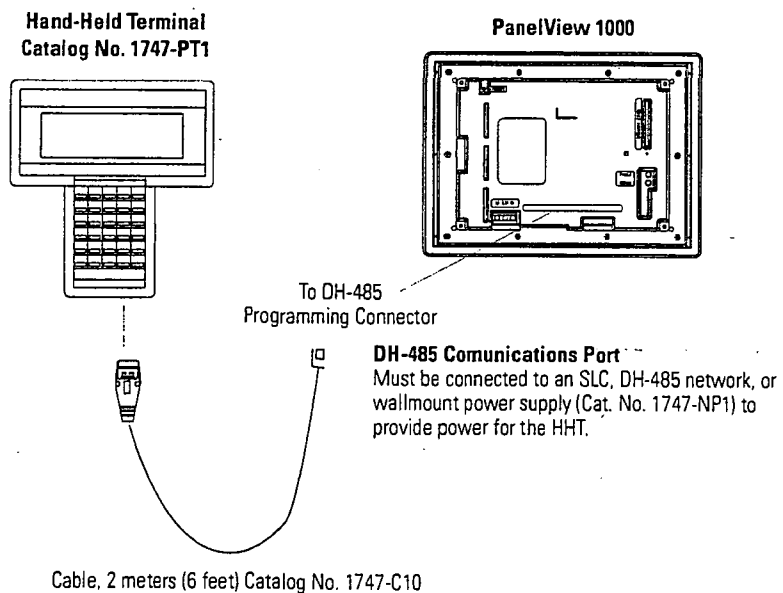
**Note:** The computer can connect to any node on the network. It is not necessary to directly connect the computer to the PanelView terminal.

## Connecting a Hand-Held Terminal

To connect a Hand-Held Terminal (HHT) to the PanelView terminal, use cable Catalog No. 1747-C10. One end of the cable connects to the HHT connector and the other end connects to the DH-485 programming connector on the terminal. All power is supplied to the HHT through the cable.

### IMPORTANT

The PanelView terminal must be connected to an SLC, DH-485 network or power supply. This connection provides power for the HHT.



## RS-232 (DH-485) Terminal Connections

This section describes connections for the RS-232 (DH-485) PanelView terminals including:

- RS-232 ports
- connecting to a SLC, CompactLogix, or MicroLogix Controller (point-to-point)
- connecting to a MicroLogix Controller through the AIC+ module
- connecting a computer
- connecting to a DH-485 link

Refer to page 12-39 for PanelView 300 Micro RS-232 connections

### RS-232 Terminal Ports

RS-232 (DH-485) PanelView terminals with catalog numbers ending in 5 have a single RS-232 communications port. Terminals with catalog numbers ending in 9 also have an RS-232 printer port.

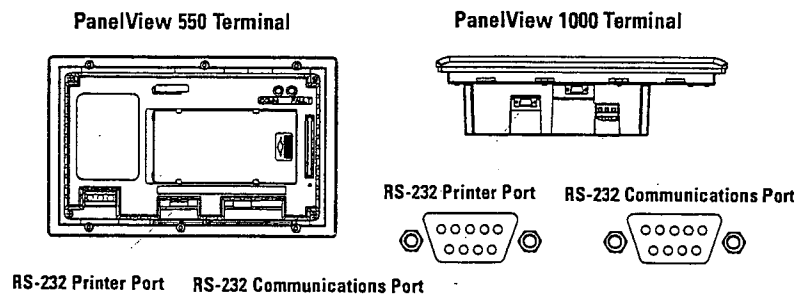
#### Use the RS-232 communications port to:

- communicate with a single SLC 5/03, 5/04 or 5/05 controller (Channel 0 port) or MicroLogix 1000, 1200 or 1500 controller using point-to-point communications
- download/upload PanelView applications

#### Use the RS-232 printer port to:

- connect a printer that supports the IBM enhanced character set. For connection details, see the last section in this chapter.

The RS-232 communications port and the printer port are reversed on the PanelView 550 touch screen terminals.



## Connecting to an SLC, CompactLogix, MicroLogix (Point-to-Point)

This section shows how to connect a CompactLogix, MicroLogix 1500LRP, or SLC controller (SLC-5/03, 5/04, or 5/05) to the RS-232 PanelView terminal for point-to-point (DH-485) communications. On terminals with two ports, use the RS-232 Communications Port.

For the SLC, CompactLogix or MicroLogix 1500LRP controller, use one of these cables:

- 5 meter (16.4 foot) Catalog No. 2711-NC13
- 10 meter (32.7 foot) Catalog No. 2711-NC14
- 3 meter (10 foot) Catalog No. 2706-NC13

PanelView 1000 Terminal

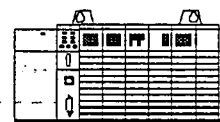


To PanelView Terminal  
9-pin, Male, D-Shell Connector

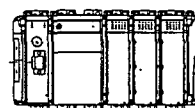
Cable, Cat. No. 2711-NC13  
Cable, Cat. No. 2711-NC14  
Cable, Cat. No. 2706-NC13

To SLC 5/03, 5/04, 5/05,  
Compact Logix or MicroLogix 1500LRP  
Channel 0 Port  
9-pin, Male, D-Shell Connector

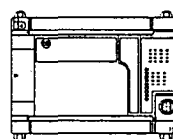
SLC 5/03, 5/04, 5/05



CompactLogix



MicroLogix 1500LRP



Pin #	Required	Pin #	Required
1		1	
2	Data Out (TXD)	2	Data In (RXD)
3	Data In (RXD)	3	Data Out (TXD)
4		4	
5	Signal Common	5	Signal Common
6		6	
7		7	
8		8	
9		9	

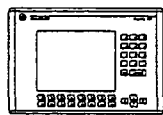
### IMPORTANT

You must configure the Channel 0 Port of the SLC 5/03, 5/04, 5/05 controller for DH-485 communications using the RSLogix 500 or AI500 software.

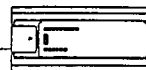
For the MicroLogix 1000, 1200, or 1500LSP controller, use one of these cables:

- 5 meter (16.4 foot) Catalog No. 2711-NC21
- 15 meter (49 foot) Catalog No. 2711-NC22

PanelView 1000 Terminal



MicroLogix 1000, 1200, 1500LSP

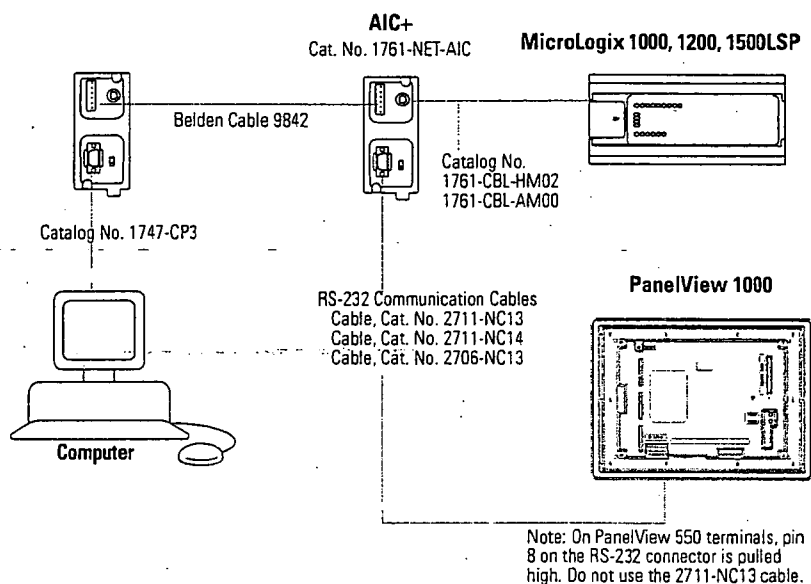


Cable, Cat. No. 2711-NC21  
Cable, Cat. No. 2711-NC22  
(null modem not required)

## 12-22 Terminal Connections

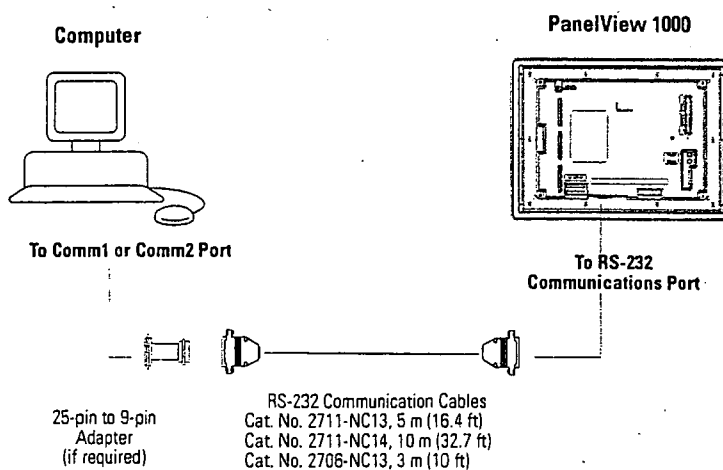
## Connecting to a MicroLogix Controller through an AIC+

This section shows how to connect the RS-232 (DH-485) version of the PanelView terminal to a MicroLogix controller through an AIC+ Link Coupler.



## Connecting a Computer

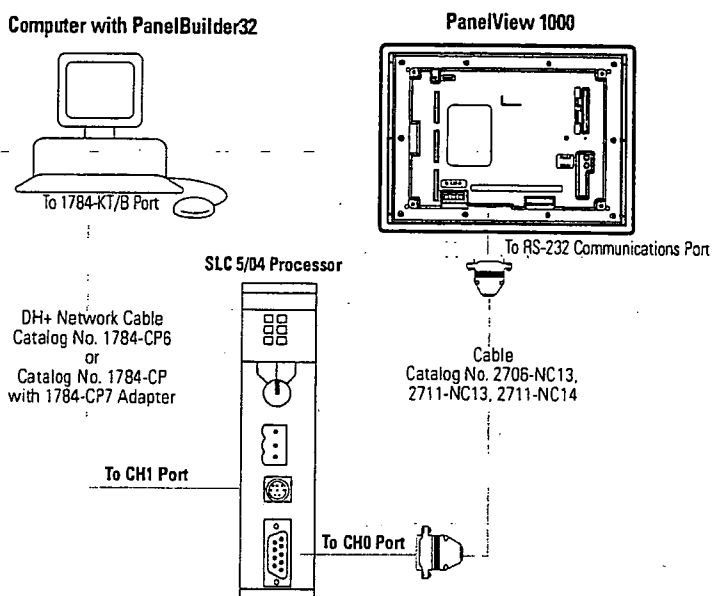
This section shows how to connect a computer to the RS-232 (DH-485) PanelView terminal for transferring applications.



## Connecting a DH+ to DH-485 Pass-Through Link

This section shows connections for transferring applications between a computer on the Allen-Bradley DH+ link and an RS-232 (DH-485) PanelView terminal, through an SLC 5/04 controller.

The RS-232 (DH-485) Communications port on the terminal connects to the CH0 port of the controller using one of the cables listed below.



## RS-232 (DF1) Terminal Connections

This section describes connections for the RS-232 (DF1) versions of the PanelView terminal including:

- compatible controllers
- RS-232 terminal ports
- connecting to a controller (point-to-point)
- using a modem
- connecting to a DeviceNet or EtherNet/IP network

**Note:** For PanelView 300 Micro terminals, refer to page 12-39.

### Compatible Controllers

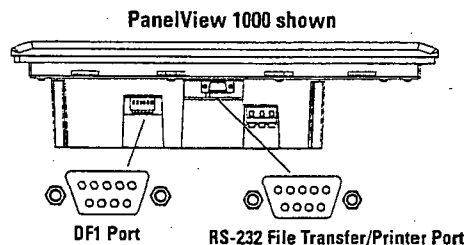
The RS-232 (DF1) terminals support full duplex communications with the following controllers.

- MicroLogix 1000, 1200, 1500 via the communication port.
- ControlLogix, CompactLogix, FlexLogix controller via RS-232 port
- SLC, PLC or MicroLogix 1000, 1200 or 1500 via 1761-Net-DNI modules (for DeviceNet Network).
- SLC 5/03, 5/04, or 5/05 via Channel 0/DF1 port.
- PLC-5/10, 5/12, 5/15, or 5/25 via bridge such as the 1770-KF2, or 1785-KE.
- Enhanced PLC-5 controllers (for example, PLC-5/11, 5/20, 5/20C, 5/20E) via Channel 0/DF1 port.

### RS-232 (DF1) Terminal Ports

The RS-232 (DF1) PanelView terminals, with catalog numbers ending in 17, have a single RS-232 communications port supporting DF1 (Full Duplex) communications port. PanelView terminals with catalog numbers ending in 16 also have an RS-232 printer/file transfer port.

- Use the DF1 port to communicate with a logic controller using DF1 full duplex communications.
- Use the RS-232 printer/file transfer port to transfer applications between a computer and the terminal or to connect a printer. For connection details, see the last section in this chapter.



**Note:** The PanelView 300 has one DF1 port which is used for communications and transferring applications.

### RS-232/DF1 Port Connector

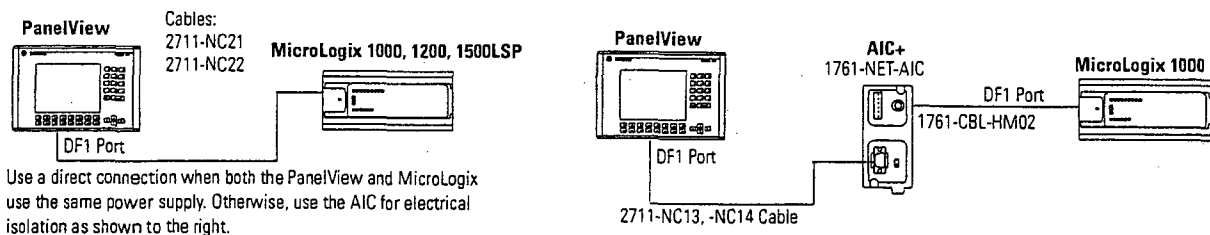
The DF1 port on the PanelView terminal is a 9-pin, male, RS-232 connector. The table below shows the pinout descriptions for this port and how these pins map to the DF1 ports on the controllers.

DF1 Port 9-pin DCE		SLC 9-pin	PLC 25-pin	MicroLogix/DNI 8-pin DIN
1				
2	RXD →	2	3	4
3	← TXD	3	2	7
4	← DTR	4	20	
5	← COM	5	7	2
6	→ DSR	6	6	
7	← RTS	7	4	
8	→ CTS	8	5	
9				

The maximum cable length for DF1/full duplex communications is 15.24 meters (50 feet).

### Connecting to a MicroLogix 1000

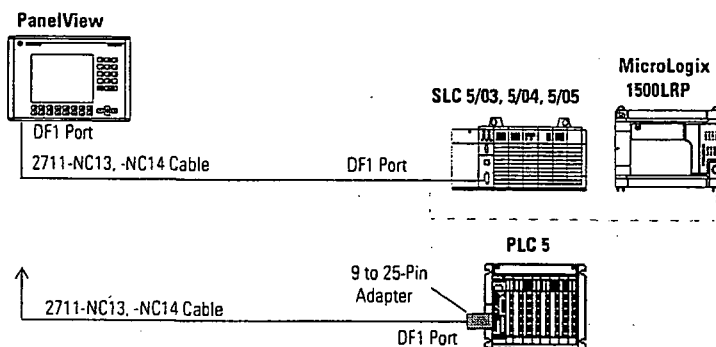
The following shows a point-to-point connection between the RS-232 (DF1) port of the PanelView terminal and a MicroLogix 1000.



The 1761-NET-AIC is used only with the MicroLogix and eliminates grounding level differences between the controller and PanelView.

### Connecting to an SLC, PLC or MicroLogix 1500LRP

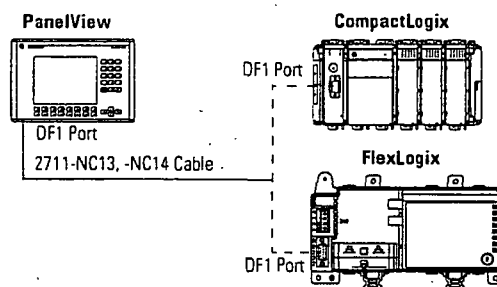
The following shows a point-to-point connection between the DF1 port of the PanelView and an SLC or PLC controller.



Use an optical isolator or equivalent when grounding level differences exist between the controller or modem and the PanelView.

