

## **UMC800 Controller Installation and User Guide**

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# About This Document

## Abstract

This document provides descriptions and procedures for the installation, operation and maintenance of the UMC800 Controller hardware.

## References

The following list identifies all documents that may be sources of reference for material discussed in this publication.

Document Title	ID #
UMC800 Technical Overview Specification	51-52-03-24
UMC800 Operator Interface User Guide	51-52-25-62
UMC800 Control Builder User Guide	51-52-25-63
UMC800 Function Block Reference Guide	51-52-25-64
UMC800 RS232 Communications Reference Manual	51-52-25-76
UMC800 User Utility User's Guide	51-52-25-77
Modbus® RTU Serial Communications User Manual	51-52-25-87
How to Apply Digital Instrumentation in Severe Electrical Noise Environments	51-52-05-01

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## Symbol Definitions

The following table lists those symbols that may be used in this document to denote certain conditions.

Symbol	Definition
	This <b>DANGER</b> symbol indicates an imminently hazardous situation, which, if not avoided, <b>will result in death or serious injury</b> .
	This <b>WARNING</b> symbol indicates a potentially hazardous situation, which, if not avoided, <b>could result in death or serious injury</b> .
	This <b>CAUTION</b> symbol may be present on Control Product instrumentation and literature. If present on a product, the user must consult the appropriate part of the accompanying product literature for more information.
	This <b>CAUTION</b> symbol indicates a potentially hazardous situation, which, if not avoided, <b>may result in property damage</b> .
	<b>WARNING</b> <b>PERSONAL INJURY:</b> Risk of electrical shock. This symbol warns the user of a potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 Vdc may be accessible. <b>Failure to comply with these instructions could result in death or serious injury.</b>
	ATTENTION, Electrostatic Discharge (ESD) hazards. Observe precautions for handling electrostatic sensitive devices
	Protective Earth (PE) terminal. Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	Functional earth terminal. Used for non-safety purposes such as noise immunity improvement. NOTE: This connection shall be bonded to protective earth at the source of supply in accordance with national local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	Earth Ground. Functional earth connection. NOTE: This connection shall be bonded to Protective earth at the source of supply in accordance with national and local electrical code requirements.
	Chassis Ground. Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

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# Introduction

## Purpose

This Installation and User guide assists in the installation, start up, operation, maintenance and troubleshooting of the UMC800 Controller.

The information in this guide is organized as follows:

Topic	Description	Page
UMC800 Overview	Provides a concise description of the UMC800 control system, its applications, architecture and its features	3
Equipment Identification	A high-level physical and functional description of the UMC800 components	5
Pre-installation Considerations	Lists a number of things to consider when planning the controller installation. Environmental factors as well as methods to minimize interference are discussed.	11
Mounting and Wiring	Information and procedures to successfully install the UMC800 controller and its components. Interconnecting wiring to other UMC800 components is also covered.	15
Installation Checkout and Power Up	Provides a checklist to complete before power up. Covers power up procedure.	44
Operation	Power up and power down routines, operational modes and controls, software download routines, warm and cold start routines, Status LEDs, and scan rates are covered in this section.	52
Maintenance	Procedures are given covering routine maintenance and the replacement of controller components. Information on I/O module calibration is presented.	63
Diagnostics and Troubleshooting	Provides description of controller status and error conditions. Provides corrective actions necessary to clear fault conditions.	79
Parts List	A list of replacement parts for the controller.	91
Specifications	Summary of electrical, physical, environmental and performance specifications.	93
Supplemental Installation Information	Provides helpful information for installing digital equipment in severe electrical noise environments.  Refer to document 51-52-05-01 <i>How to Apply Digital Instrumentation in Severe Electrical Noise Environments</i> .	—

## UMC800 Controller

The UMC800 is industrial process control equipment that must be mounted. The wiring terminals must be enclosed within a panel.

## CE Conformity (Europe)

This product is in conformity with the protection requirements of the following European Council Directives: **73/23/EEC**, the Low Voltage Directive, and **89/336/EEC**, the EMC Directive. Conformity of this product with any other “CE Mark” Directive(s) shall not be assumed.

Deviation from the installation conditions specified in this manual, and the following special conditions, may invalidate this product’s conformity with the Low Voltage and EMC Directives.



### ATTENTION

The emission limits of EN 50081-2 are designed to provide reasonable protection against harmful interference when this equipment is operated in an industrial environment. Operation of this equipment in a residential area may cause harmful interference. This equipment generates, uses, and can radiate radio frequency energy and may cause interference to radio and television reception when the equipment is used closer than 30 meters (98 feet) to the antenna(e). In special cases, when highly susceptible apparatus is used in close proximity, the user may have to employ additional mitigating measures to further reduce the electromagnetic emissions of this equipment.

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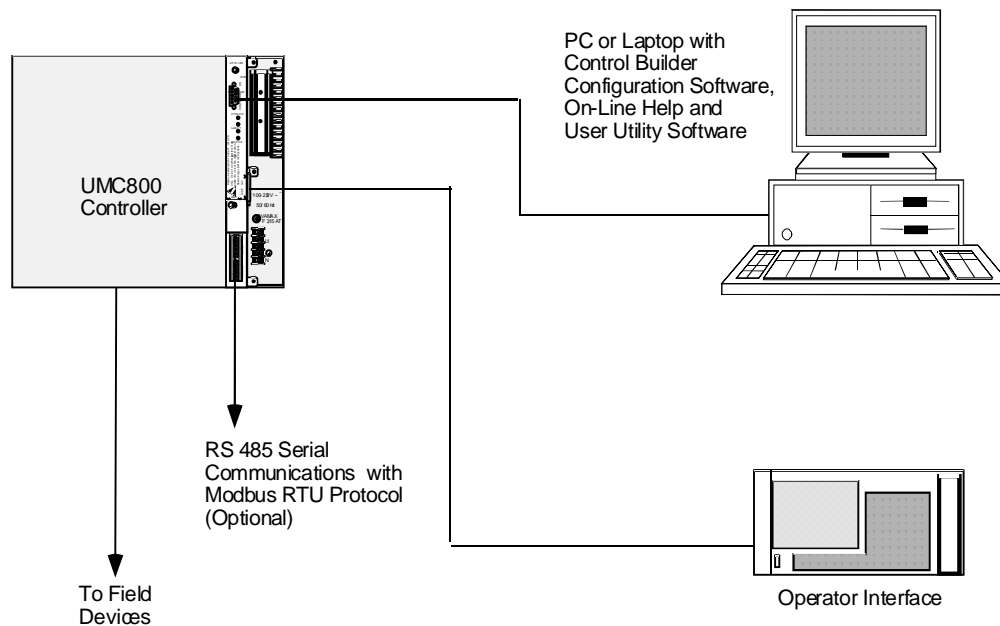
## UMC800 Overview

### UMC800 Description

The Universal Multiloop Controller (UMC800) is a modular controller designed to address the analog and digital control requirements of small unit processes. With up to 16 analog control loops, four setpoint programmers, and an extensive assortment of analog and digital control algorithms, the UMC800 is an ideal control solution for furnaces, environmental chambers, ovens, reactors, cookers, freeze dryers, extruders, and other processes with similar control requirements.