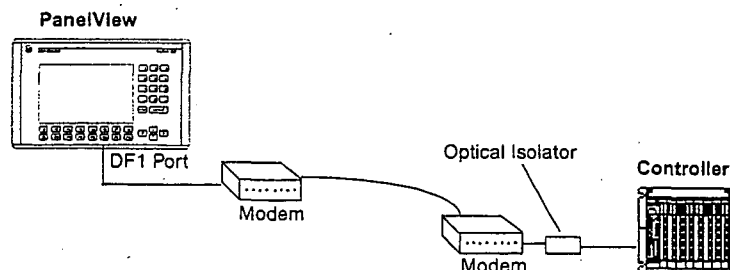
### Connecting to a CompactLogix or FlexLogix

The following shows a point-to-point connection between the DF1 port of the PanelView and a CompactLogix or FlexLogix controller.



### Using a Modem

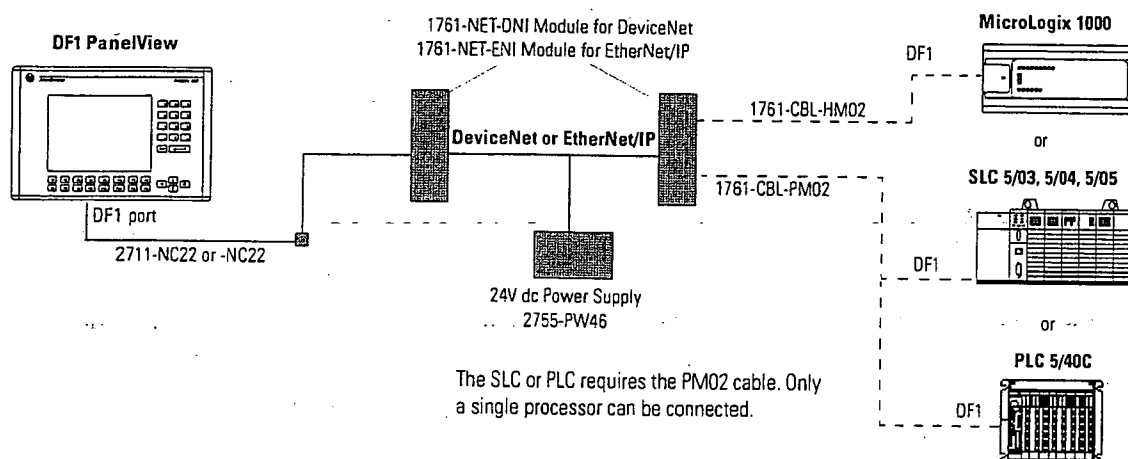
Wire or radio modem communications is possible between a DF1 terminal and controller. Each modem must support full duplex communications. Refer to your modem user manual for details on settings and configuration.



## Connecting to a DeviceNet or EtherNet/IP Network

The following illustration shows a DF1 PanelView terminal connected to a single controller (MicroLogix, SLC or PLC) on:

- a DeviceNet network via 1761-NET-DNI modules or
- an EtherNet/IP network via 1761-NET-ENI modules



## Constructing a Null Modem Cable

To construct a null modem cable, refer to the following pinout:

9-pin		25-pin	9-pin
3	↔	3	3
2	↔	2	2
5	↔	7	5
1	↔	8	1
4	↔	20	4
6	↔	6	6
8	↔	5	8
7	↔	4	7

## ControlNet Connections

This section describes connections for the ControlNet PanelView terminals including:

- ControlNet Protocol
- Compatible ControlNet Controllers
- ControlNet ports on the PanelView terminal
- Typical ControlNet network
- Making ControlNet connections

### Related Information

For more information on ControlNet products, refer to the following publications.

- ControlNet System Overview (Publication 1786-2.9)
- ControlNet System Planning and Installation Manual (1786-6.2.1)
- ControlNet Cable System Component List (AG-2.2)

The Allen-Bradley website ([www.ab.com](http://www.ab.com)) provides information and product descriptions of ControlNet products. Under the Products and Services heading, select Communications.

### ControlNet Protocol

The PanelView terminal supports release 1.5 of ControlNet. Scheduled and Unscheduled PLC-5C and ControlLogix messaging. Redundant cabling is supported.

ControlNet allows a flexible control architecture that can work with multiple processors and up to 99 nodes (via taps) anywhere along the trunk cable of the network. There is no minimum tap separation and you can access the ControlNet network from every node (including adapters).

## Compatible ControlNet Controllers

The ControlNet PanelView terminal communicates with a PLC-5C (using PCCC commands) or a ControlLogix processor (using CIP protocol) using unscheduled and scheduled messaging. The following controllers are supported:

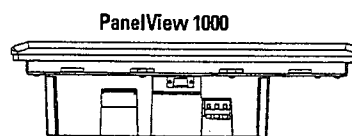
- ControlLogix using 1756-CNB module
- PLC-5/20C, -5/40C, -5/60C, -5/80C

## ControlNet Terminal Ports

ControlNet versions of the PanelView terminal (catalog numbers ending in 15) have a ControlNet communication port and an RS-232 serial port.

- Use the ControlNet port to connect to devices on a ControlNet network and transfer applications over a ControlNet network.
- Use the RS-232 port to transfer applications between a computer and the terminal using a direct connection or to connect a printer.

For details on connecting to the RS-232 port, see the last section in this chapter.

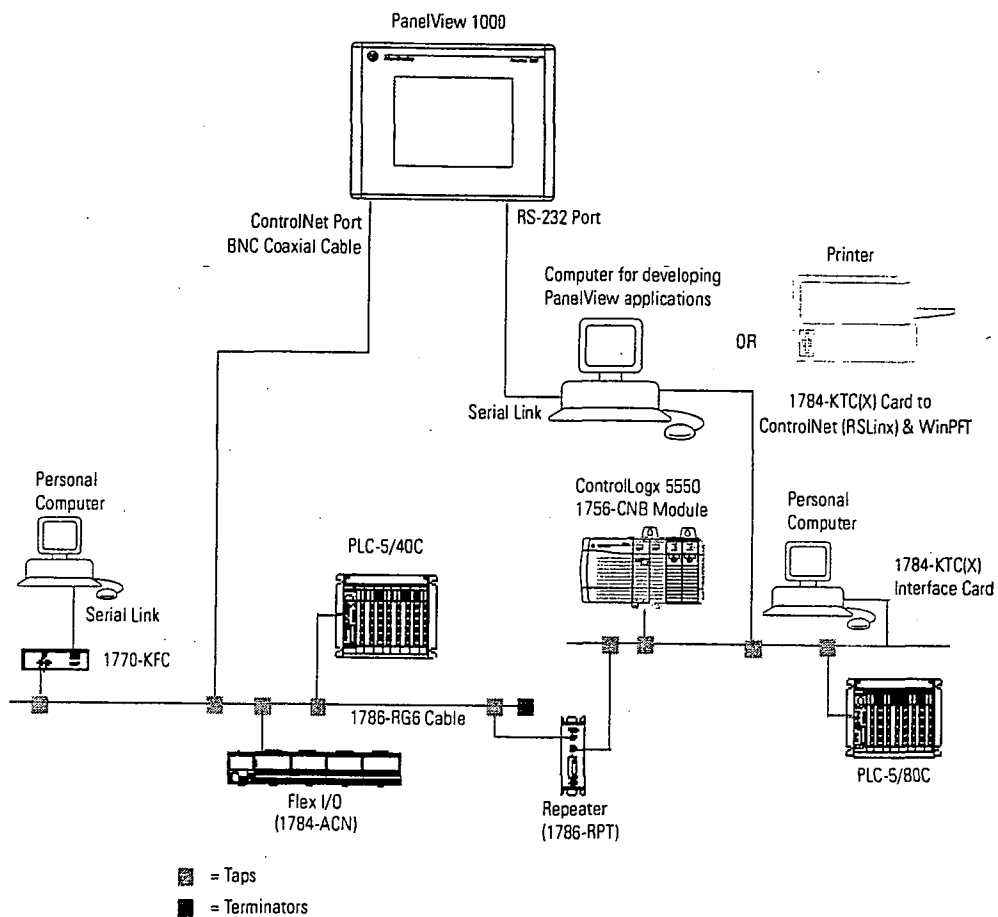


ControlNet Communications Port      RS-232 Port

## 12-30 Terminal Connections

## Typical ControlNet Network

Below is a typical ControlNet network with a PanelView terminal installed on a network drop.

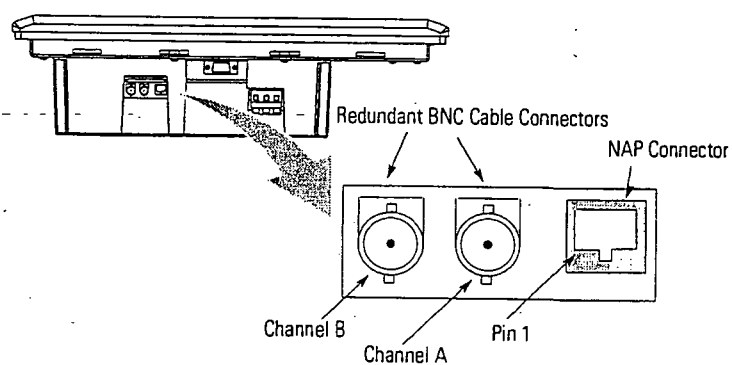


## Making ControlNet Connections

Use the pinout information below to connect the PanelView to a ControlNet network.

### IMPORTANT

Follow the ControlNet network layout and design as specified in the ControlNet Cable System Planning and Installation Manual (Publication 1786-6.2).



Pin #	NAP Signal
1	Signal Common
2	No Connection
3	TX_H
4	TX_L
5	RX_L
6	RX_H
7	No Connection
8	Signal Common
Shell	Earth Ground

## NAP and Redundant Cables

ControlNet cables, taps, connectors. Refer to the ControlNet Cable System Planning and Installation manual (Publication 1786-6.2.1) for descriptions of these components. For information on purchasing these items, refer to the Allen-Bradley ControlNet Cable System Component List (Publication AG-2.2).

Item	Catalog Number
RG-6 quad-shield	1786-RG6
Coax repeater	1786-RPT, -RPTD
Coax taps	1786-TPR, -TPS, -TPYR, -TPYS
Network access cable	1786-CP
Coax tool kit	1786-CTK
Segment terminators	1786-XT
BNC connectors	1786-BNC, -BNCJ, -BNCP, -BNCJ1

**IMPORTANT**

Do not connect to a network using both the redundant cable BNC connector and the Network Access Port (NAP).

## DeviceNet Terminal Connections

This section describes connections for the DeviceNet PanelView terminals including:

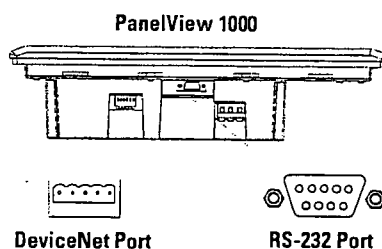
- DeviceNet connectors
- connections
- typical DeviceNet network

### DeviceNet Terminal Ports

The DeviceNet versions of the PanelView terminals (catalog numbers ending in 10) have a DeviceNet port and an RS-232 serial port.

- Use the DeviceNet port to connect to devices on a DeviceNet network or transfer applications over a DeviceNet network.
- Use the RS-232 port to transfer applications between a computer and the terminal using a direct connection or to connect a printer.

For details on connecting to the RS-232 port, see the last section in this chapter.



## 12-34 Terminal Connections

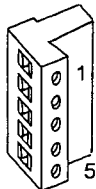
## Making DeviceNet Connections

Use one of the cables below to connect the DeviceNet version of the PanelView terminal to a DeviceNet network.

Cable	Publication No.
DeviceNet Cable, 50 meters (164 feet)	1485C-P1A50
DeviceNet Cable, 100 meters (328 feet)	1485C-P1A150
DeviceNet Cable, 150 meters (492 feet)	1485C-P1A300

**IMPORTANT**

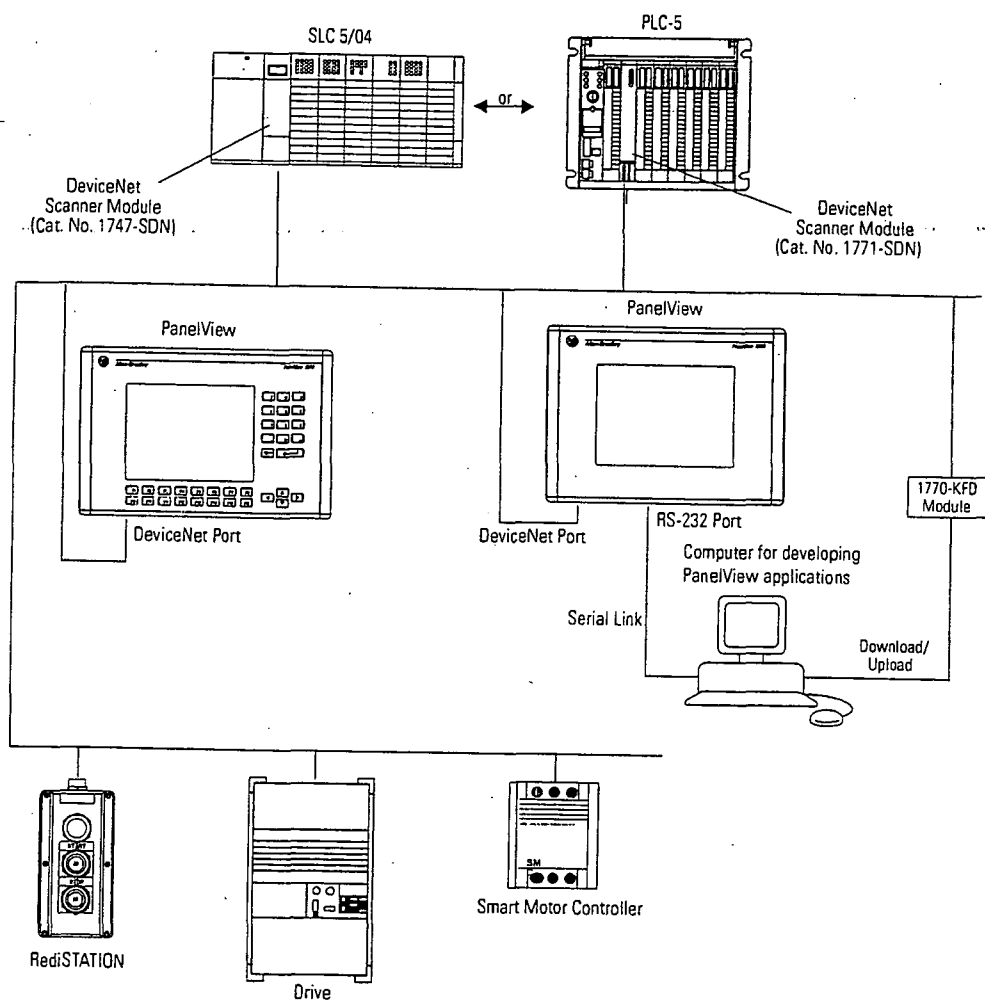
Refer to DeviceNet Cable System Planning and Installation manual (Publication 1485-6.7.1) for network layout and design information

DeviceNet Terminal Block	Terminal	Signal	Function	Color
	1	COM	Common	Black
	2	CAN_L	Signal Low	Blue
	3	SHIELD	Shield	Uninsulated
	4	CAN_H	Signal High	White
	5	VDC+	Power Supply	Red

## Typical DeviceNet Network

Below is a typical DeviceNet network with PanelView terminals installed on 2 of the network drops.

A DeviceNet network requires a 24V dc power supply. DeviceNet power consumption is 24mA - 90mA @24V dc. The PanelView terminal does not receive its power from the network.



## EtherNet/IP Connections

The EtherNet/IP PanelView terminal can communicate on an EtherNet TCP/IP network with the following devices:

- PLC-5E or PLC-5 with 1761-NET-ENI or 1785-ENET module
- SLC-5/05 or SLC with 1761-NET-ENI module
- ControlLogix controller with 1756-ENET/B or 1761-NET-ENI module
- MicroLogix, CompactLogix, or FlexLogix with 1761-NET-ENI module
- another EtherNet/IP PanelView terminal
- Any device that can process CIP messages

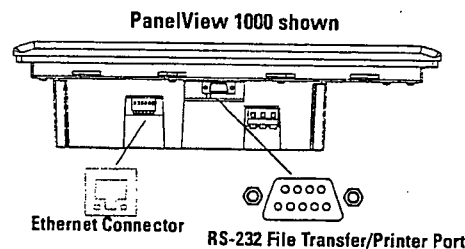
The PanelView terminal supports access to multiple ControlLogix controllers through:

- a single 1756-ENET/B module in a single 1756-I/O rack
- multiple 1756-ENET/B modules in a single 1756-I/O rack
- multiple 1756-ENET/B modules in multiple 1756-I/O racks

## EtherNet/IP Terminal Ports


The EtherNet/IP versions of the PanelView terminals (catalog numbers ending in 20) have an Ethernet RJ45 communications port and an RS-232 serial port.

- Use the RJ45 port to communicate with a logic controller on an EtherNet/IP network and transfer applications over an EtherNet/IP network.
- Use the RS-232 serial port to transfer applications between a computer and the terminal using a direct connection or to connect a printer. For connection details, see the last section in this chapter.



## Ethernet Connector

The Ethernet connector is an RJ45, 10/100Base-T connector. The pinout for the connector is shown below:

Pin	Pin	Pin Name
RJ45 Connector 	1	TD+
	2	TD-
	3	RD+
	4	NC
	5	NC
	6	RD-
	7	NC
	8	NC

When to use a straight-through and cross-over pin-out:

- Direct point-to-point 10/100Base-T cables, with cross over pin-out (1-3, 2-6, 3-1, 6-2), connect the PanelView Ethernet port directly to another SLC 5/05 Ethernet port (or a computer 10/100Base-T port).

## Cables

Category 5 shielded and unshielded twisted-pair cables with RJ45 connectors are supported. The maximum cable length between the PanelView Ethernet port and a 10/100Base-T port on an Ethernet hub (without repeaters or fiber) is 100 meters (328 feet). However, in an industrial application, the cable length should be kept to a minimum.

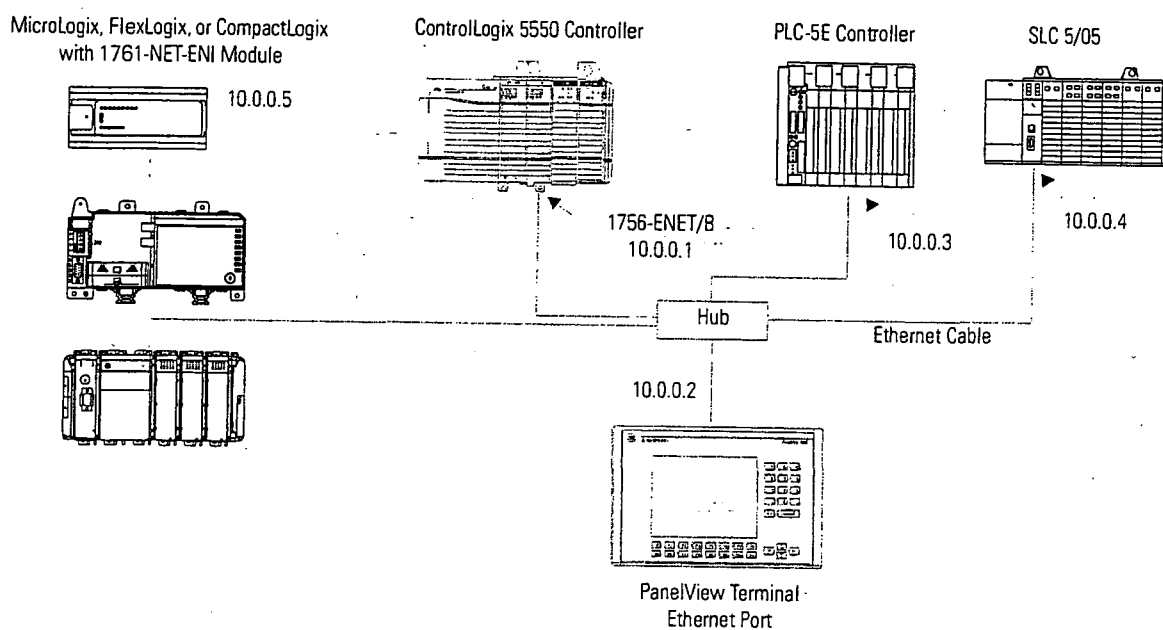
### ATTENTION



If you connect or disconnect the Ethernet cable with power applied to the PanelView or any device on the network, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.

## Typical EtherNet/IP Configuration

The following illustration shows a ControlLogix Controller (with 1756-ENET/B modules), a PLC-5E controller, SLC 5/05, a MicroLogix/CompactLogix/FlexLogix (with 1761-NET-ENI module), and an Ethernet PanelView terminal connected to an EtherNet/IP network. Note that each node has a unique IP address.



## PanelView 300 Micro Terminal Connections

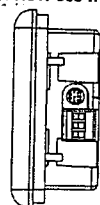
This section describes how to connect the PanelView 300 Micro terminal. Refer to the following topics in this section:

- RS-232 communications port
- Connecting to a MicroLogix Controller
- Connecting to a SLC, PLC-5, ControlLogix, MicroLogix, CompactLogix, or FlexLogix Controller
- Connecting to a DH-485 Network
- Connecting to a DeviceNet Network
- Connecting to a personal computer

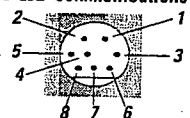
### RS-232 Communications Port

The PanelView 300 Micro terminal (catalog numbers ending in 18 and 19) has a single RS-232 communications port (8-pin mini DIN).

PanelView 300 Micro



RS-232 Communications Port

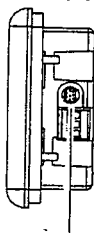


Pin #
1 NC (No Connection)
2 GND
3 RTS
4 RXD
5 NC (No Connection)
6 CTS
7 TXD
8 GND

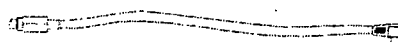
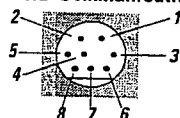
### Connecting to a MicroLogix Controller

Directly connect the PanelView 300 Micro terminal to a MicroLogix 1000/1200/1500 controller using the following cables. Use DH-485 or DF1 protocols for communications.

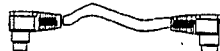
PanelView 300 Micro



RS-232 Communications Port

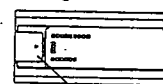


1761-CBL-HM02  
2711-CBL-HMxx

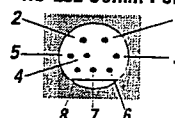


1761-CBL-AM00

MicroLogix 1000 Shown



RS-232 Comm Port



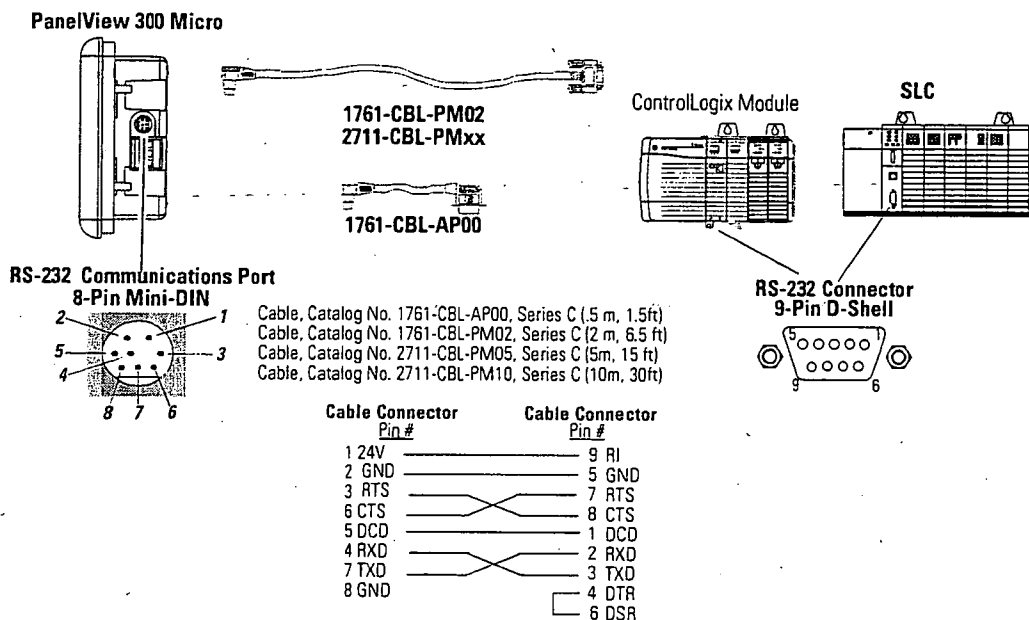
Cable, Catalog No. 1761-CBL-AM00, Series C (5 m, 1.5 ft)  
Cable, Catalog No. 1761-CBL-HM02, Series C (2 m, 6.5 ft)  
Cable, Catalog No. 2711-CBL-HM05, Series C (5 m, 15 ft)  
Cable, Catalog No. 2711-CBL-HM10, Series C (10 m, 30 ft)

Cable Connector	Pin #	Cable Connector	Pin #
24V	1	1 24V	1
GND	2	2 GND	2
RTS	3	3 RTS	3
CTS	6	6 CTS	6
DCD	5	5 DCD	5
RXD	4	4 RXD	4
TXD	7	7 TXD	7
GND	8	8 GND	8

Publication 2711-UM014B-EN-P

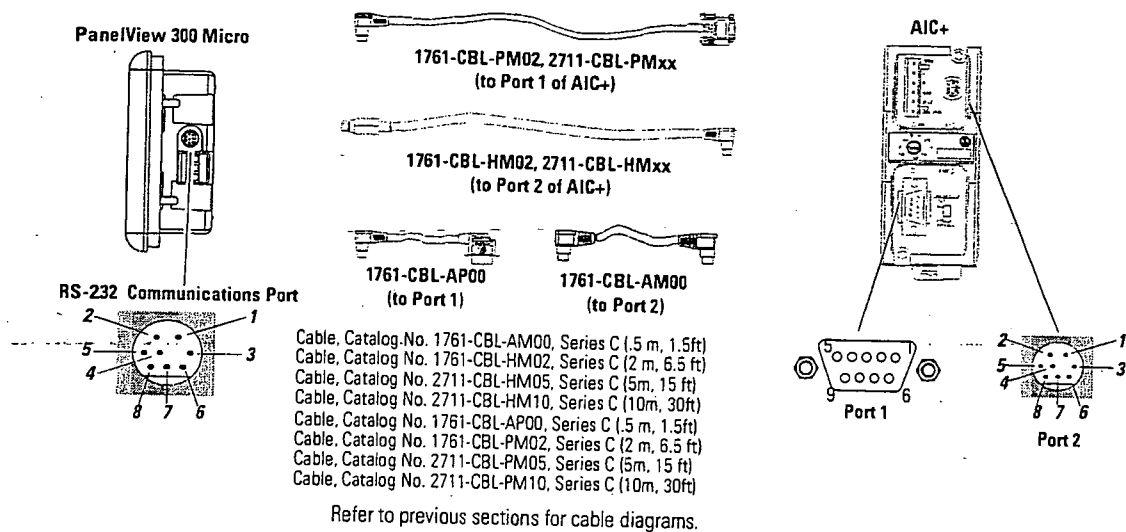
## Connecting to an SLC, PLC-5, ControlLogix, MicroLogix 1500LRP, CompactLogix, or FlexLogix

Directly connect the PanelView 300 Micro terminal to an SLC, PLC-5, ControlLogix, MicroLogix 1500LRP, CompactLogix, or FlexLogix processor using the following cables. Use DH-485 (SLC only) or DF1 protocols for communications.



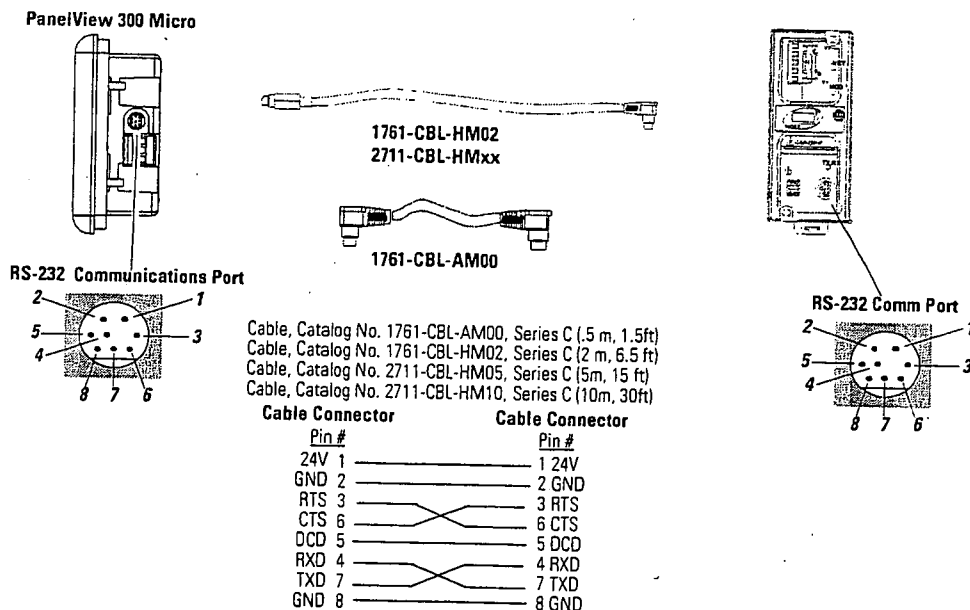
## Connecting to an Advanced Interface Converter

DH-485 versions of the PanelView 300 Micro can operate on a DH-485 network through an Advanced Interface Converter (AIC+) module. Use the following cables.



## Connecting to a DeviceNet Interface (DNI)

Operate the PanelView 300 Micro on a DeviceNet network using DF1 protocol through a point-to-point connection to a DNI module.



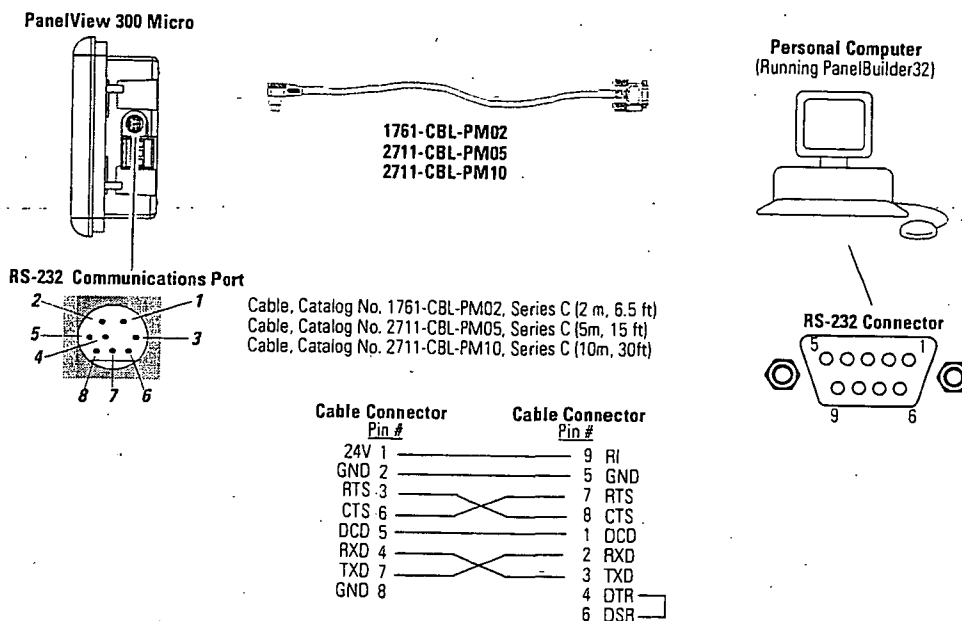
Publication 2711-UM014B-EN-P

## 12-42 Terminal Connections

## Connecting to a Personal Computer (Application File Transfers)

Transfer applications between a computer and PV300 Micro terminal using one of the following cables.

**Note:** Applications for the PanelView 300 Micro terminal are developed using PanelBuilder32 Software (Catalog No. 2711-ND3, V3.60 or later).



Refer to the PanelBuilder32 Software user manual for application download instructions. Here's a short summary of the methods that can be used to transfer files to a PanelView 300 Micro:

### PanelBuilder32 Software

Supports the direct transfer of application files from PanelBuilder32 using an RS-232 link.

### Windows™ PanelView File Transfer (WinPFT) Utility

Supports the direct transfer of PanelBuilder32 application files from WinPFT over an RS-232 link. The WinPFT utility is included with the PanelBuilder32 Software. RSLinx software may be required to transfer applications to the terminal for DH-485 and DF1 protocols.

This method is recommended for direct downloads to installed PanelView 300 Micro terminals using a portable or laptop computer.