Accommodating up to 64 universal analog inputs, 16 analog outputs, and 96 digital inputs/outputs, the UMC800 provides the appropriate balance of input and output hardware for these smaller unit processes.

The UMC800 uses separate hardware for control functions and operator interface functions to provide greater installation flexibility. See Figure 1. The **controller** incorporates card slots capable of supporting up to 16 input and output modules that can be mixed to satisfy the hardware requirements of a specific application. The **operator interface** uses a color graphic LCD display to provide a variety of display presentations for viewing control loops, setpoint programs, and other analog and digital status.



**Figure 1 UMC800 components**

A separate “**Control Builder**” configuration software program is used for system configuration that operates on a Windows 95- or NT-based PC. The software program uses graphic symbols and line drawing connections to create custom control strategies. Menus are provided in the software to allow selection of screens for the operator interface and to customize screen access methods and operator keys. Completed configurations are loaded into the control system using a dedicated communications port in the controller, or optionally, via floppy disk. A separate **User Utility** software program (also running on a PC) is used to create, edit, save, open and download individual recipe, profile and data storage files. Calibration of the analog input and output modules can be performed through this utility program. A modem connection

through the Configuration port allows remote access to the controller via the Control Builder and User Utility programs. This will enable trouble shooting, configuration changes and firmware upgrade.

The optional communications board adds two bi-directional, multi-drop RS 485 serial communication interfaces to the controller CPU module. The COMM A port uses Modbus RTU protocol and is a master/slave link allowing up to 31 controllers to be connected to a single host computer. The computer initiates all communication. COMM B port allows the controller to operate as a master device to up to 16 slave Modbus compatible devices. Data transferred through this port is integrated into the user's control strategy through read and write function blocks. Applications might include writing controller data (set points, process variables, etc.) to a strip chart recorder to produce a hard copy of process performance, or to read data from other controllers.

## Feature Summary

- Up to 16 control loops, including:
  - Proportional Integral Derivative (PID),
  - ON/OFF,
  - Three Position Step Control (TPSC), and
  - Carbon Potential.
- Auto-tuning for each control loop
- Up to 64 Universal Analog Inputs
- Up to 16 Analog Outputs
- Up to 96 Digital Inputs/Outputs
- Up to 50 Recipes with up to 50 variables each
- Up to 4 Setpoint Programmers, 3500 total segments
- Setpoint Profile and Recipe storage, up to 70 programs
- Setpoint Scheduler, 10 stored schedules
- Function Block Graphic Configuration with up to 250 blocks
- Large assortment of algorithms for combination of analog and logic functions
- Extensive Alarm and Event monitoring
- Operator interface with a selection of graphic displays
- Carbon Potential, Dewpoint and Relative Humidity Control
- Optional 3-1/2" floppy disk drive for data archiving, setpoint program and recipe storage
- Universal Power (100 to 240 Vac or Vdc) or 24 VA RH)
- UL, CE, and CSA approved, Y2K compliant C/DC (optional)
- Industrial Operating Range (0 °C to 55 °C, 10 % to 90 %
- UL, CE, and CSA Approved, Y2K compliant

# Equipment Identification

## Controller Components

### Enclosure

The UMC800 controller illustrated in Figure 2 consists of a single metal enclosure that houses the following controller components:

- Power supply module that plugs into the controller common backplane.
- CPU module with two serial communications ports. An optional communications board provides two RS485 serial communication ports (slave and master) that support Modbus® RTU protocol.
- Backplane assembly capable of supporting up to 16 input or output modules.
- Various types of I/O processing modules that plug into the common backplane.
- Removable terminal blocks that connect the I/O modules with the field wiring.
- Battery back-up power for RAM and real time clock in the event of power interruption.

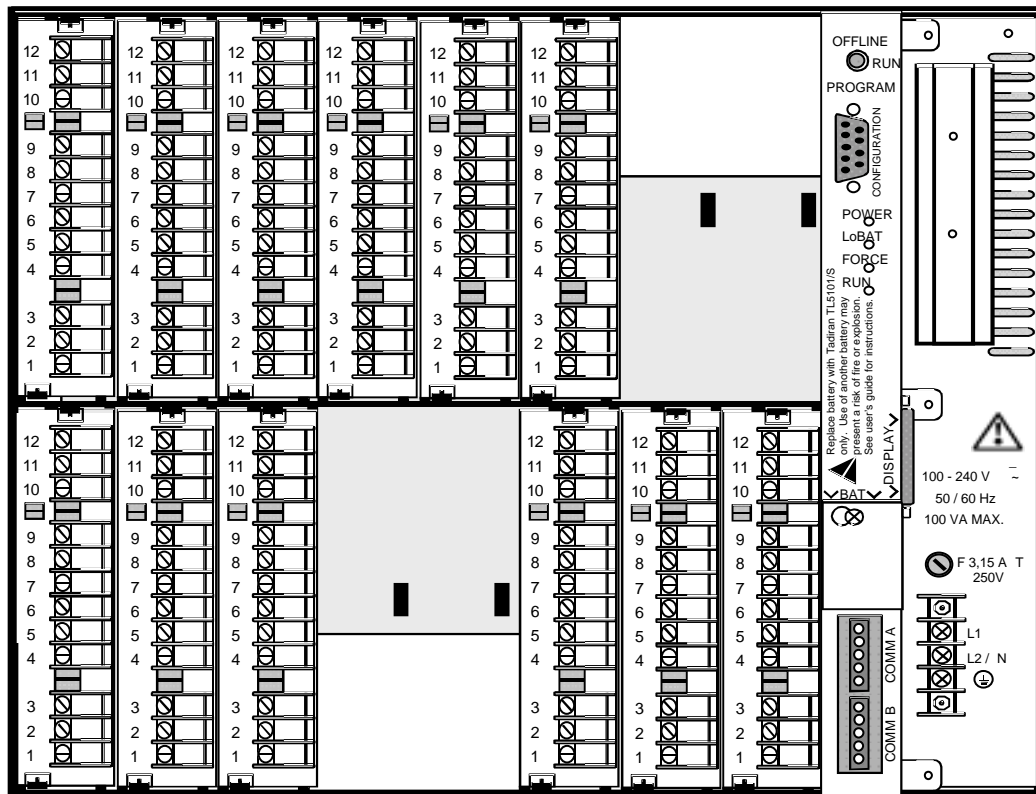


Figure 2 UMC800 controller hardware

## I/O modules

Eleven different module types can be installed in the controller to support both analog and digital inputs and outputs of various types and signal levels. The signal type and I/O capacity for each module type is indicated in Table 1.