**Windows™ CE Pocket PanelView File Transfer (PocketPFT)  
Utility**

Supports the direct transfer of PanelBuilder32 application files from the PocketPFT software over an RS-232 link. The PocketPFT software and an RS232 cable is available from Rockwell Software as part of the MaintenCE suite of tools. You will also need one of the recommended download cables.

This method is recommended for direct downloads to installed PanelView 300 Micro terminals using an HPC JORNADA portable CE computer, available only from Rockwell Software.

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**IMPORTANT**

After a successful download of an application, you may not be able to download another application. The downloaded application may have different communication settings than the settings in PanelBuilder32. Either change the terminal settings using the Communication Setup screen (see page 3-2) or the Application settings dialog in PanelBuilder 32.

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## 12-44 Terminal Connections

## Connecting a Computer or Printer to the Terminal

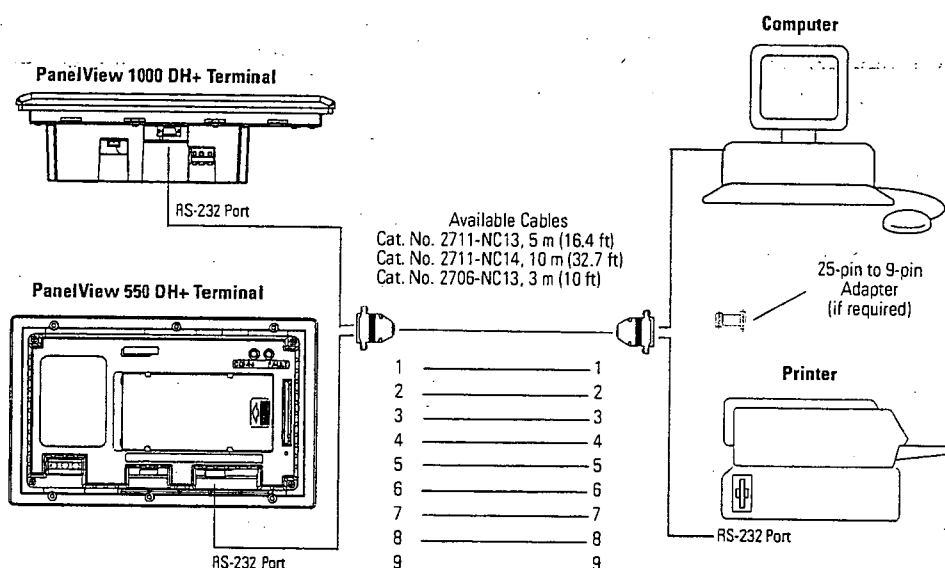
Most of the PanelView terminals have an RS-232 serial port to:

- download/upload applications over a serial link
- and/or connect a printer that supports the IBM enhanced character set

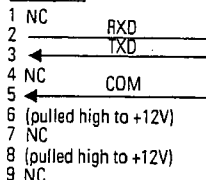
PanelView terminals that don't have an additional RS-232 Printer Port include the 300 Micro, the 300 (except for DeviceNet), and the -xxA2/-xxA5 versions of the 550/600 and 900 monochrome terminals.

The illustration below shows how to make these connections.

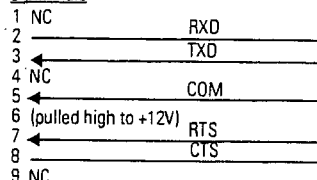
Communication parameters for the RS-232 port are set on the Printer Setup screen of the Configuration Mode menu.



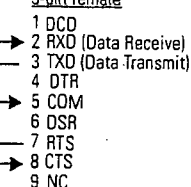
### PV550 Printer Port (DCE) without Handshaking 9-pin male



### PV600/900/1000/1400 Printer Port (DCE) 9-pin male

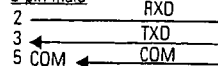


### Printer/Computer Port (DTE) with Handshaking 9-pin female

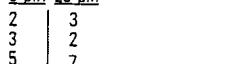


### Upload/Download or Printer Cable without Hardware Handshaking

#### PV550 Printer Port (DCE) 9-pin male



#### Printer/Computer Port (DTE) 9-pin 25-pin



## Chapter 13

# Troubleshooting and Maintenance

### Chapter Objectives

This chapter tells how to isolate and correct common operating problems and perform routine maintenance tasks.

- equipment required
- using troubleshooting chart
- LED indicators
- cleaning display window
- replacing clock module
- replacing backlight

**Note:** The PanelView 300 Micro has no internal components that are user accessible. The rear cover is not removable, do not attempt to remove the cover. The real-time clock battery and LCD display backlight are not replaceable.

### Equipment Required

Other than verifying that the correct power source is connected to the terminal (use a voltmeter), no electronic diagnostic equipment is required for troubleshooting.

### Using the Troubleshooting Chart

The following pages provide a troubleshooting chart for the terminal. This chart lists the most common operating problems, causes, and steps to correct them.

#### ATTENTION



The PanelView terminals contain hazardous voltages. Do not insert objects or let objects fall into the terminal through ventilation slots. Always disconnect power when checking wiring connections. Failure to take adequate precautions may result in electrical shock.

## 13-2 Troubleshooting and Maintenance

## Troubleshooting Chart

Problem	Probable Cause(s)	Corrective Action(s)
Terminal does not power up.	<ol style="list-style-type: none"> <li>1. Improper connection to power source.</li> <li>2. Incorrect input voltage level.</li> <li>3. DC power wires reversed (DC terminals only).</li> <li>4. Power terminal block not fully seated (PV300 terminals only).</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify wiring and connections to power source.</li> <li>2. Verify correct voltage is present at power terminals.</li> <li>3. Make sure DC power positive and negative are connected to the proper terminals.</li> <li>4. Verify power terminal block is snapped onto base of PV300 Micro.</li> </ol>
Application file will not download (first download).	<ol style="list-style-type: none"> <li>1. Communication cable disconnected.</li> <li>2. Incorrect baud rate or communication settings.</li> <li>3. Incorrect computer COM port selection.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check communication cable type and connections.</li> <li>2. Verify computer and terminal are set to same communication settings.</li> <li>3. Verify correct COM port number in WinPFT or PanelBuilder32 software.</li> </ol>
Application file will not download (subsequent downloads).	<ol style="list-style-type: none"> <li>1. Incorrect communication or baud rate settings.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify computer and terminal have same communication settings. Change settings in Communication Setup screen of the terminal.</li> </ol>
No communications with MicroLogix, ControlLogix, SLC or PLC controller.	<ol style="list-style-type: none"> <li>1. Communications (COMM) fault.</li> <li>2. Baud rates not set properly.</li> <li>3. Controller is not in run mode.</li> <li>4. Terminal node and maximum node numbers are not set correctly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check status of COMM LED. Verify cable connections using cable diagrams in Chapters 12.</li> <li>2. Verify that terminal and controller are set at the same baud rate.</li> <li>3. Place controller in run mode.</li> <li>4. Verify node address settings.</li> </ol>
No communications with PLC but COMM LED is active.	<ol style="list-style-type: none"> <li>1. PanelView is trying to communicate with a controller at a different address.</li> <li>2. The inhibit bit is set as the default on the Channel Status Screen in the PLC.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify address of the controller.</li> <li>2. Change setting of the inhibit bit.</li> </ol>
No communications with computer.	<ol style="list-style-type: none"> <li>1. Communications (COMM) fault.</li> <li>2. No SLC, network, or power supply connection at terminal's DH-485 port.</li> <li>3. Baud rates not set correctly.</li> <li>4. Terminal node and maximum node numbers are not set correctly.</li> <li>5. Computer fault.</li> <li>6. Communication driver not properly loaded.</li> <li>7. Printer port is enabled.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check status of COMM LED. Verify cable connections using cable diagrams in Chapter 10.</li> <li>2. Personal Computer Interface Converter (PIC) receives power from DH-485 connection. Verify that the terminal is connected to an SLC, network, or wallmount power supply as shown in Chapter 12.</li> <li>3. Verify that terminal and computer are set at the correct baud rate.</li> <li>4. Verify node number settings.</li> <li>5. Refer to user manual for computer.</li> <li>6. Refer to RSLinx online help or manual.</li> <li>7. Disable printing on the Printer Setup screen of the Configuration Mode menu.</li> </ol>
Clock Module Battery Low message is displayed.	<ol style="list-style-type: none"> <li>1. Internal parameters corrupt. a. Clock module battery failure.</li> </ol>	<ol style="list-style-type: none"> <li>1. Reload application and cycle power to the terminal.</li> <li>2. Replace clock module as described in instructions provided with clock module kit. For PanelView 300 Micro, clock module cannot be replaced.</li> </ol>
Cannot transfer application from memory card.	<ol style="list-style-type: none"> <li>1. Memory card is not properly installed.</li> <li>2. Application is too large for terminal memory.</li> <li>3. Data checksum is incorrect.</li> <li>4. Invalid file format.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify correct installation.</li> <li>2. Reduce size of application file.</li> <li>3. Check that memory card is properly seated. Application may be corrupt.</li> <li>4. Verify file format (.PVA) being transferred.</li> </ol>

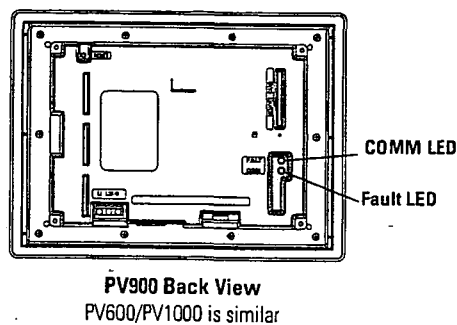
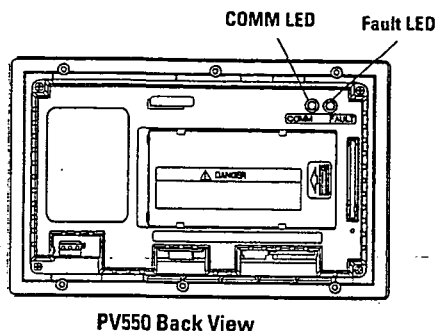
Problem	Probable Cause(s)	Corrective Action(s)
Cannot transfer application to memory card. <sup>1</sup>	<ol style="list-style-type: none"> <li>1. Memory card is not properly installed.</li> <li>2. Memory card is write protected.<sup>1</sup></li> <li>3. File currently exists on memory card.<sup>1</sup></li> <li>4. Application file is too large, not enough space on memory card.</li> <li>5. Invalid memory card format.<sup>1</sup></li> <li>6. Data checksum is incorrect.</li> <li>7. Application does not exist.<sup>1</sup></li> </ol>	<ol style="list-style-type: none"> <li>1. Verify correct installation.</li> <li>2. Change memory card protection switch.</li> <li>3. Erase and reformat card.</li> <li>4. Reduce size of application file or erase/format memory card.</li> <li>5. Replace or reformat memory card. If problem continues, try another card.</li> <li>6. Check that card is installed correctly. If problem continues, try another card.</li> <li>7. Check the Terminal Info screen to verify that an application exists.</li> </ol>
Screen objects do not function. <sup>1</sup>	<ol style="list-style-type: none"> <li>1. Terminal not communicating with controller.</li> <li>2. Terminal in screen saver mode.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check status of COMM LED. See problem 'No communications with SLC or PLC controller' for more information.</li> <li>2. Access Screen Setup from the terminal Configuration Mode to check if terminal is in Screen Saver Mode.</li> </ol>
Application file name appears as ***** on Terminal Info screen.	<ol style="list-style-type: none"> <li>1. Application is invalid.</li> <li>2. Application is unusable because of error.</li> </ol>	<ol style="list-style-type: none"> <li>1. Download application and try again.</li> <li>2. Download new application.</li> </ol>
Area on color screen appears dark.	<ol style="list-style-type: none"> <li>1. One of the backlight tubes has burnt out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace color backlight.</li> </ol>
Screen objects are not visible.	<ol style="list-style-type: none"> <li>1. Correct power is not applied.</li> <li>2. Contrast or intensity is not set correctly.</li> <li>3. Terminal is in screen saver mode.</li> <li>4. PV550 backlight lamp is not on.</li> <li>5. Terminal's backlight is burnt out.</li> </ol>	<ol style="list-style-type: none"> <li>1. Verify power connections.</li> <li>2. Access Screen Setup on the Configuration Mode menu and adjust the contrast. On keypad terminals, press the left and right arrow keys simultaneously, then press [F9] or [F15].</li> <li>3. Access Screen Setup on the Configuration Mode menu to see if terminal is set for screen saver mode.</li> <li>4. Access Screen Setup on the Configuration Mode menu and turn on backlight.</li> <li>5. Replace backlight.</li> </ol>
Values do not update on display but appear as asterisks ****	<ol style="list-style-type: none"> <li>1. Terminal is not communicating with controller.</li> <li>2. Value is invalid or exceeds the field width defined for the object.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check status of COMM LED. Refer to problem 'No communication with SLC or PLC controller' for more details.</li> <li>2. Change the field width for the object.</li> </ol>
Can't enter Configuration Mode when pressing Left and Right arrow keys simultaneously.	<ol style="list-style-type: none"> <li>1. Left and right arrow keys are assigned to screen objects in the terminal application.</li> </ol>	<ol style="list-style-type: none"> <li>1. Contact Allen-Bradley technical support for assistance.</li> </ol>

<sup>1</sup> Terminal displays a warning message with instructions if these errors occur.

## 13-4 Troubleshooting and Maintenance

## Indicators

On PanelView terminals (except PanelView 300 Micro), use the COMM and Fault LED indicators to isolate operating problems. The illustration below shows the location of these indicators on some terminals. See chapter 1 for LED locations on other terminals.



On PanelView 300 Micro terminals, view the Comm and Fault indicators in the terminal configuration mode (Communication Setup selected).

## DF1, DH-485, DH+ LED Indications

LED	This Pattern:	Indicates:
Comm <sup>1</sup>	Solid Fill	Normal operating state (no communication faults).
	No Fill	Fault detected. <ul style="list-style-type: none"> <li>• Make sure controller is run mode</li> <li>• Verify baud settings of terminal and controller</li> <li>• Verify proper terminal to controller connections</li> </ul>
	Flashing	When power is first applied (momentarily).
	Blinking	No communications established. For DF1 terminals, the Comm indicator flashes until an application is loaded.
Fault	No Fill	Normal operating state
	Solid	Fault detected. Cycle power to the terminal. If the fault still exists, the terminal requires servicing.
	Blinking	Hardware is functioning but no application is loaded or the current application is corrupt. Reload the application into the terminal.

<sup>1</sup> Comm LED stays on until powerup self-tests are complete.

**Remote I/O LED Indications**

LED	This pattern:	Indicates:
Comm <sup>1</sup>	Solid Fill	Normal operating state (no communication faults)
	No Fill	Communications not functioning <ul style="list-style-type: none"> <li>• Verify that baud rate and rack settings match the PLC settings</li> <li>• Verify proper terminal to controller connections</li> <li>• Verify that the PLC enables Remote I/O communications</li> </ul>
	Blinking	No communications established. PLC is in program mode.
	Flashing	When power is first applied (momentarily)
Fault	No Fill	Normal operating state
	Solid Fill	Fault detected. Cycle power to the terminal. If the fault still exists, the terminal requires servicing.
	Blinking	Hardware is functioning but no application is loaded or the current application is corrupt.

<sup>1</sup> Comm LED stays on until powerup self-test are complete

**DeviceNet, ControlNet, EtherNet/IP**

LED	This Pattern:	Indicates:
Comm	Solid Fill	Normal operating state (no communication faults).
	No Fill	Hardware failed.
	Flashing	When power is first applied (momentarily).
	Blinking	No communications established.
Fault	Solid Fill	Normal operating state (no communication faults).
	No Fill	Hardware failed.
	Blinking	Hardware is functioning but no application is loaded or the current application is corrupt.

## Cleaning the Display Window

### To clean the display window:

**ATTENTION**

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



1. Disconnect power from the terminal at the power source.
2. Use a clean sponge or a soft cloth to clean the display with a mild soap or detergent.
3. Dry the display with a chamois or moist cellulose sponge to avoid water spots.

### **Removing Paint and Grease**

Remove fresh paint splashes and grease before drying by rubbing lightly with isopropyl alcohol (70% concentration). Afterward, provide a final wash using a mild soap or detergent solution. Rinse with clean water.

### **Equipment Hose Downs**

Be aware that screen objects on touch cell terminals may activate during equipment hose downs.

**ATTENTION**

Because touch terminals have sensitive touch cell regions, it is possible for screen objects to activate during equipment hose downs.



## Replacing the Clock Module

The Real-Time Clock (RTC) module contains a lithium battery used only by the real-time clock. The battery is not used for application backup or input retention. The clock module has a typical life expectancy of 7 years.

**Note:** The real-time clock on the PanelView 300 Micro terminal is not replaceable.

The clock module replacement kits for the PanelView terminals are listed in Chapter 1 under *Replacement Parts*. Replacement instructions are provided with the kits.

**ATTENTION**

The clock module contains lithium. Do not attempt to dispose of the module in a fire or incinerator. Doing so may cause the clock module to explode. Follow disposal regulations in your area for lithium battery disposal.

## Replacing the Backlight

Replacement backlights are available for the PanelView terminals. See *Replacement Parts* in Chapter 1 for the catalog numbers. Replacement instructions are provided with the kits.

**Note:** The backlight on the PanelView 300 and 300 Micro terminal is not replaceable.

## 13-8 Troubleshooting and Maintenance

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# Appendix A

## Specifications

### PanelView 300 Micro

<b>Electrical</b>	
DC Power Supply Voltage Limits Power Consumption	11 to 30V dc (24V nominal) 2.5W maximum (0.105A @24Vdc)
<b>Mechanical</b>	
Enclosure	NEMA Type 12/13, 4X (Indoor use only), IP54, IP65
Weight	284 grams (10 oz.)
Dimensions	mm Inches 133 (H) x 112 (W) x 48 (D) 5.23 (H) x 4.38 (W) x 1.87 (D)
Installed Depth	35mm (1.39 inches)
<b>Display</b>	
Type	Liquid Crystal Display (LCD) with integral LED backlight (100,000 hour life)
Size	73 mm (w) x 42 mm (h) 2.87 in. (w) x 1.67 in. (h)
Pixels	128 x 64
<b>Terminal Memory</b>	
Total Application Flash Memory	240K bytes (application screens)
<b>Environment</b>	
Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-20 to 85° C (-4 to 188° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	2.5 Watts (8.5 BTU/Hour)
Impulse Shock	30G operating, 50G nonoperating
Vibration (operating)	2G up to 2,000 Hz

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## A-2 Specifications

**Character Sizes** (Pixel size = 0.48 x 0.48 mm)

Size in Pixels width x height	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
4 x 6	31	10	1.9 x 2.9
6 x 8	20	7	2.9 x 3.8
6 x 16	20	3	2.9 x 7.7
6 x 24	20	2	2.9 x 11.5
12 x 8	10	7	5.8 x 3.8
12 x 16	10	3	5.8 x 7.7
12 x 24	10	2	5.8 x 11.5
18 x 8	6	7	8.6 x 3.8
18 x 16	6	3	8.6 x 7.7
18 x 24	6	2	8.6 x 11.5

**PanelView 300****Electrical**

DC Power	18 to 32V dc (24V dc nominal)
Supply Voltage Limits	10 Watts, max. (0.42A @ 24V dc)
Power Consumption	

**Mechanical**

Enclosure	NEMA Type 12/13, 4X (Indoor use only), IP54, IP65
LED Indicators COMM Fault	Green Red
Weight	673 grams (1.48 lbs)
Dimensions	mm Inches 197 (H) x 140 (W) x 82 (D) 7.76 (H) x 5.53 (W) x 3.21 (D)
Installed Depth	69mm (2.73 inches) 122.4 mm (4.82 inches) with memory card retainer 216 mm (8.5 inches) with memory card retainer and clearance to insert and remove memory card

**Display**

Type	Liquid Crystal Display (LCD) with integral LED backlight (100,000 hour life)
Size	73 mm (w) x 42 mm (h) 2.87 in. (w) x 1.67 in. (h)
Pixels	128 x 64

**Terminal Memory**

Total Application Flash Memory	240K bytes (application screens)
--------------------------------	----------------------------------

**Environment**

Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-25 to 85° C (-4 to 188° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	18 Watts (69 BTU/HR)
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	2G up to 2,000 Hz

**Character Sizes** (Pixel size = 0.48 x 0.48 mm)

Size in Pixels width x height	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
4 x 6	31	10	1.9 x 2.9
6 x 8	20	7	2.9 x 3.8
6 x 16	20	3	2.9 x 7.7
6 x 24	20	2	2.9 x 11.5
12 x 8	10	7	5.8 x 3.8
12 x 16	10	3	5.8 x 7.7
12 x 24	10	2	5.8 x 11.5
18 x 8	6	7	8.6 x 3.8
18 x 16	6	3	8.6 x 7.7
18 x 24	6	2	8.6 x 11.5

## A-4 Specifications

## PanelView 550

<b>Electrical</b>	
DC Power	
Supply Voltage Limits	18 to 30V dc (24V dc nominal)
Power Consumption	18 Watts, max. (0.75A @ 24V dc)
Supply Voltage Limits (touch screen only)	18 to 32V dc (24V dc nominal)
Power Consumption (touch screen only)	18 Watts, max. (0.75A @ 24V dc)
AC Power	
Supply Voltage Limits	85 to 264V ac, 47 to 63 Hz
Power Consumption	45 VA maximum
<b>Mechanical</b>	
Enclosure	NEMA Type 12/13, 4X (Indoor use only), IP54, IP65
LED Indicators	
COMM	Green
Fault	Red
Weight	
Keypad, Keypad & Touch	1.2 kg (2.7 lbs)
Touch Screen	.93 kg (2.1 lbs)
Dimensions- Keypad, Keypad & Touch	
mm	167 (H) x 266 (W) x 106 (D)
Inches	6.57 (H) x 10.47 (W) x 4.17 (D)
Dimensions- Touch Screen	
mm	152 (H) x 185 (W) x 82 (D)
inches	6.00 (H) x 7.28 (W) x 3.20 (D)
Installed Depth- Keypad, Keypad & Touch	86 mm (3.39 inches) 118 mm (4.64 inches) with memory card retainer 207 mm (8.15 inches) with memory card retainer and clearance to insert and remove memory card
Installed Depth- Touch Screen	64 mm (2.54 inches) 109 mm (4.30 inches) with memory card retainer 188 mm (7.40 inches) with memory card retainer and clearance to insert and remove memory card
<b>Display</b>	
Type	Liquid Crystal Display (LCD)
Size	120 x 60 mm (4.75 x 2.38 in.)
Pixels	256 x 128
Touch Cells	128 (16 columns x 8 rows)
Touch Cell Size	16 x 16 pixels
<b>Terminal Memory</b>	
PV550 (Series E or later) or PV550T (Series A or later) Total Application Flash Memory	240K bytes (application screens)
PV550 (Prior to Series E) Total Application Flash Memory	112K bytes (application screens)

Environment	
Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-20 to 70° C (-4 to 158° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 30° C (32 to 86° F) 5 to 75% at 31 to 40° C (88 to 104° F) 5 to 50% at 41 to 55° C (106 to 131° F)
Heat Dissipation	20 Watts (69 BTU/HR) for AC Power or DC Power
Impulse Shock (operating/non-operating)	30G/50G
Vibration (operating)	2G up to 2,000 Hz

**Character Sizes** (Pixel size = 0.47 x 0.47 mm)

Size in Pixels width x height	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
6 x 8	40	16	2.2 x 3.2
6 x 16	20	16	3.8 x 5.6
6 x 24	13	16	3.8 x 8.4
12 x 8	40	8	7.6 x 2.8
12 x 16	20	8	7.6 x 5.6
12 x 24	13	8	7.6 x 8.4
18 x 8	40	5	11.2 x 2.8
18 x 16	20	5	11.2 x 5.6
18 x 24	13	5	11.2 x 8.4

## A-6 Specifications

## PanelView 600 Color Keypad & Touch

<b>Electrical</b>	
DC Power Supply Voltage Limits Power Consumption	85 to 264V ac, 43 to 63 Hz 60 VA maximum
AC Power Supply Voltage Limits Power Consumption	18 to 32V dc (24V dc nominal) 34 Watts max. (1.4A @ 24V dc)
<b>Mechanical</b>	
Enclosure	NEMA Type 12/13, 4X (Indoor use only), IP54, IP65
LED Indicators -COMM Fault	Green Red
Weight	2 kg (4.4 lbs)
Dimensionsmm mm inches	192 (H) x 290 (W) x 116 (D) 7.55 (H) x 11.40 (W) x 4.57 (D)
Installed Depth	99 mm (3.89 inches) 131 mm (5.14 inches) with memory card retainer 220 mm (8.65 inches) with memory card retainer and clearance to insert and remove memory card
<b>Display</b>	
Type	Active Matrix Thin-Film Resistor (TFT) with Cold Cathode Fluorescent (CCF) Backlight
Size	115 x 86 mm (4.54 x 3.4 in.)
Pixels	320 x 234
Touch Cells	128 (16 columns x 8 rows)
Touch Cell Size	20 x 29 pixels
<b>Terminal Memory</b>	
Total Application Flash Memory	240K bytes (application screens)
<b>Environment</b>	
Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-25 to 70° C (-13 to 158° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	32 Watts (107 BTU/HR) for AC or DC Power
Impulse Shock (operating/non-operating)	30G/50G
Vibration (operating)	2G up to 2,000 Hz

**Character Sizes** (Pixel size = 0.36 x 0.37 mm)

Size in Pixels width x height	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
6 x 9	52	25	2.9 x 5.9
8 x 16	39	14	2.9 x 5.9
8 x 24	39	9	2.9 x 8.9
16 x 24	19	9	5.8 x 8.9
24 x 32	13	7	8.6 x 11.8
32 x 40	9	5	11.5 x 14.8

## PanelView 600 Color Touch Only

**Electrical**

DC Power Supply Voltage Limits Power Consumption	18 to 32V dc (24V dc nominal) 17 Watts max. (0.71A @ 24V dc)
--	---

**Mechanical**

Enclosure	NEMA Type 12/13, 4X (Indoor use only), IP54, IP65
LED Indicators COMM Fault	Green Red
Weight	1 kg (2.3 lbs)
Dimensions	mm Inches 152 (H) x 185 (W) x 96 (D) 6.00 (H) x 7.28 (W) x 3.80 (D)
Installed Depth	79 mm (3.12 inches) 132 mm (5.21 inches) with memory card retainer 211 mm (8.30 inches) with memory card retainer and clearance to insert and remove memory card

**Display**

Type	Passive Matrix LCD with Cold Cathode Fluorescent (CCF) Backlight
Size	115 x 87 mm (4.54 x 3.43 in.)
Pixels	320 x 240
Touch Cells	128 (16 columns x 8 rows)
Touch Cell Size	20 x 30 pixels

**Terminal Memory**

Total Application Flash Memory	240K bytes (application screens)
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**A-8** Specifications

<b>Environment</b>	
Operating Temperature	0 to 50° C (32 to 122° F)
Storage Temperature	-25 to 70° C (-13 to 158° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 40° C (32 to 104° F)
Heat Dissipation	17 Watts (577 BTU/HR)
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	2G up to 2,000 Hz

**Character Sizes** (Pixel size = 0.35 x 0.35 mm)

<b>Size in Pixels width x height</b>	<b>Characters/Row</b>	<b>Maximum Rows</b>	<b>Dimensions in mm Width x Height</b>
6 x 9	52	25	2.1 x 3.1
8 x 16	39	14	2.8 x 5.6
8 x 24	39	9	2.8 x 8.4
16 x 24	19	9	5.6 x 8.4
24 x 32	13	7	8.4 x 11.1
32 x 40	9	5	11.1 x 13.9

## PanelView 900 Monochrome and Color

<b>Electrical</b>	
AC Power - PV900M and PV900C Supply Voltage Limits Power Consumption	85 to 264V ac, 47 to 63 Hz 110 VA maximum
DC Power - PV900M Supply Voltage Limits Power Consumption	18 to 30 V dc (24V dc nominal) 58 Watts max. (2.5A @ 24V dc)
DC Power - PV900C Supply Voltage Limits Power Consumption	18 to 32 V dc (24V dc nominal) 50 Watts max. (2.1A @ 24V dc)
<b>Mechanical</b>	
Enclosure	NEMA Type 12/13, 4X (Indoor use only) IP54, IP65
LED Indicators COMM Fault	Green Red
Weight - PV900M Keypad Touch Screen	3.14 kg (4.4 lbs) 2.91 kg (6.4 lbs)
Weight - PV900C Keypad Touch Screen	3.18 kg (7.0 lbs) 2.95 kg (6.5 lbs)
Dimensions - PV900M/900C Keypad	mm 249 (H) x 406 (W) x 112 (D) inches 9.80 (H) x 15.97 (W) x 4.40 (D)
Dimensions - PV900M/900C Touch Screen	mm 249 (H) x 336 (W) x 112 (D) inches 9.80 (H) x 13.24 (W) x 4.40 (D)
Installed Depth - PV900M	97 mm (3.81 inches) 129 mm (5.06 inches) with memory card retainer 220 mm (8.65 inches) with memory card retainer and clearance to insert and remove memory card
Installed Depth - PV900C	99 mm (3.89 inches) 131 mm (5.14 inches) with memory card retainer 222 mm (8.73 inches) with memory card retainer and clearance to insert and remove memory card

**A-10 Specifications****Display****PV900M**

Type	AC Gas Plasma
Size	210 x 131 mm (8.27 x 5.17 in.)
Pixels	640 x 400
Touch Cells	384 (24 columns x 16 rows)
Touch Cell Size	26 x 25 pixels

**PV900C**

Type	Active Matrix Thin-Film Resistor (TFT) with Cold Cathode Fluorescent (CCF) Backlight
Size	171 x 130 mm (6.73 x 5.12 in.)
Pixels	640 x 480
Touch Cells	384 (24 columns x 16 rows)
Touch Cell Size	26 x 30 pixels

**Terminal Memory**

PV900M (prior to Series E) Total Application Flash Memory	240K bytes (application screens)
PV900M (Series E, firmware 3.0 or later), PV900C Total Application Flash Memory	1008K bytes (application screens)

**Environment****PV900M**

Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-25 to 70° C (-13 to 158° F)
Relative Humidity (non-condensing)	5 to 85% at 0 to 30° C (32 to 86° F)
Heat Dissipation	50 Watts (165 BTU/HR) for AC Power or DC Power
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	1G up to 2,000 Hz

**PV900C**

Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-25 to 70° C (-13 to 158° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	39 Watts (133 BTU/HR)
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	1G up to 2,000 Hz

**Character Sizes PV900M** (Pixel size = 0.33 x 0.33 mm)

Size in Pixels width x height)	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
8 x 16	79	24	2.6 x 5.3
8 x 24	79	16	2.6 x 7.9
16 x 24	39	16	5.3 x 7.9
24 x 32	26	12	7.9 x 10.6
32x 40	19	9	10.6 x 13.2

**Character Sizes PV900C** (Pixel size = 0.27 x 0.27 mm)

Size in Pixels width x height)	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
8 x 16	79	24	2.2 x 4.3
8 x 24	79	19	2.2 x 6.5
16 x 24	39	19	4.3 x 6.5
24 x 32	26	14	6.5 x 8.6
32x 40	19	11	8.6 x 10.8

## A-12 Specifications

## PanelView 1000 Color & Grayscale

Electrical	
AC Power - PV1000G and PV1000C Supply Voltage Limits Power Consumption	85 to 264V ac, 47 to 63 Hz 100 VA maximum
DC Power - PV1000G Supply Voltage Limits Power Consumption	18 to 32 V dc (24V dc nominal) 40 Watts max. (1.7A @ 24V dc)
DC Power - PV1000C Supply Voltage Limits Power Consumption	18 to 32 V dc (24V dc nominal) 50 Watts max. (2.1A @ 24V dc)
Mechanical	
Enclosure	NEMA Type 12/13, 4X (Indoor use only) IP54, IP65
LED Indicators COMM Fault	Green Red...
Weight - PV1000G Keypad Touch	3.27 kg (7.2 lbs) 3.18 kg (7.0 lbs)
Weight - PV1000C Keypad Touch Screen	3.72 kg (8.2 lbs) 3.58 kg (7.9 lbs)
Dimensions-PV1000G/1000C Keypad	mm inches 282 (H) x 423 (W) x 112 (D) 11.11 (H) x 16.64 (W) x 4.40 (D)
Dimensions - PV1000G/1000C Touch Screen	mm inches 282 (H) x 370 (W) x 112 (D) 11.11 (H) x 14.58 (W) x 4.40 (D)
Installed Depth - PV1000G	97 mm (3.81 inches) 129 mm (5.06 inches) with memory card retainer 220 mm (8.65 inches) with memory card retainer and clearance to insert and remove memory card
Installed Depth - PV1000C	99 mm (3.89 inches) 131 mm (5.14 inches) with memory card retainer 222 mm (8.73 inches) with memory card retainer and clearance to insert and remove memory card
Terminal Memory	
Total Application Flash Memory	1008K bytes (application screens)