**Table 1 Controller plug-in I/O module types**

Module Type	Signal Types	Maximum I/O	I/O per card	Maximum no. of cards
Universal Analog Inputs (AI)	mV, V, mA, T/C, RTD, Ohms	64	4	16
Analog Outputs (AO)	0 mA to 20 mA	16	4	4
Digital Inputs (DI) - 4 types:				
AC	100/240 Vac	96	6	16
DC	24 Vdc	96	6	16
Logic	Dry contacts (5 mA - 5 Vdc)	96	6	16
16 point	Dry contacts	48	16	3
Digital Outputs (DO) - 4 types:				
AC	100/240 Vac	96	6	16
AC High current outputs	100/240 Vac With: 2 outputs rated @ 2 A 4 outputs rated @ 0.5 A	12	2	12
DC	24 Vdc	96	6	16
Relay	SPST normally open (NO) or normally closed (NC) contact. (User configurable)	60	6	10
Pulse Input/Frequency Input	24 Vdc	64	4	16
pH Power Module	± 15 Vdc	8	4	2

NOTE: Total combined digital I/O is 96 points.

## Control architecture

The UMC800 uses a function block configuration architecture to develop control strategies for both analog and digital operations. A function block may represent a physical input or output, a group of physical inputs or outputs, an internal calculation, or an internal function such as a PID algorithm. More than 70 standard UMC800 function block algorithm types are available for configuring analog and logic functions.

Typically, a function block algorithm type may be used any number of times up to the limit of 250 blocks. Some of these with specific limitations are:

- Control loops (i.e., PID, ON/OFF, TPSC, and Carbon potential)—eight or sixteen maximum
- Setpoint programmer and associated support blocks—four maximum
- Setpoint Scheduler and associated support blocks—one maximum
- Time proportioning output blocks—sixteen maximum
- Pushbutton blocks—four maximum
- 4 Selector Switch blocks—four maximum
- Modbus Slave blocks—sixteen maximum

## Operator Interface

The UMC800 operator interface (Figure 3, Figure 4, and Figure 5) provides a graphic LCD display and a monoplaner keyboard to allow operator access to all controller functions. The operator interface becomes operational once a valid database is configured in the controller. Modification and customization of the operator interface is performed using Control Builder software. With the software, data points can be identified (tagged) using eight character names. Once named, these data points may be accessed by the operator interface using a standard set of display formats and a predefined menu hierarchy. Customized display access and the assignment of selected displays to keyboard buttons may be developed using Control Builder software. Selected displays such as bargraphs, trends, and overview displays will require the user to specify the individual data points to be represented on the display.

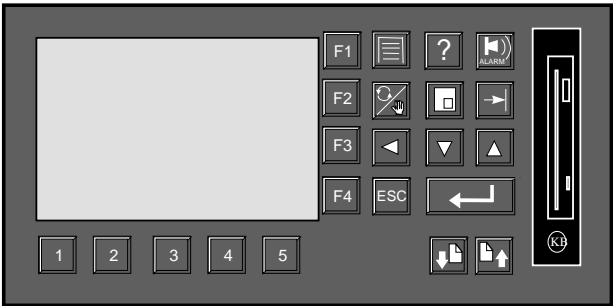


Figure 3 551 operator interface

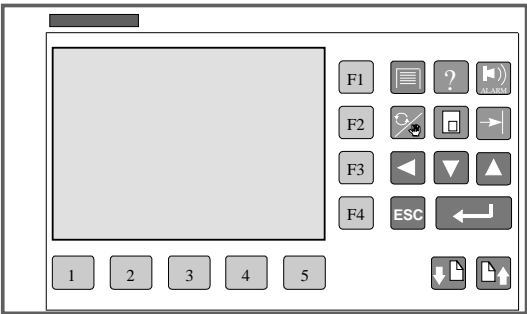


Figure 4 552 operator interface

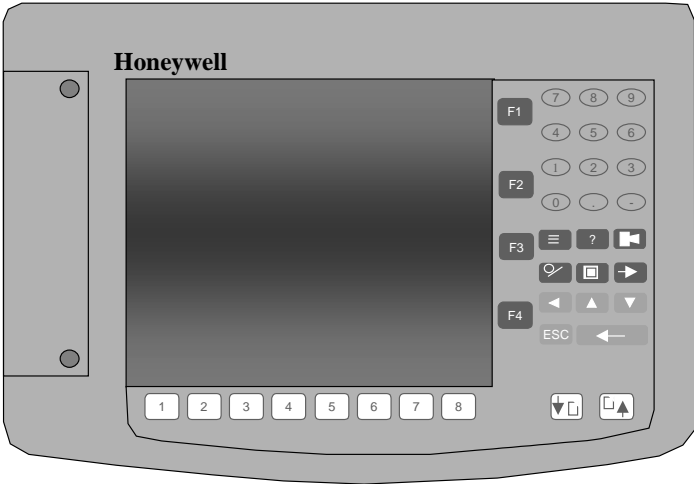


Figure 5 1041 operator interface

## Control Builder

All controller and operator interface configuration is performed using Control Builder software on a separate PC operating with Windows™ 95 or Windows™ NT 4.0. All configuration is performed off-line (computer disconnected from the controller and operator interface). The configuration is downloaded in a separate operation as a complete file through a dedicated RS-232 communication port on the controller. Once a configuration is installed into the controller and operator interface, the Control Builder software may be used to monitor areas of the configuration to verify proper operation. Controller configuration development is performed using "Drag and Drop" techniques for positioning graphic icons on a CRT display from a list of available functions. See Figure 6. Signal flow connections from icon to icon complete the controller configuration. The Control Builder software will create a graphic diagram 1 page high by 20 pages wide. The completed diagram may be printed on 20 pages of 8.5" x 11.5" paper. Each configuration is saved as a single PC file. Multiple files may be saved on the PC. The Control Builder can concurrently open multiple configuration files.