**Display****PV1000G**

Type	Electroluminescent
Size	211 x 158 mm (8.3 x 6.2 in.)
Pixels	640 x 480
Touch Cells	384 (24 columns x 16 rows)
Touch Cell Size	26 x 30 pixels

**PV1000C**

Type	Active Matrix Thin-Film Resistor (TFT) with Cold Cathode Fluorescent (CCF) Backlight
Size	211 x 158 mm (8.3 x 6.2 in.)
Pixels	640 x 480
Touch Cells	384 (24 columns x 16 rows)
Touch Cell Size	26 x 30 pixels

**Environment**

Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-25 to 70° C (-13 to 158° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	39 Watts (132 BTU/HR) for Grayscale and Color
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	2G up to 2,000 Hz

**Character Sizes PV1000G and 1000C (Pixel size = 0.33 x 0.33 mm)**

Size in Pixels width x height	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
8 x 16	79	24	2.2 x 5.3
8 x 24	79	19	2.6 x 7.9
16 x 24	39	19	5.3 x 7.9
24 x 32	26	14	7.9 x 10.6
32 x 40	19	11	10.6 x 13.2

## A-14 Specifications

## PanelView 1400 Color

**Electrical**

AC Power	
Supply Voltage Limits	85 to 264V ac, 43 to 63 Hz
Power Consumption	200 VA maximum

**Mechanical**

Enclosure	NEMA Type 12/13, 4X (Indoor use only) IP54, IP65
LED Indicators COMM Fault	Green Red
Weight - Keypad - Touch Screen	20.3 kg (44.75 lbs) 19.6 kg (43.2 lbs)
Dimensions - PV1400 Keypad	mm 355 (H) x 483 (W) x 394 (D) inches 13.97 (H) x 19.0 (W) x 15.53 (D)
Dimensions - PV1400 Touch Screen	mm 355 (H) x 441 (W) x 394 (D) inches 13.97 (H) x 17.37 (W) x 15.53 (D)
Installed Depth	370 mm (14.58 inches) 400 mm (15.75 inches) with clearance to insert and remove memory card

**Terminal Memory**

Total Application Flash Memory	1008K bytes (application screens)
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**Display**

Type	Color CRT
Size	255 x 191 mm (10.0 x 7.5 in.)
Pixels	800 x 600
Touch Cells	384 (24 columns x 16 rows)
Touch Cell Size	33 x 37 pixels

**Environment**

Operating Temperature	0 to 55° C (32 to 131° F)
Storage Temperature	-40 to 85° C (-40 to 185° F)
Relative Humidity (non-condensing)	5 to 95% at 0 to 55° C (32 to 131° F)
Heat Dissipation	78 Watts (264 BTU/HR)
Impulse Shock (operating/non-operating)	15G/30G
Vibration (operating)	1G up to 2,000 Hz

**Character Sizes PV1400** (Pixel size = 0.32 x 0.32 mm)

Size in Pixels width x height)	Characters/Row	Maximum Rows	Dimensions in mm Width x Height
8 x 20	99	29	2.5 x 6.4
16 x 24	49	24	5.1 x 7.6
24 x 32	33	18	7.6 x 10.2
32 x 40	24	14	10.2 x 12.7
32 x 64	24	9	10.2 x 20.4

## Communications

DH-485 Network Baud Rate Distance Maximum	1200, 2400, 9600, 19.2K 1219 meters (4,000 feet)
DH+ Network Baud Rate Distance Maximum	57.6K, 115.2K, 230.4K 3048 meters (10,000 feet)
RS-232 or DH-485 Point-to-Point Baud Rates Distance Maximum	1200, 2400, 9600, 19.2K 6.1 meters (20 feet)
Remote I/O Baud Rates	57.6K, 2,800 meters (10,000 feet) 115.2K, 1,400 meters (5,000 feet)
DeviceNet Baud Rates	125K, 250K, 500K
ControlNet Network Baud Rate Distance Maximum	5M 1,000 meters (3,280 feet)
EtherNet/IP Network Distance Maximum	100 meters (328 feet)
DF1/Full Duplex Communications Baud Rate Distance Maximum	1200, 2400, 4800, 9600, 19.2K 15.24 meters (50 feet)
RS-232 Printer Port Baud Rates Parity Data Bits Stop Bits Handshaking	1200, 2400, 9600, 19.2K None, Even, Odd 7 or 8 1 or 2 None, Software (XON, XOFF), Hardware

**A-16** Specifications**Agency Certifications**

	300 Micro	300	550	600	900M	900C	1000G	1000C	1400
Emissions (Class B: Light Industrial) EN50081-1:1992						x <sup>1</sup>	x <sup>1</sup>		
Emissions (Class A: Industrial) EN50081-2:1993	x	x	x	x	x			x	x
Immunity (Industrial) EN61000-6-2:1999	x								
Immunity (Industrial) EN50082-2:1995		x	x	x	x	x	x	x	x
Programmable Controllers Equipment Requirements and Tests) EN61131 2:1995		x	x	x	x	x	x	x	x
Low Voltage Directive (Safety Sections of EN61131-2)		x	x	x <sup>5</sup>	x	x	x	x	x
UL508	x	x	x	x	x	x	x	x	x
UL1604 Class 1, Div 2, Groups A, B, C, D, T4	x	x	x <sup>2,4</sup>	x	x <sup>3</sup>	x	x	x	
UL2279 (IEC79-15) Class 1, Zone 2, Groups IIC, T4				x			x	x	
DEMKO prEN5002 1 Ex Na Group IIC, T4		x		x			x	x	
CSA 22.2, No. 142	x	x	x	x	x	x	x	x	x
CSA 22.2: No. 213 Class 1, Div 2, Groups A, B, C, D, T4	x	x	x <sup>2,4</sup>	x	x <sup>3</sup>	x	x	x	

- 1 DeviceNet PanelView terminals are Class A for Emissions
- 2 DeviceNet PanelView terminals are Class A for Emissions
- 3 PV550 (Series C or later) or PV550 Touch Screen Only (Series A or later)
- 4 All PV550 terminals have a Temperature Code Rating of T2
- 5 Does not apply to 600 Touch Screen Only terminals

## Appendix **B**

### Messages, Codes and Self-Test Numbers

This appendix lists:

- terminal messages and codes that may appear during terminal operation
- description of self-test numbers

#### **Types of Terminal Messages**

##### **Status Messages**

Indicate the terminal is performing an operation that may limit access to the terminal, such as an application download or a communication problem. The message disappears when the terminal completes the operation or when the condition is satisfied.

##### **Reminder Messages**

Indicate a minor fault or mistake. Reminder messages appear when an invalid operation is attempted, such as entering an out-of-range value. Pressing any key removes the message.

##### **Warning Messages**

Indicate the operation may produce undesirable results. You must respond to warning messages as indicated in the message.

##### **Fault Messages**

Indicate the terminal has detected a condition which prevents further operation. The current application will halt. The terminal must be reset (power cycled) to recover from this type of error.

**B-2** Messages, Codes and Self-Test Numbers**General Terminal Messages**

Error Number	Terminal Messages	Type	Meaning	Recommended Action
200-206, 300, 318-321, 328, 329, 331, 346, 347, 355, 356, 358, 367, 404, 411, 416, 417, 421-425, 447-449, 457, 459, 700, 1105, 1111, 1113, 1115, 1207-1211, 2002-2009, 2016, 2018, 2021, 2028 and 2029	A fault has occurred. Error = X	Minor Fault or Terminal Fault	A minor fault was detected that could impact terminal operation or a terminal fault was detected.	Press any key to recover from a minor fault. For terminal faults, contact technical support with the error code.
208	Write to logic controller failed	Comm Status	Controller does not accept data from the terminal. Controller is not connected.	Check connections (on Remote I/O units). Verify that controller is in run mode and not busy. Verify that controller data files are not in use by other applications.
303	Aborted.	Reminder/File Transfer Status	The terminal received an abort command during a file transfer.	Try again.
304	File read access error	Reminder	Error reading the source file from a source device.	Try again. If problem continues, contact technical support.
305	File write access error	Reminder	Error writing source file.	Try again. If problem continues, contact technical support.
307	File not supported	Reminder/File Transfer Status	File is incompatible with the terminal's firmware.	Contact technical support to verify compatibility. File must be a .PVA file.
308	Timeout	Reminder / File Transfer Status	The terminal was waiting for the partner device in a file transfer, but the terminal timed out before the data or expected reply was received.	Check cable connections or data corruption with noise on cable. Verify that the computer was not reset. Try again.
309-311	Data corrupted. Verify file and retry.	Reminder/File Transfer Status	The data checksum failed in a file transfer.	Check electrical and cable connections. Try the file transfer again.
312	Unknown device	Reminder / File Transfer Status	Verify the file type entered. Try again.	Destination or source device is invalid for a read or write application transfer.
313	File too large	Reminder / File Transfer Status	Reduce application size. See Appendix A for terminal requirements. If copying to a card, check card space.	File too large to be transferred to the terminal. In a memory card transfer, the card does not have enough space.
314	No Card Inserted	Reminder	Install a memory card and try again.	You tried to transfer data to/from a memory card but there is no card in the card slot.
315	Unformatted card	Reminder	Memory card is unformatted, contains an unrecognizable format or is corrupt.	Reformat the card or replace it with a new card if corrupt. Try again.
316	Write Protected Card	Reminder / File Transfer Status	A write command to the card failed because the card switch is in the protected mode.	Select write mode by changing the switch on the top edge of the card. Try again.
317	File exists. Cannot overwrite	Reminder/File Transfer Status	See message 342. This message only occurs when the file cannot be renamed.	Change the file name or save to a new memory card.
323	No application on PV terminal	Reminder/File Transfer Status	You tried to load an application on a memory card but there is no application in the terminal.	View the Terminal Info screen to see if an application is loaded in the terminal.
324	Check card status	Reminder/File Transfer Status	Problem formatting the memory card.	Try a new memory card.

Error Number	Terminal Messages	Type	Meaning	Recommended Action
325	Unformatted card	Reminder	Memory card is unformatted, contains an unrecognizable format or is corrupt.	Reformat the card or replace it with a new card. Try again.
326	No Card Inserted	Reminder	You tried to transfer data to/from a memory card but there is no card in the card slot.	Install a memory card and try again.
327	No files	Reminder	You tried to transfer a file from the memory card but there are no files on the card.	Use memory card containing application (.PVA) files.
330	Write Protected Card	Reminder / File Transfer Status	A write command to the card failed because the card switch is in protected mode.	Select write mode by changing the switch on the top edge of the card. Try again.
332	No application on PV terminal	Reminder/File Transfer Status	You tried to load an application on a memory card but there is no application in the terminal.	View the Terminal Info screen to see if an application is loaded in the terminal.
333	File in use - Request denied	Reminder	Attempt to format memory card containing a file used by the application. This usually occurs when an application requires a font file on the memory card.	Format the memory card on a computer or a PanelView terminal that does not have an application loaded.
334	Unexpected card removal. Please disconnect card before removal.	Reminder / File Transfer Status	You removed the memory card during normal operation and did not press the Disconnect button on the Memory Card configuration screen.	Press the Disconnect Card button to close the files on the card. When prompted, remove the card from the slot and then re-insert the card. Enter Configuration Mode and press the Run Mode button.
340	Format erases entire card: 0 or F1 - Abort 1 or F2 - Continue	Warning	Operator pressed [F4] Erase / Format Card on the Memory Card configuration screen.	Enter appropriate response: 0 or F1 to abort 1 or F2 to continue
341	Proceed with download? 0 or F1 - Abort 1 or F2 - Continue	Warning	You pressed [F2], Restore From Card on the Memory Card configuration screen.	Enter appropriate response: 0 or F1 to abort 1 or F2 to continue
342	The PVA File exists. 0 or F1 - Abort 1 or F2 - Upload with new PVA filename	Reminder / File Transfer Status	You pressed [F3], Save To Card on the Memory Card configuration screen when the file exists on the card.	Enter appropriate response: 0 or F1 to abort 1 or F2 to upload new PVA file.
361	Value not in range	Reminder	Entered value is outside of valid range.	Enter a value within the valid range.
364	Closing Files ...	Status	Terminal is preparing for removal of memory card.	Wait for files to close before removing memory card.
365	Remove card ...	Reminder	You must remove the memory card for the terminal to continue operation.	Remove the memory card.
366	Card disconnection will require card removal to continue operation.	Warning	Attempt to disconnect the memory card.	After memory card is disconnected it must be removed from card slot before the terminal will operate.
392	File not supported	Reminder/File Transfer Status	File is incompatible with the terminal type.	In PanelBuilder32, select the Setup tab on the Application Settings dialog and select the correct terminal type.
393	File not supported	Reminder/File Transfer Status	File is incompatible with the communication protocol of the terminal.	In PanelBuilder32, select the Setup tab on the Application Settings dialog and make sure the protocol matches your terminal.

**B-4** Messages, Codes and Self-Test Numbers

Error Number	Terminal Messages	Type	Meaning	Recommended Action
394	File not supported	Reminder/File Transfer Status	File is incompatible with the terminal's firmware.	In PanelBuilder32, click the Catalog & Revisions button on the Setup tab on the Application Settings dialog. Select a firmware version that matches your terminal.
395	File not supported	Reminder/File Transfer Status	File is incompatible with the operator input type (keypad, touch or keypad and touch) of terminal.	In PanelBuilder32, select the Setup tab on the Application Settings dialog. Select the type of operator input that matches your terminal.
396	File not supported	Reminder/File Transfer Status	File is incompatible with the terminal.	Download the file to the terminal again. If problem reoccurs, contact technical support.
415	Retained memory lost. Presets were loaded.	Reminder	The battery backed memory was invalid during startup. The system defaulted to preset values instead of the last states.	No action necessary. Terminal reverts to defaults.
436	Logic Controller has screen control	Reminder	You tried to change the application screen but it is configured for controller only access.	No action required, controller will change screens as programmed.
634	Read Fail or Write Fail	Status	ControlLogix Tag or address does not exist or is the wrong data type. Designated slot does not contain a ControlLogix Processor.	Check tag address. Check for data type mismatch. Verify ControlLogix slot location.
1109	Font file unavailable. Font error = ****	Minor Fault or Terminal Fault	You downloaded an application to the PanelView without the appropriate memory card (containing the font file) inserted in the card slot of the terminal.	From the Memory Card screen, press the Disconnect button to close the files on the card. Remove the card from the card slot. Locate the card containing the font file or copy the correct font file to a card. Insert the correct memory card in the card slot and enter Run mode.
1110	No valid application	Reminder	You tried to run an application that has not been downloaded to the terminal.	Download application to terminal.
111B	Access denied.	Status	Wrong password entered.	Enter a valid password.
1119	Access denied.	Status	Password not recognized	Enter a valid password.
1120	Security tampering.	Status	PVA file was corrupted - attempt to bypass security was detected	New application file must be downloaded to the terminal.
1121	No operator selected.	Status	There is no currently selected operator, but a password change has been requested	Select the operator requiring the new password.
1122	Password change is not allowed.	Reminder	Password is unchangeable	Password cannot be changed at the current level of security.
1123	Password change is not allowed.	Reminder	Operator cannot change password	Current operator does not have access for password changes.
1124	New password must be entered before it can be verified.	Reminder	New pass words must be entered twice.	Enter the new password again to verify that it was entered correctly.
1125	New and verify passwords differ.	Status	The same password was not entered for verification.	Enter the same password for New and Verify.
1126	Please verify new password.	Reminder	New pass words must be entered twice.	Enter the new password again.
1127	Password changed	Reminder	Password change is effective.	You must use new password for security access.

Messages, Codes and Self-Test Numbers **B-5**

Error Number	Terminal Messages	Type	Meaning	Recommended Action
2005	Application file: Insufficient RAM	Terminal Fault	Application file may be too large.	Try again. If possible, reduce the size of the application.
2007 - 2010	Application file contains errors	Terminal Fault	Application contains incompatible data.	Check application and try again.
2011	Retained memory lost. Presets were loaded.	Reminder	The battery backed memory was invalid during startup. The system defaulted to preset values instead of the last states.	No action necessary. Terminal reverts to defaults.
2012	Application file: Too many retained memory devices	Terminal Fault	The battery-backed RAM is too full to hold all devices requiring presets.	Reduce the number of control objects. Use global objects.
2014	Hardware configuration is corrupted	Terminal Fault	The terminal hardware configuration is corrupt.	Contact technical support.
2030, 2031	Hardware and firmware do not match	Terminal Fault	A mismatch exists between the terminal firmware and the terminal hardware.	Verify that the series and revision markings on the back of the terminal are compatible with the firmware.