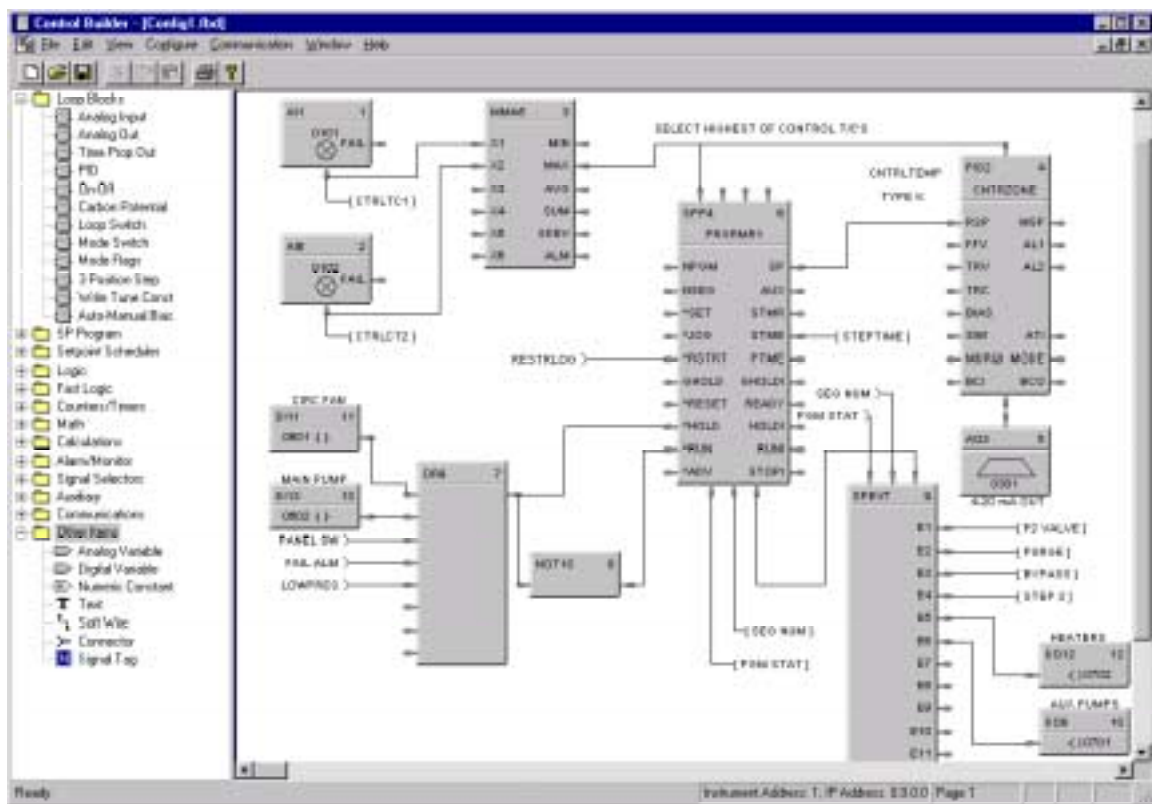


Figure 6 Typical Control Builder graphic display



Completed configurations may also be saved on 3.5" floppy disk and loaded into the controller and operator interface through an optional 3.5" floppy disk drive, eliminating the need for a direct connection of a PC to the controller.

Each analog signal flow line of the configuration may be labeled with an 8-character name, 4-character engineering unit definition, and may have a decimal point location specified. Digital signal lines may be identified with an 8-character name and 6-character ON and OFF label.

Signal tag descriptions are used by the operator interface to present on-line status.

Control Builder software may also be used to reconstruct an existing controller configuration by uploading the configuration from the controller for maintenance or diagnostic purposes.

Operator Interface configuration is performed by identifying values to show on predefined display templates and defining the display access buttons.

### **Control Builder on-line help**

The on-line help system provides a convenient and quick way to look up any task you are performing in the Control Builder program. This Windows<sup>®</sup> help system offers context-sensitive help which means that at any time you request help, a help topic appears that pertains to where you are in the program. For example, if you are focused on a particular program window, you will get a help topic that describes that window. If you are in a particular dialog box or entry field, you will get a help topic that describes that dialog box or entry field.

Within a help window there may be hotspots which are shown as highlighted text. If you click on the highlighted text, a pop-up box with a definition or a separate window of information that corresponds to the designated hotspot topic will appear.

The help menu, which is accessible from any main menu, can be used to display an index and the contents of all help topics in the program.

A right-click on a Function Block provides topic help for that block.

### **User utility**

A separate user utility program is available, which is a windows-based program, and is designed for end-user administration tasks of the UMC800. This utility allows you to create, edit, and download recipes, setpoint profiles, setpoint schedules and data storage files. Controller files can be downloaded and uploaded at the PC. Using the communications menu and dialog boxes, communications parameters can be setup to match your PC communications settings. A loopback test can be initiated to verify communications between your PC and the controller, and an error summary provides data for troubleshooting communications problems. The maintenance menu provides access to controller diagnostic data and allows users to initiate calibration of selected I/O modules.

## Serial Communication Ports

The controller contains dedicated serial ports for external communications. These are described in Table 2.

**Table 2 Communication port descriptions**

<b>Communication Port (on CPU Module)</b>	<b>Description</b>
<b>Configuration</b>	Configuration Port - This RS232 port is a dedicated connection for communications with a PC running the Control Builder configuration program. The communications link layer protocol is proprietary. Communication is through a null modem cable or through a modem.
<b>Display</b>	This RS 422 port is a dedicated connection for communications with the operator interface. Separate power leads included in the cable also supply power to the operator interface. The communications link layer is proprietary and not intended for external use.
<b>COMM A</b> (with optional communication board)	RS 485 Serial communication port using Modbus RTU protocol. This port allows the controller to operate as a slave device on a multi-drop bus with up to 31 other UMC800 controllers and Modbus compatible devices. A PC host can be connected to the bus and used for controller configuration and monitoring tasks.
<b>COMM B</b> (with optional communication board)	RS 485 Serial communication port using Modbus RTU protocol. This port allows the controller to operate as a master device to up to 16 slave Modbus compatible devices. Data transferred through this port is integrated into the user's control strategy through read and write function blocks.

# Pre-Installation Considerations

## Introduction

Installation of the controller consists of mounting and wiring the controller according to the guidelines given in this section. The controller is industrial control equipment that must be panel mounted within an enclosure. The wiring terminals must be enclosed within the enclosure.

Read the pre-installation information, check the model number interpretation [*Controller model number (page 21)*], and become familiar with your model selections, then proceed with installation.

While the UMC800 has been designed for use in most industrial environments, there are certain requirements that should be considered regarding installation and wiring to ensure optimum performance. Many of the problems associated with electronic control equipment can be traced to the primary ac power system. Disturbance, such as electrical noise, power interruptions, and lightning, must be factored into the planning of the primary power system so the control equipment will perform satisfactorily and continuously.

In addition to the precaution of the separation of signal and power wiring in separate conduits, this section suggests some other measures that can be taken to minimize the effects of electromagnetic interference (EMI) and radio frequency interference (RFI), voltage surges and static electricity.

## Operating limits

We recommend that you review and adhere to the operating limits listed in Table 3 when you install the controller.