**DH-485 Terminal Messages**

Error Number	Terminal Messages	Type	Meaning	Recommended Action
612	No active node(s) found on network	Comm Status	Tag or address does not exist or is the wrong data type.	Check tag address. Check for data type mismatch.
613	Required network node(s) not found	Comm Status	Tag or address does not exist or is the wrong data type.	Check tag address. Check for data type mismatch.
615	Duplicate node address	Comm Status	More than one node was assigned the same address.	Verify all device nodes.
616	Data errors on the link	Comm Status	Corrupt data packets were detected on DH-485 network.	Verify controller addressing and baud rate settings. Check for loose or reversed wiring.

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**B-6** Messages, Codes and Self-Test Numbers**ControlNet Terminal Messages**

See Terminal Codes for messages below				
Error Number	Terminal Messages	Type	Meaning	Recommended Action
634	PanelView offline	Comm Warning	PanelView is offline.	Check connections
634	Write fail.	Comm Warning	PanelView is communicating with the controller. The data table address does not exist.	Check / define data table address in the controller.
634	Write timeout.	Comm Warning	PanelView is not communicating with the logic controller.	Check connections and node configuration in the application.
634	Read fail.	Comm Warning	PanelView is communicating with the controller. The data table address does not exist.	Check/define data table address in the controller.
634	Read timeout.	Comm Warning	PanelView is not communicating with the controller.	Check/define data table address in the controller.
636	Initial write failed.	Reminder	Write to Logic Controller on Startup was configured and on powerup, the PanelView could not write initial values to a node's data table address. or Write to Logic Controller on Startup was not configured and the PanelView was unable to write a controller. <b>Note:</b> The error is only displayed on the first-write attempt.	Check/define data table address in the controller. Check communication connections and node configuration in the application.

### Remote I/O Terminal Messages

Error Number	Terminal Messages	Type	Meaning	Recommended Action
661	Timeout - No Block Transfer Writes	Comm Status	The PLC is communicating with the terminal, but the PanelView is not receiving BTW requests required by the application.	Check ladder logic for missing BTW instructions (instructions are not enabled) or addressing errors. Check for logic controller errors.
662	Timeout - No Block Transfer Reads	Comm Status	The PLC is communicating with the terminal, but the PanelView is not receiving BTR requests required by the application.	Check ladder logic for missing BTR instructions (instructions are not enabled) or addressing errors. Check for logic controller errors.
663	Timeout - No Block Transfer Requests	Comm Status	The PLC is communicating with the terminal, but the PanelView is not receiving BTR or BTW requests required by the application.	Check ladder logic for missing BTR or BTW instructions (instructions are not enabled) or addressing errors. Check for logic controller errors.
664	PLC in program mode	Comm Status	The PLC is offline (in Program Mode). The COMM LED on the Configuration Mode menu is off.	Place the PLC in run mode to resume communication.
665	No PLC communications	Comm Status	The PLC is not communicating. Possible causes are disconnected cable, no power to PLC, incorrect baud rate or rack settings for PLC configuration. COMM LED is off.	Check for pulled cables and PLC power. Check baud rate settings and rack configurations. Check wiring of connector. Communication resumes when problem is corrected.
666	Invalid Rack Configuration	Comm Status	No communications can occur because of an invalid rack configuration.	Correct the RIO rack configuration.
667	Remote I/O Hardware Failed	Comm Status	During startup, the terminal detected a missing, corrupt or nonfunctional Remote I/O card. The terminal will run but not communicate.	Contact technical support and provide specific message.

### EtherNet/IP Messages

For a description of EtherNet/IP terminal codes, see page B-13.

**B-8** Messages, Codes and Self-Test Numbers**DH+ Terminal Messages**

Error Number	Terminal Messages	Type	Meaning	Recommended Action
675 or 684	Required network node(s) not found	Comm Status	The network is active, but the logic controller(s) are not located at the expected nodes.	Verify that the logic controller(s) required by the application are at the expected node addresses and that the communication parameters are set properly.
676 or 685	File access error	Comm Status	<ol style="list-style-type: none"> <li>1. The terminal is trying to access one or more controller data files that are unavailable.</li> <li>2. If the message is flashing, the terminal is trying to read or write data files that are unavailable.</li> </ol>	<ol style="list-style-type: none"> <li>1. The data files do not exist on the controller. Create the data files.</li> <li>2. The data file is smaller than what is required. For example, the PanelView uses N7:10 but only N7:0 is defined in the controller.</li> </ol>
677 or 686	Unstable DH+ network	Comm Status	Corrupt data packets or intermittent system configuration was detected on DH+ network.	Verify all controller addressing and baud rate settings. Check for loose or reversed wiring.
678 or 687	Duplicate node detected	Comm Status	More than one node was assigned the same address.	Verify all device nodes.
679 or 688	No active Node(s) found on network	Comm Status	No other DH+ devices can be located on the network.	Verify that PanelView terminal and logic controller(s) are correctly connected to the system. Check cable and wiring. If error continues, verify that baud rates on the terminal and controller are the same. Communication resumes when the problem is corrected.
681 or 690	DH+ hardware failed	Comm Status	During startup, the terminal detected a missing, corrupt, or nonfunctional DH+ card. The terminal will run but not communicate.	Contact technical support and provide the specific terminal message.

**DF1 Terminal Messages**

Error Number	Terminal Messages	Type	Meaning	Recommended Action
675 or 682	Required network node(s) not found	Comm Status	The network is active, but the logic controller(s) are not located at the expected nodes.	Verify that the logic controller(s) required by the application are at the expected node addresses and that the communication parameters are set properly.
676 or 683	File access error	Comm Status	The terminal is trying to access one or more controller data files that are unavailable. If the message is flashing, the terminal is trying to read or write data files that are unavailable.	The data files do not exist on the controller. Create the data files.
679 or 686	Panelview offline	Comm Warning	PanelView is offline.	Check connections
681 or 688	DF1 hardware failed	Comm Status	During startup the terminal detected a missing, corrupt, or nonfunctional DF1+ card. The terminal will run but not communicate.	Contact technical support and provide terminal message.

## Terminal Codes

Terminal Codes are displayed on the PanelView terminal during operation or terminal configuration.

## DeviceNet Codes

Comm Status codes appear as a banner at the top of an application screen or as an LED status on the terminal's Configuration screen. Error 634 appears in upper left of banner. Codes less than 12 are minor faults and clear automatically when corrected. Codes above 12 require a terminal reset to clear.

DeviceNet Comm Status Code	Indicates:	Recommended Action
1	No connections established. Occurs on power-up until a device connection is established on the network.	Establish a connection over DeviceNet to the PanelView.
2	A connection is in the timed out state. Occurs when I/O polling stops after an I/O poll connection is running.	Check that the network wiring and that the master device (scanner) is operational.
3	An peer tag cannot be obtained. Occurs if the device associated with a peer tag is not responding or the peer tag does not exist at the specified class, instance, and attribute number.	Ensure the data location is correct and that the end device is attached and operational. For write tags, ensure that the appropriate attribute is targeted. If the targeted device is UCMM capable, ensure it has enough explicit message connections to allow the PanelView to take one. If the targeted device is not UCMM capable, ensure that it is owned by a Master device (scanner).
4	A zero length I/O message was received placing the I/O application in idle mode. Occurs when scanner is in program mode.	Error clears when switched back to run. Correct the problem of the Master sending the I/O idle condition.
5	Message Overrun. Message traffic from the PanelView is being generated quicker than it is possible to send the data. Occurs with large I/O sizes when Change-Of-State is being used and state changes are occurring very quickly or if polling too fast.	Slow down I/O polling or the state changes generating Change-of-State I/O messages. Use Cyclic I/O at a fast heartbeat rate rather than Change-of-State. Use the production inhibit capability on the master.
6	Offline Connection Set Identify Received. An Offline Connection Set Point-to-Point Identify Message has been received. Occurs if a Client device on the network capable of executing the Offline Connection Set sends a Point-to-Point Identify message to the terminal while it is in the Offline State. (It failed Duplicate MAC ID Detection on startup).	No action required. The error clears within 500 ms of the last Identify message sent.
7	A Listen Only connection has timed out. It has not received a message in at least four times the expected packet rate value. This occurs if the message associated with the Listen Only tag is not occurring or was not identified correctly.	Check that the Listen Only tags are properly configured. Verify that the associated message is occurring at the expected packet rate. DeviceNet traffic monitor may be helpful.
10	Autobaud in Progress. Occurs on startup while the Autobaud process is executing.	No action required. The error clears within 10 seconds, the maximum time allowed to detect a baud rate.
11	No network power detected. Occurs if network 24V is not present.	Check the wiring. This message will clear automatically when 24V power is restored.
12	Dup MAC Failure. Occurs if the PanelView powers up with the same Node Address present on the network.	Change the node address to an unused address and reset the terminal.
13	Bus-off Interrupt occurred. CAN Chip is held in reset. Caused by noise on network signal lines or an attempt to connect to the network at the wrong baud rate.	Check baud rate and network wiring, including termination resistors. Reset the terminal.

**B-10** Messages, Codes and Self-Test Numbers

Alert codes appear as a box in the middle of the screen. Error 636 appears in the upper left corner. Operation of the terminal continues. Alert messages can be cleared.

DeviceNet Alert Codes	Indicates:	Recommended Action
2	Unsupported DeviceNet Message received. The Network Access Object received a message that is not supported.	Should not occur in normal operation. Clear the message. If problem re-occurs, contact technical support.
3	Initial Writes Failure. The Motherboard failed to send all input data to the daughter card prior to network startup.	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
4	Invalid Peer Address. Occurs at runtime if the node address of a peer tag is the same as the PanelView.	Clear the message and determine which tag in the application is pointing to the PanelView's node address. Correct the application.
7	Change-Of-State Input Overrun. Occurs if PanelView state changes on I/O input data occurs faster than the PanelView can send them to the I/O scanner.	Clear the message. Excessive network traffic could cause this problem if inputs are changing rapidly.
8	An external network process has caused the reset of the network access process. Connections are temporarily lost. Occurs if an external device sends an Identify Object Reset Service to the terminal or if an external device changes the terminal's node address (directly or using the Offline Connection Set).	No action required. Any server connections will need to be re-established.
10	Unsupported DeviceNet message received.	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
12	Invalid ASA Number (0x00000000 or 0xFFFFFFFF). Occurs if the flash memory is corrupt or an invalid ASA number was programmed.	Clear the message. The message occurs each time the terminal is reset. The terminal operates normally but you should correct the problem. Contact technical support.
14	Get Next Scan Item Failed in peer mode.	Should not occur in normal operation. Clear the message. If problem reoccurs, contact technical support.
15	Peer Input Data not received. Will occur if an input (push button) changes a second time before its previous state was sent on the network. Only for Peer tags.	Clear the message. Excessive network traffic could cause this problem if inputs are changing rapidly. Handle high speed input data over I/O connections if possible.
16	I/O Connection Size does not match size of I/O data in Assembly Instances 1 & 2. Programmed connection sizes for I/O do not match the amount of data represented by the I/O type tags.	Clear the message and if the problem reoccurs, consult technical support.
19	Get Next Contact Request Failure. In Peer Mode scanning, the request to obtain the next tag in current context failed.	Should not occur in normal operation. Clear the message. If problem reoccurs, contact technical support.
20	Autobaud Failure. The autobaud process failed to detect a valid baud rate within 10 seconds. Occurs if network traffic is nonexistent or intermittent.	Start the terminal when network traffic exists or use a fixed baud rate.
23	Nonvolatile Objects have been reset. Nonvolatile storage of some objects required a full reset on powerup. Certain nonvolatile values will be reset to defaults.	Can occur when the daughtercard firmware in the terminal is upgraded. Clear the message and continue. If problem reoccurs, contact technical support.
38	An external client device on the network has performed a Set Attribute request on the Baud Rate setting. The baud may be different on next terminal reset.	Confirm the Active Baud on the Communication Setup screen of the terminal.

Fault codes appear as a full screen box with Error 635 appears in the upper left corner. Reset the terminal to clear the condition. If the problem reoccurs, note the 2-digit code and contact technical support.

DeviceNet Fault Codes	Indicates:	Recommended Action
5	PCCC Message Transaction error during the transfer	Should not occur in normal operation. Clear the message. If problem re-occurs, contact technical support.
6	Stack overflow fault	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
13	Invalid Screen Context Priority Received	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
17	Client Object Failed	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
18	CAN Chip Failed to initialize	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
33	I/O Assembly Remap Error	Revalidate the application and download. If problem re-occurs, contact technical support.
37	The size of a particular channel exceeds the size limitation set by the daughtercard.	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
39	The application contains more Listen Only channels that the daughtercard supports.	Reset the terminal. If problem re-occurs, contact technical support.
20xx	Critical Internal DeviceNet firmware fault	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.
9-11, 21, 22, 24-36	Internal faults associated with motherboard/daughtercard communications	Should not occur during normal operation. Clear the message. If problem reoccurs, contact technical support.

### General Codes

General Terminal Alert Code	Alert Type	Indicates:	Recommended Action
603	Critical fault	File download error	Reset the terminal. If problem occurs again, contact technical support.
9020	Critical fault	An internal fault occurred.	Reset the terminal. If problem occurs again, contact technical support.

**B-12** Messages, Codes and Self-Test Numbers**ControlNet Codes**

These errors appear at the top of the application screen or on the terminal's configuration screen. If you should get an alert number that is not listed, contact technical support.

<b>ControlNet Error Codes</b>	<b>Error Type</b>	<b>Indicates:</b>	<b>Recommended Action</b>
1803	Informational	The communications device has completed the request to force the device into the listen-only state.	The PanelView was detected as having a duplicate node address and is in the listen-only mode. Check the node address (MAC ID) of the devices on the network to verify that addresses are not duplicated.
1824	Warning	The PanelView was forced to a listen-only state.	Contact technical support.
1826	Warning	A fixed tag packet was received but there is no place to route the packet. The data packet is discarded and the error message is displayed.	Contact technical support.
1828	Warning	An attempt was made to open an unsupported transport class.	Contact technical support.
1829	Warning	An attempt was made to open a Class 1 transport with application triggering or a Class 3 transport with cyclic triggering.	Contact technical support.
3333	Warning	A connection has timed out.	A file transfer was unexpectedly interrupted. Try to transfer again.

These messages appear on the terminal screen as DC Error=xx. If you get an alert number that is not listed here, contact technical support.

<b>ControlNet Alert Codes</b>	<b>Alert Type</b>	<b>Indicates:</b>	<b>Recommended Action</b>
9000	Critical fault	Interface startup failed.	Contact technical support.
9003	Critical fault	CIP S/N is not valid.	Contact technical support.
9004	Critical fault	Out of buffers.	Contact technical support.
9010	Critical fault	Invalid target node, target node is the same as the PanelView, or larger than the UMAX.	Check node address of all devices on the network including the PanelView terminal.
9012	Communications Warning	ControlNet object received a reset request.	Contact technical support.
9014	Critical fault	A fatal CPU fault occurred.	Contact technical support.
9015	Critical fault	A ControlNet hardware fault occurred.	Contact technical support.
9016	Critical fault	RAM verification failed at startup.	Contact technical support.
9017	Critical fault	CRC verification failed at startup.	Contact technical support.
9018	Critical fault	A critical internal error occurred.	Contact technical support.
9019	Critical fault	An internal fault occurred.	Reset terminal, if problem occurs again, contact technical support.
9020	Critical fault	An internal fault occurred.	Reset terminal. If problem occurs again, reload application. If problem persists, contact technical support.

## EtherNet/IP Codes

These messages appear on the terminal screen as DC Error=xx. If you get an alert number that is not listed here, contact technical support.