**Table 3 Operating limits**

Condition	Specifications
Ambient Temperature	32 °F to 131 °F (0 °C to 55 °C)
Relative Humidity	10 % to 90 % RH at 40 °C (104 °F)
Vibration	
Frequency	14 Hz to 250 Hz
Acceleration	1 g
Mechanical Shock	
Acceleration	1 g
Duration	30 ms
Power	
Voltage	100 V to 240 V (24 V optional)
Frequency (Hz)	50/60 Hz or dc
Power Consumption	100 VA Maximum

## Electrical considerations

The controller is considered “open equipment” per EN 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements. Conformity with 72/23/EEC, the Low Voltage Directive requires the user to provide adequate protection against a shock hazard. The user shall install this controller in an enclosure that limits OPERATOR access to the rear terminals.

## Controller grounding

PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed shall be in accordance with National Electrical Code (ANSI/NFPA 70) and local electrical codes.

## Taking electrical noise precautions

Electrical noise is composed of unabated electrical signals that produce undesirable effects in measurements and control circuits.

Digital equipment is especially sensitive to the effects of electrical noise. You should use the following methods to reduce these effects:

- Supplementary bonding of the controller enclosure to a local ground, using a No. 12 (4 mm<sup>2</sup>) copper conductor, is recommended. This may help minimize electrical noise and transients that may adversely affect the system.
- Separate External Wiring - separate connecting wires into bundles (see Table 4) and route the individual bundles through separate conduits or metal trays.
- Use shielded twisted pair cables for all Analog I/O, Process Variable, RTD, Thermocouple, dc millivolt, low level signal, 4-20 mA, Digital I/O, and computer interface circuits.
- Use suppression devices for additional noise protection. You may want to add suppression devices at the external source. Appropriate suppression devices are commercially available.
- Refer to document 51-52-05-01 *How to Apply Digital Instrumentation in Severe Electrical Noise Environments* for additional installation guidance.

**Permissible wire bundling**

Table 4 shows which wire functions should be bundled together.

**Table 4 Permissible wiring bundles**

Bundle No.	Wire Functions
1	<ul style="list-style-type: none"> <li>• Line power wiring</li> <li>• Earth ground wiring</li> <li>• Control relay output wiring</li> <li>• Line voltage alarm wiring</li> </ul>
2	Analog signal wire, such as: <ul style="list-style-type: none"> <li>• Input signal wire (thermocouple, 4 mA to 20 mA, etc.)</li> <li>• 4-20 mA output signal wiring</li> <li>• Slidewire feedback circuit wiring</li> <li>• Digital input signals</li> <li>• Communications</li> </ul>
3	<ul style="list-style-type: none"> <li>• Low voltage alarm relay output wiring</li> <li>• Low voltage wiring to solid state type control circuits</li> </ul>



## Mounting and Wiring

### Site Preparation

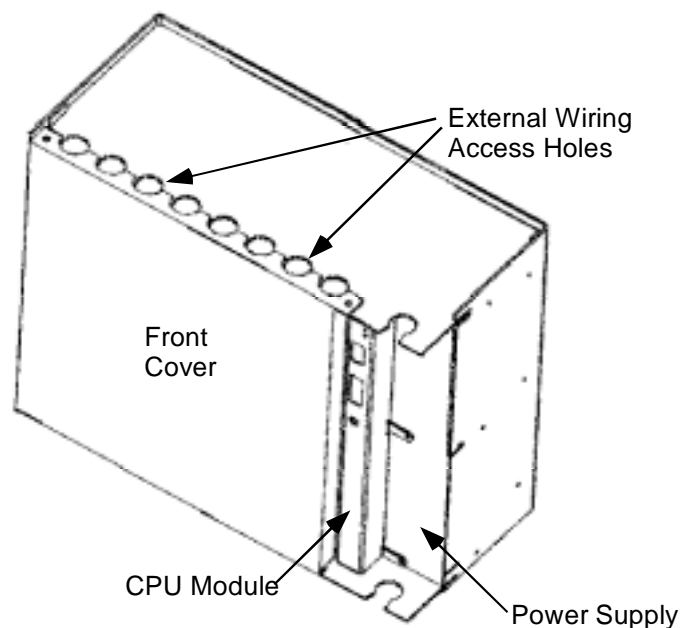
The UMC800 must be mounted within an enclosure. Hardware is provided to surface mount the controller to a panel or other suitable surface. Be sure that there is sufficient clearance for mounting the controller enclosure and the external wiring.

### UMC enclosure and components

The controller enclosure houses all circuit assemblies of the UMC controller. See Figure 7. The power supply and CPU are modules that plug into slots on the right hand side of the enclosure. Both modules have metal covers on the front where indicators, switches and connectors are located. All external connections to the power supply and CPU are made on the front panels of these modules.

A front cover can be removed by two screws to access the I/O modules. There are two rows of card guides to accommodate up to 16 plug-in I/O modules. External signal wiring to field devices are made with removable terminal blocks that attach to the front of each I/O module. Optional terminal strips can be used to provide shield termination of field wiring.

Power supply, CPU and I/O modules are connected through a common backplane within the enclosure. All external wiring for power supply and I/O modules are brought out through rubber grommets located at the top and bottom of the enclosure. The CPU features two connections for external communications. One provides a cable connection to a PC for configuration and database file management; the other connection accommodates a cable to the operator interface. An optional communication board provides two RS 485 serial communications ports (slave and master) using Modbus RTU protocol.



**Figure 7 UMC800 controller enclosure**

## Power requirements

The standard supply uses 100/240 Vac or Vdc input ranges for its source. The input requirements are listed in Table 5. Instructions for wiring the power supply are found in Table 5.

**Table 5 Power supply input requirements**

Voltage Input	Frequency	Power Consumption
100-240 Vac or dc (+10 % or -15 %)	50/60 Hz or dc	100 VA maximum
24 Vac or dc ( <i>optional</i> ) 24 Vac (+25 % or -15 %) or 24 Vdc (+50 % or -8%)	50/60 Hz or dc	100 VA maximum

## Assembling parts

Assemble all parts of the UMC800 along with tools required to mount the UMC800 hardware. You should have these tools on hand:

- Tool box that includes a center punch and a standard complement of flat blade and Phillips head screwdrivers as well as box-end and open-end wrenches.
- A drill tap and drill with number 9 drill bit for drilling clearance holes as applicable.
- Tools for measuring and marking location of clearance holes and cutout on panel as well as cutting a hole in the panel.

## Mounting the Controller

### Mounting controller enclosure on a panel

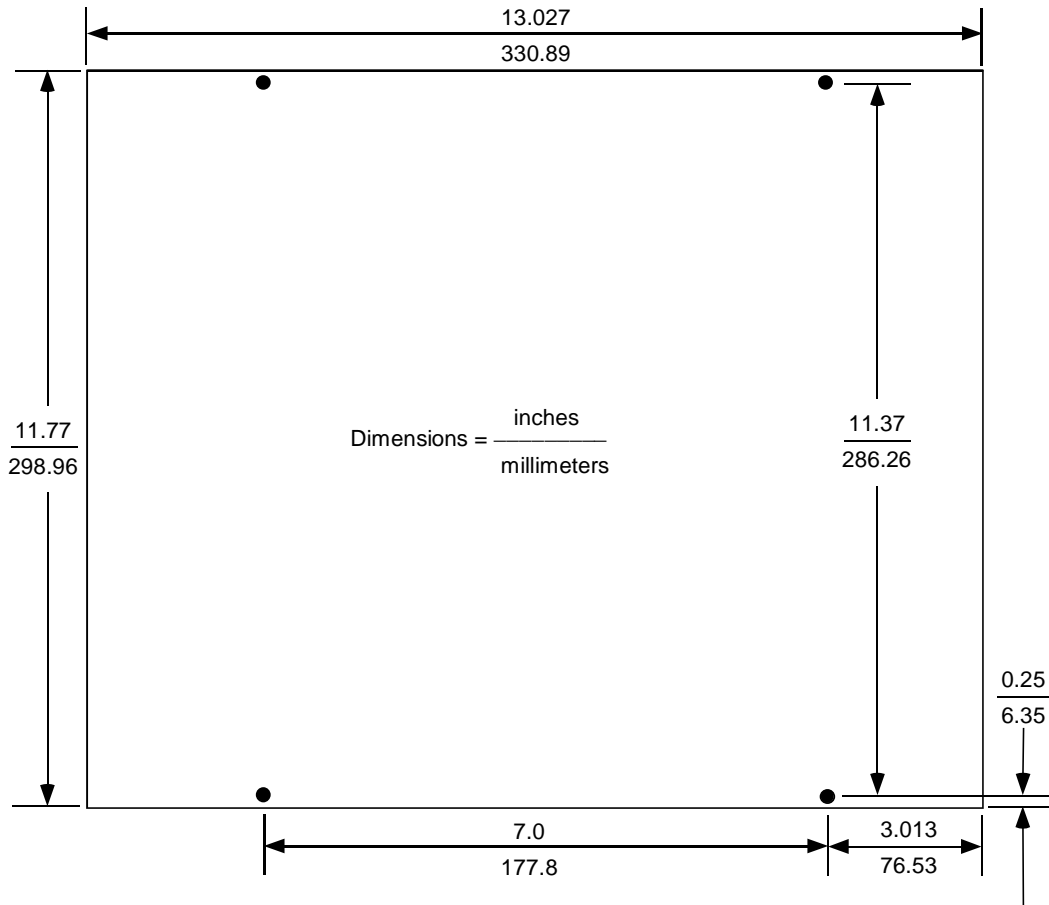
The controller enclosure is made to be surface mounted within an enclosure. The controller can be mounted so that the power supply is at the righthand side, or the controller can be rotated 90 degrees so that the power supply is at the top. For either mounting, there must be sufficient space allowed for routing the external wiring.

Four holes at the back of the enclosure are provided for surface mounting with screws. Use the steps in the table below to mount the controller enclosure on a panel.

Step	Action
1	Layout mounting hole patterns on panel according to dimensions shown in Figure 8. Or, position controller enclosure on panel and use enclosure as a template.  NOTE: Rotate the mounting dimensions 90 degrees to mount the enclosure sideways with the power supply at the top.
2	Drill and tap mounting holes for 1/4-20 (or M6) machine screws (supplied by user).
3	Position enclosure on panel so holes in enclosure align with holes in panel. Secure enclosure to panel with 1/4-20 (or M6) machine screws using external tooth washers.



**Enclosure mounting dimensions**



NOTE: Allow 7.0" (178 mm) depth to mounting dimensions for controller enclosure and cabling. To mount the controller so that the power supply is at the top, rotate the mounting dimensions 90 degrees.

**Figure 8 UMC800 controller enclosure dimensions**

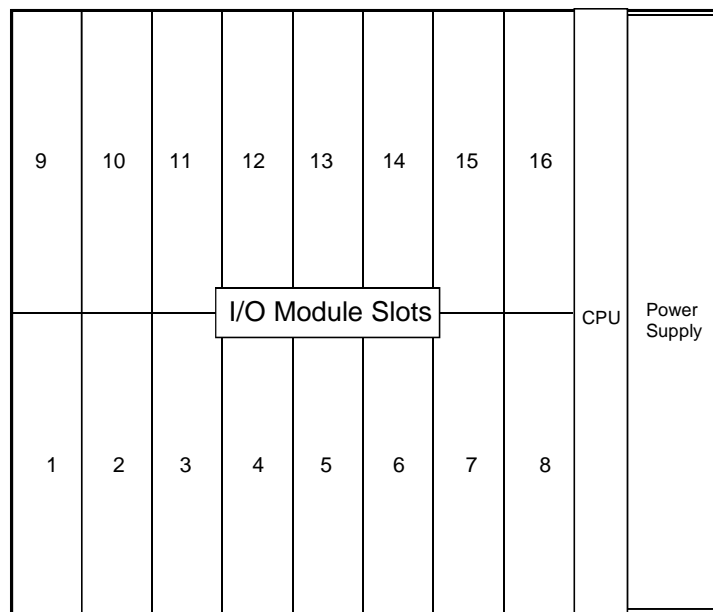
## Plug-in Module Locations

### Common backplane

The controller backplane provides common connections for the power supply, CPU and I/O modules. All modules are installed into the backplane in their assigned slots designated by the controller model number. [See *Controller model number (page 21)*.] The power supply and CPU occupy the slots on the right side of the enclosure. See Figure 9. Slots for the I/O modules are numbered from 1 to 16 to be consistent with I/O address assignment when using the PC control builder software.

Slots 1-8 (left to right) comprise the lower slots.

Slots 9-16 (left to right) comprise the upper slots.