Error Number	Terminal Messages	Type	Meaning	Recommended Action
xx,xx,xx Number depends on hardware fault detected.	Communication Interface Fault	Critical Fault	A hardware problem was detected during power-up. If you ignore message and display the EtherNet/IP Communications Screen, the Comm Status displays "Comms hardware fault:" without an error number. The FW revision, serial number and EtherNet/IP address fields are displayed.	Contact technical support to have unit repaired.
770	Buffer overflow	Comm Status	Internal error occurred.	Contact technical support.
771	Buffer underflow	Comm Status	Internal error occurred.	Contact technical support.
1799	Heap partition empty	Comm Status	Internal error occurred.	Contact technical support.
16387	Comms not started yet...	Comm Status	The PanelView has not connected to the network.	Check IP configuration (on the Communication Setup screen) and wait for PanelView to connect to the network.
16388	CIP S/N is not valid	Critical fault.	DC incorrectly configured.	Contact technical support.
16389	Out of buffers	Critical fault.	No buffers are available for read or write operations.	Contact technical support.
16390	An initial write failed	Comm Warning	Write to Logic Controller on Startup was configured and on powerup, the PanelView could not write initial values to a node's data table address. or Write to Logic Controller on Startup was not configured and the PanelView was unable to write a controller. <b>Note:</b> The error is only displayed on the first write attempt.	Check/define data table address in the controller. Check communication connections and node configuration in the application.
16391	PV write failed	Comm Warning	PanelView is communicating with the controller. The data table address does not exist.	Check/define data table address in the controller.
16392	PV write timeout	Comm Warning	PanelView is not communicating with the logic controller.	Check connections and node configuration in the application.
16393	PV read fail	Comm Warning	PanelView is communicating with the controller. The data table address does not exist.	Check/define data table address in the controller.
16394	PV read timeout	Comm Warning	PanelView is not communicating with the controller.	Check/define data table address in the controller.
16397	CN object received a reset request	Comm Warning	An Ethernet object received a reset request from a device on the network.	The PanelView does not support network resets.
16398	The Connection Originator is indicating it is in Program Mode	Comm Warning	The logic controller is offline (in Program Mode). The COMM LED on the Configuration Mode menu is off.	Place the logic controller in run mode to resume communication.
16399	A fatal CPU fault occurred	Critical Fault	A fatal CPU fault occurred.	Contact technical support.
16401	The RAM check failed	Critical Fault	RAM verification failed at startup.	Contact technical support.

## B-14 Messages, Codes and Self-Test Numbers

Error Number	Terminal Messages	Type	Meaning	Recommended Action
16402	The CRC check of the firmware failed	Critical Fault	CRC verification failed at startup.	Contact technical support.
16403	OS startup failed	Critical Fault	Operating system failed to start.	Contact technical support.
16404	PV Client Task Fault	Critical Fault	Internal error has occurred.	Contact technical support.
16405	Invalid preset information received from motherboard.	Critical Fault	Internal error has occurred.	Contact technical support.
16406, 16407	Connection with Addr or scan rate invalid or no connection being attempted.	Critical Fault	Internal error has occurred.	Contact technical support.
16408	No buffers available for read operation	Critical Fault	Internal error has occurred.	Contact technical support.
16409	DC couldn't send out the write request in time.	Critical Fault	Too many write operations are occurring.	Contact technical support.
16410	Too many clients attempted to connect to server	Critical Fault	Internal error has occurred.	Contact technical support.
16411	XS-WD creation error	Critical Fault	Internal error has occurred.	Contact technical support.
16412	XS-WD start error	Critical Fault	Internal error has occurred.	Contact technical support.
16413	ENet addr is not valid	Communication Warning	The EtherNet address for a device on the EtherNet/IP network is invalid.	Contact technical support.
16414	Duplicate IP address detected	Critical Fault	The PanelView has the same IP address as another device on the EtherNet/IP network.	Change the IP address of the PanelView (on the Communication Setup screen) so that is unique on the network.
16415	Unknown error detected	Communication Warning	An operating system message has occurred.	Contact technical support.
16416	No network link	Critical Fault	Communications has not been established with network.	Check Ethernet cable.
16417	DHCP/BootP Enable failed	Communication Warning	The DHCP/BootP Enable server failed to allocate an IP address, subnet mask and gateway address to the PanelView terminal	Check DHCP/BootP Enable server on your network.
16418	Invalid IP Address or Subnet Mask	Communication Warning	The IP address or the subnet mask of the PanelView terminal is not valid. <b>Important:</b> The Gateway Address cannot be entered at the terminal; you must configure this address in the Communication Setup dialog of PanelBuilder32.	Enter a valid IP address and/or the subnet mask of the PanelView terminal on the Communication Setup screen. This error occurs if the downloaded application has DHCP/BootP enabled and it is then disabled at the terminal. On a restart, the terminal will not have the necessary information (IP Address, Subnet Mask, Gateway Address) to connect to the network.
16420	Invalid Gateway Address	Communication Warning	The Gateway Address is not valid.	Change the Gateway Address in the PanelBuilder32 software.

## Remote I/O Communication Loss

When communication fails on a Remote I/O network:

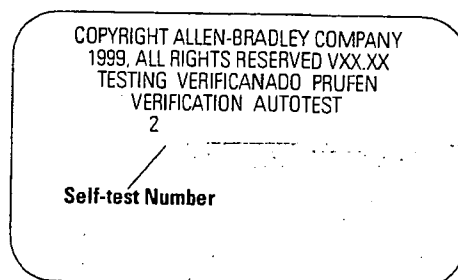
- Object states are maintained and the message "No PLC Communication" is displayed on the screen.
- If Block Transfers are defined for the application, but no BTR or BTW instructions are received, another message appears when the Block Transfer Timeout occurs.

These messages continue to display until communications is established. If a write operation is attempted to the logic program controlling the PanelView objects, the terminal will display the message "Error: Write to Logic Controller failed".

If a PanelView object is activated during a communication loss, the object retains its new state and sends this state value to the controller when communications is established.

## Self-test Numbers

The self-test numbers appear on the screen during powerup.



Test Number	Indicates
1	STATIC RAM test
2	Terminal searching for a file to download.
10	Erase boot flash area.
11	Copy boot code
12	Boot code copy successful
13	Boot code copy failed. Check for error after boot code is copied to the onboard flash EPROM.
20	Erase firmware from flash EPROM
21	Copy firmware to firmware flash memory
22	Firmware copy successful
23	Firmware copy failed
24	Performed CRC base firmware check
25	Firmware not compatible with boot code
26	Firmware not compatible with hardware

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**B-16** Messages, Codes and Self-Test Numbers

Test Number	Indicates
30	Watchdog test
31	Stuck key test
32	Real time clock test
33	LCD RAM failed
34	Performed CRC extended firmware check

**Note:** You may not see all of these test numbers during a powerup.

If a test fails, the terminal displays:

ERROR! FEHLER! - ERREUR! - ERRORE!

The following test numbers appear only if a problem occurs.

Test Number	Indicates
40	No executable code to run after boot
50	Wrong memory card format
60	CPU could not execute code

The table below shows fault conditions that may occur during powerup.

Fault Indicator	Indicates
Solid Red	Static RAM Test failed. Contact technical support.
Blinking Red (6 times per second)	Checksum test on boot code failed. Contact technical support.
Blinking Red (5 seconds on/5 seconds off)	Boot code is incorrect for terminal type (touch screen or keypad). Contact technical support.

## Appendix **C**

### European Union Directive Compliance

If the PanelView Operator Terminals are installed within the European Union or EEA regions and have the CE mark, the following regulations apply.

#### EMC and Low Voltage Directives

These apparatuses are tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC), and amending directives 92/31/EEC, 93/68/EEC; 73/23/EEC Low Voltage Directive, and amending directive 93/68/EEC using the following standards, in whole or in part::

	300 Micro	300	550	600	900M	900C	1000G	1000C	1400
Emissions (Class B: Light Industrial) EN50081-1:1992						x <sup>1</sup>	x <sup>1</sup>		
Emissions (Class A: Industrial) EN50081-2:1993	x	x	x	x	x			x	
Immunity (Industrial) EN61000-6-2:1999	x								
Immunity (Industrial) EN50082-2:1995		x	x	x	x	x	x	x	x
Programmable Controllers Equipment Requirements and Tests) EN61131-2:1995		x	x	x	x	x	x	x	x
Low Voltage Directive (Safety Sections of EN61131-2)			x	x	x	x	x	x	x
DEMKO prEN5002 1 Ex Na Group IIC, T4		x		x			x	x	

<sup>1</sup> DeviceNet PanelView terminals are Class A for Emissions

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**C-2 European Union Directive Compliance**

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**Intended Use of Product**

According to these Standards, the factor which determines, for EMC purposes, whether a product is deemed to be "Industrial" rather than "Residential, commercial or light industrial", is given in clause 1 of EN50081-2 as follows:

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

When installed in Europe, any other application is in contravention of European Union Directives, and a breach of these laws.

The PanelView 900 color, the 1000 grayscale and the 1400 terminals are certified for direct connection to a low-voltage public mains supply or to a dedicated source, which is intended to interface to a low-voltage public mains supply.

**Wiring Recommendations**

To reduce electrical noise, connect the PanelView terminal to its own branch circuit. The input power source should be protected by a fuse or circuit breaker rated no more than 15 amps. Route incoming power to the PanelView terminal by a separate path from the communications cable.

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

**Declarations of Conformity**

Declarations of Conformity are available for each of the PanelView terminals at the website [www.ab.com/support](http://www.ab.com/support) under Product Certification.

## **Glossary**

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**adapter**

ControlNet device which responds to scanner messages (also called slave device).

**address**

1) A character string that uniquely identifies a memory location. 2) A character string that uniquely identifies the physical location of an input or output circuit.

**application**

In the context of PanelBuilder32, an application is a logical arrangement of screens which replace the functions of a control panel and consist of push buttons, data entry objects, control lists and indicators. The application runs in a PanelView terminal.

**application file**

File containing configuration information for a PanelView terminal. Files exist in either a PanelView (.PVA) or a PanelBuilder32 (.PBA) format. Files transferred to a terminal are in a .PVA format. Files within PanelBuilder32 are in a .PBA format.

**ATA card**

Advanced Technology Attachment (ATA), Intelligent Drive Electronics (IDE), PC Cards (formerly PCMCIA) combine the drive controller and memory storage device. ATA cards can be accessed with standard Copy or Delete commands on a computer. The card looks like a hard drive to the user. You can use the card on a variety of computers without any special setup.

**baud**

A unit of signaling speed equal to the number of discrete conditions or signal events per second. Where one bit is encoded on each signalling event, the number of baud is the same as the number of bit/s.

**boot revision**

Revision number of the terminal boot code.

**bridge**

Device that allows network data to pass from one link to another link.

**controller**

A unit, such as a programmable controller or relay panel, that controls machine or process elements.

**cursor keys**

Up, down, left, right arrows on the terminal keypad. These keys are used to move a selection cursor or the active object indicator bar.

**DF1**

Allen-Bradley communication protocol based on an ANSI X3.28-1976 specification.

**download**

See upload/download.

**DH-485 link**

Data Highway 485 link. An Allen-Bradley token-passing carrier-band link for a local area network.

**DH+™ link**

Data Highway Plus link. An Allen-Bradley token-passing baseband link for a local area network.

**DHCP**

Dynamic Host Configuration Protocol (DHCP) software allows for dynamic allocation of addressing information for new attached devices on a TCP/IP network.

**Domain Name**

Character string mapping the local domain to the IP address of the DNS server. See DNS Server.

**DNS Server**

The Domain Name Server (DNS) converts more convenient host names into IP addresses. The DNS server is identified by a 32-bit IP address.

**EMI**

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

**EPROM**

Erasable Programmable Read-only Memory. A PROM that can be erased, usually with ultraviolet light, then re-programmed with electrical signals. As with all PROMs, it is nonvolatile random-access memory.

**EEPROM (flash)**

Electrically-Erasable PROM. A type of PROM that can be erased and re-programmed by electrical signals. As with all PROMs, it is nonvolatile random-access memory. Used by the PanelView terminals to stored applications.

**firmware**

Logic stored in read-only memory.

**function keys**

Set of keys (labeled F1-F10, F1-F16 or F1-21) on the PanelView terminals used to initiate functions. The function keys are user-defined and may have custom labels.

**gateway address**

A unique 32-bit address of the Gateway connecting two individual IP networks into a system of networks. When a node needs to communicate with a node on another network, the Gateway transfers the data between the two networks. The IP address is formatted as four sets of decimal numbers (0 to 255) with periods between them (130.200.25.30).

**interscan delay**

Determines the amount of time the PanelView waits before re-reading the current screen data from the logic controller.

**IP address**

A unique 32-bit address of a node on the Ethernet/IP network.

**keeper**

The network controller of a ControlNet network.

**keypad**

Set of 14 keys (numeric 0-9, decimal point, backspace, minus, and enter) to the right of the display on keypad terminals. These keys are used to enter data.

**LED**

Light-Emitting Diode.

**Memory Card**

A storage medium which can store a PanelView application and/or a font file.

**MicroLogix**

An Allen-Bradley programmable controller.

**NEMA standards**

Consensus standards in the United States for electrical equipment approved by the members of the National Electrical Manufacturers Association (NEMA).

**network**

Collection of connected nodes including the connection paths, repeaters, and bridges.

**Network Access Point (NAP)**

Port providing temporary access to a ControlNet network through the RJ-45 connector.

**Network Update Time (NUT)**

The ControlNet network update time established for the communications link.

**node**

The connection point at which medium access is provided.

**PanelBuilder32 software**

A Windows program used to develop applications which run in PanelView terminals.

**PanelView terminal**

An Allen-Bradley keypad or touch screen terminal providing the operator interface to the logic controller when an application is executing.

**PC**

1) Personal Computer. 2) Programmable Controller. 3) Printed Circuit.

**PCCC**

Acronym for Programmable Controller Communication Commands.

**PGM (Program)**

PGM setting means the baud rate is set via an explicit message request over the network by another device (typically a configuration tool, such as a PC or DeviceView). This baud rate setting is retained by the daughtercard when the power is cycled on the PanelView.

**PLC controller**

1) An Allen-Bradley programmable controller with a name that has the prefix PLC. See programmable controller.

**preset value**

A value loaded into a controller data table when an application is first started.

**programmable controller**

A solid-state control system that has a user-programmable memory for storage of instructions to implement specific functions such as I/O control, logic, timing, counting, report generation, communication, arithmetic, and data file manipulation. A controller consists of a central processor, input/output interface, and memory. A controller is designed as an industrial control system.

**real time clock**

Internal clock that provides time, day, month and year.

**remote I/O**

1) I/O connected to a processor across a serial link. With a serial link, remote I/O can be located long distances from the processor.

**remote I/O link**

A serial link for carrying I/O data between a PLC or SLC processor/scanner and remote I/O adapters.

**repeater**

Two-port component that receives and transmits all data from one segment to another.

**restore**

To load an application from a memory (PC) card.

**RS-232**

An EIA standard that specifies electrical, mechanical, and functional characteristics for serial binary communication circuits in a point-to-point link.

**RS-485**

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

**scheduled messages**

Messages that occur at a regular specified interval. They are assigned a particular portion of the network update time (NUT) and are always transmitted at that time.

**safety extra-low voltage (SELV)**

A voltage which, under all operating conditions does not exceed 42.4 V peak or dc between conductors, or between any conductor and earth, in a circuit which is isolated from the main power supply by means of a safety isolating transformer or an equivalent means. National regulations have to be considered for a correct isolation voltage rating.

**scratchpad**

A window that appears in the center of the terminal display that allows data entry using the terminal or screen keypad.

**screen**

1) the viewing surface on which data is displayed. 2) The visual image on a screen.

**segment**

Trunk-cable sections connected through taps with terminators at each end and no repeaters.

**SLC**

An Allen-Bradley programmable controller with a name that has the prefix SLC.

**SMAX**

Highest ControlNet node address which can communicate during the scheduled portion of the network update interval.

**subnet mask**

A 32 value forming the PanelView terminal's subnet mask. This parameter interprets IP addresses when the EtherNet/IP network is divided into multiple networks. The IP address is formatted as four sets of decimal numbers (0 to 255) with periods between them (130.200.25.30).

**tap**

Hardware component that connects devices to the ControlNet trunk cable.

**touch cell**

1 of 128 or 384 rectangular areas on the terminal display that can sense when touched.

**touch screen**

The display window of the terminal that responds when touched.

**trunk cable**

Bus or central part of a cable system.

**unscheduled messages**

Messages that are sent on an as needed basis. Unscheduled messages are sent during the unscheduled portion of the network update interval.

**UMAX**

Highest ControlNet node address which can communicate during the unscheduled portion of the network update interval.

**upload/download**

Commonly referred to the reading/writing across a link relatively large blocks of data from one device to another. Whether it is considered an upload or download may depend upon whether it is a read or write and upon which device initiates the transaction. When data is transferred to a programming device, it is considered an upload. When data is transferred from a programming device, it is considered a download.

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**Americas Headquarters**, 1201 South Second Street, Milwaukee, WI 53201-2496, USA, Tel: (1) 414 382-2000, Fax: (1) 414-382-4444  
**European Headquarters SA/NV**, Boulevard du Souverain 36, 1170 Brussels, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640  
**Asia Pacific Headquarters**, 27/F Citicorp Centre, 18 Whitfield Road, Causeway Bay, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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