**Figure 9 UMC800 controller plug-in slots**

### I/O module identification

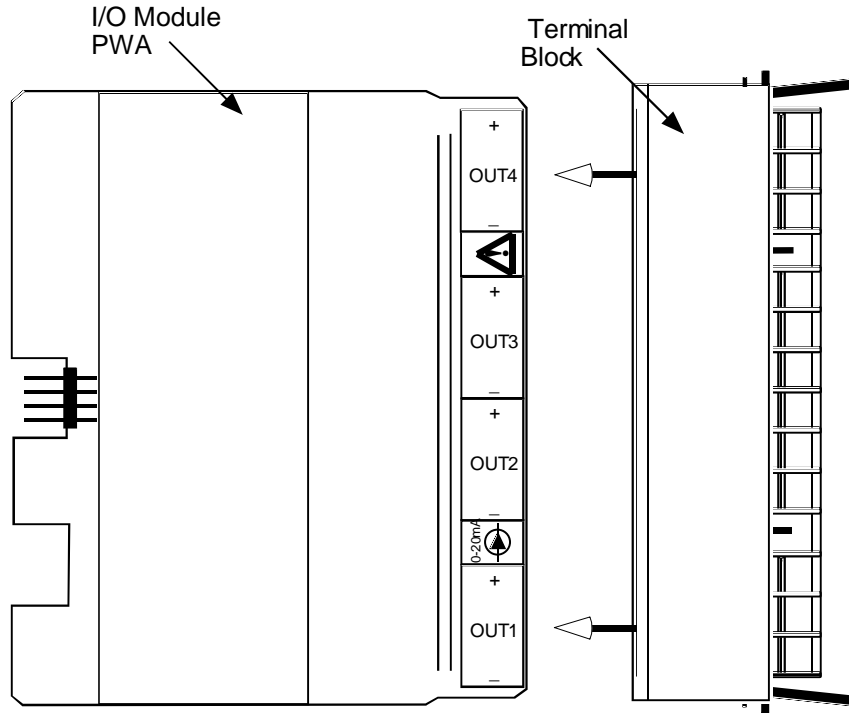
I/O modules consist of a Printed Wiring Assembly (PWA) and a color-coded terminal block. Each module type is identified by a number label attached to a colored terminal block. Typically, red terminal blocks indicate AC voltage inputs and outputs and black terminal blocks indicate low voltage modules. See Figure 10 for an example. Module type and terminal block identification are described in Table 6.



#### CAUTION

Do not switch the terminal boards and I/O module PWAs. The color and number designation of the terminal boards should match the correct I/O module type.

---



**Figure 10 I/O module PWA and terminal**

**Table 6 I/O module identification**

Module Type	ID Number	Terminal Block Color	Part Number
Analog Input (AI)	1	Black	46190305-503
Analog Output (AO)	2	Black	46190314-503
Digital Input (DI) - Logic	3	Black	46190311-503
Digital Input (DI) - DC	4	Black	46190347-501
Digital Input (DI) - AC	5	Red	46190350-501
Digital Input (DI) - 16 point	B	Orange or Beige	46190353-501
Digital Outputs (DO) - Relay	6	Red	46190308-503
Digital Outputs (DO) - DC	7	Black	46190341-501
Digital Outputs (DO) - AC	8	Red	46190344-501
Digital Outputs (DO) - Higher Current AC	A	Red	46190344-502
± 15 Vdc pH Power Module	C	Black	51450921-501
Pulse/Frequency Input	D	Black	46190360-501

**I/O module limits**

The controller backplane accommodates I/O module types, subject to the limitations as shown in Table 7. Slot Locations identify the allowable locations in the controller for each I/O module type. Maximum Allowed describes the maximum I/O configuration for each I/O type in a controller.

**Table 7 I/O module installation limitations**

<b>I/O Module Type</b>	<b>Slot Locations (See Figure 9)</b>	<b>Maximum Allowed</b>
Universal Analog Input (ID: 1)	1 through 16	16 modules (64 points)
Analog Output (ID: 2)	1 through 10	4 modules (16 points)
Digital Input (ID: 3,4,5)	1 through 16	16 modules (96 points)*
Digital Input 16 point (ID: B)	14 through 16	3 modules (48 points)*
Digital Output (ID: 6,7,8)	1 through 8	8 modules (48 points)*
Digital Output (ID: A)	9 through 16	2 modules (12 points)*
± 15 Vdc pH Power Module (ID: C)	5, 6	2 modules (8 points)
Pulse/Frequency Input (ID: D)	1 through 16	16 modules (64 points)

NOTE: Total combined I/O of all types is limited by the 16 available controller I/O slots.

\* Total of 96 DI/DOs allowed for all types combined.

**Controller model number**

The controller model number specified on your purchase order indicates the I/O module types and the assigned slot location of each I/O module present in the controller. The number fields that identify I/O modules are defined below.

**Example of controller model number**

Controller Model Number           **8001 - 000 - 0E - 01122300 - 56800000**

I/O module types and controller  
locations for . . .

Slots 1 to 8	Slots 9 to 16
--------------	---------------

So the number 01122300 - 56800000 indicates that the controller is equipped with I/O module types in the following slot locations:

Controller Slot #	I/O Module Type (Module ID)
1	Blank (0)
2	Analog Input (1)
3	Analog Input (1)
4	Analog Output (2)
5	Analog Output (2)
6	DI Logic Input (3)
7	Blank (0)
8	Blank (0)

Controller Slot #	I/O Module Type (Module ID)
9	DI AC Input (5)
10	DO Relay Output (6)
11	DO AC Output (8)
12	Blank (0)
13	Blank (0)
14	Blank (0)
15	Blank (0)
16	Blank (0)

NOTE: The numbers (in parenthesis) that identify the I/O module types are defined in Table 6.

**Verify I/O module locations**

The table below outlines the steps for identifying and recording the I/O module types in the controller.

Step	Action
1	Verify that the module types installed in the controller card slots are correct according to the controller model number. Refer to Table 6 to identify the module types.
2	Use to record the location, module type and signal type/range for each I/O module installed in the controller.  NOTE — Module types should be installed in accordance with the limitations described in Table 7.

**Table 8 I/O module identification record**

Controller Slot No.	I/O Module Type (AI, AO, DI, DO, or PI/FI)	Signal Type/Range (mV, V, mA, T/C, RTD, Ohms, pH)*				Terminal Block Color
		AI Ch 1	AI Ch 2	AI Ch 3	AI Ch 4	
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

\* An Analog Input (AI) Module can be configured to accept multiple input types.

# Signal Wiring

## I/O module wiring

Terminal blocks are installed to the front of the I/O modules for connecting field device wiring as shown in Figure 11. Terminal blocks are color coded and numbered to identify the I/O module type. (See Table 6.) The terminal blocks are removable so that I/O modules can be replaced without disconnecting the field wiring from the terminal blocks. Wire gauge sizes 16 to 22 AWG can be used to connect to the terminal blocks. The field wiring exits through rubber grommets at the top or bottom of controller enclosure. The rubber grommets are removed by sliding the grommet forward with the terminal block and the attached field wiring.

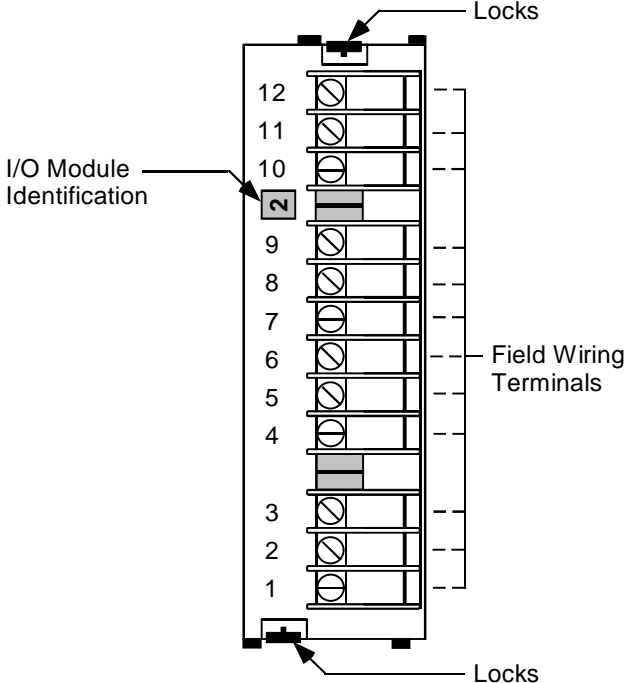


Figure 11 I/O module terminal block (all except 16 point DI)

### Analog input / analog output field wiring

Shielded twisted pairs are recommended (and required for CE approval) for analog input (AI) and analog output (AO) module field wiring. If a cabinet shield termination point is not available, the optional shield termination bracket may be used, (specify part number 51309814-501). The shield termination point is a bracket attached at the top and/or bottom on the front of the controller enclosure. The wiring shields are attached using the screws of the shield termination. Figure 12 shows the field wiring termination strip attached to the bottom front of the enclosure.

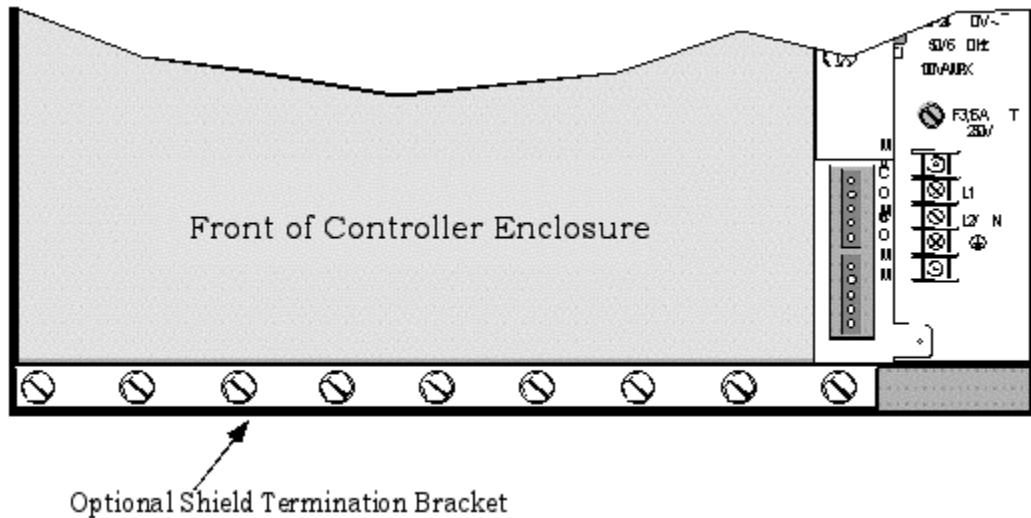


Figure 12 Field wiring shield termination

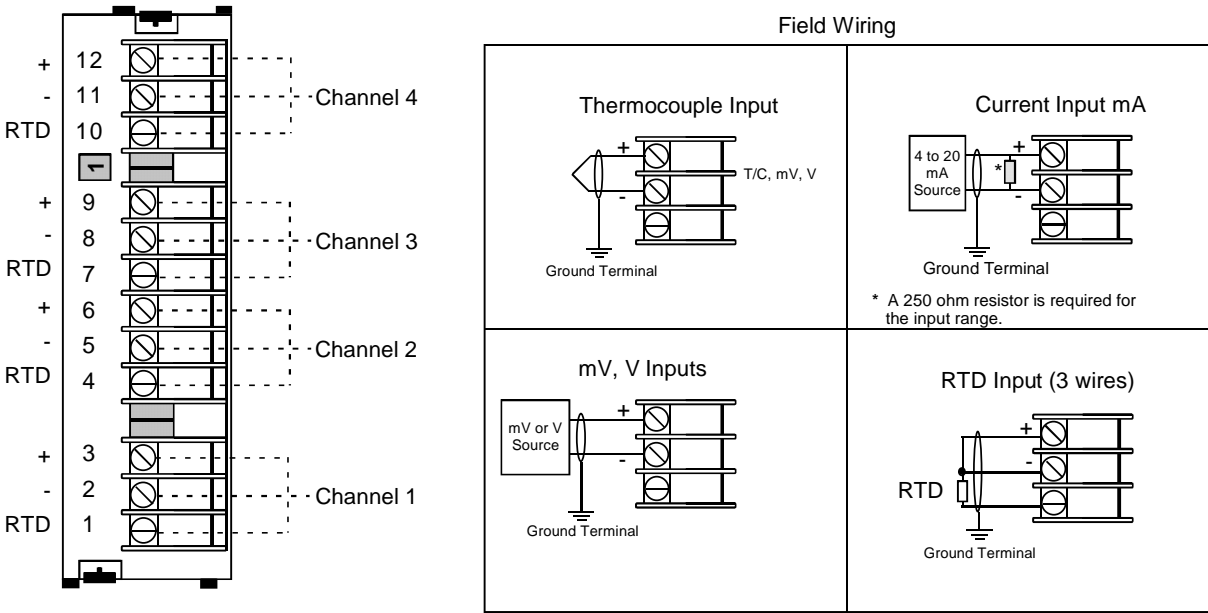


**Analog inputs (module ID 1)**

A universal Analog Input module accepts a variety of input signals from field devices as summarized in Table 9. Figure 13 illustrates the terminal block connections for the various inputs. See *Specifications* section for more details on all I/O module specifications. One AI module can be configured to accept multiple input types.

**Table 9 Universal analog input module specifications**

Specification	Description
Input Types	mV, V, mA, T/C, RTD, and Ohms
Number of Inputs	4 per module, up to 16 modules per controller (64 inputs)
Signal Source	Thermocouple with cold junction compensation, for operation between 32 °F to 176 °F (0 °C to 80 °C)  Line resistance up to 1000 ohms, T/C, mV, mA, V RTD Pt 100 3-wire connections, 40 ohms balanced max.
Input Impedance	10 Megohms for T/C, mV inputs, > 1 Megohms for volt inputs



**Figure 13 AI module terminal block connections**

### Field wiring for one pH sensor input (module ID C)

Figure 14 indicates the recommended wiring for one pH sensor input. Note that two analog input channels are required, one for the pH sensor and one for temperature. Similar wiring may be used for additional sensors. A UMC800 controller can accommodate 2 power modules for a total of up to 8 pH inputs.

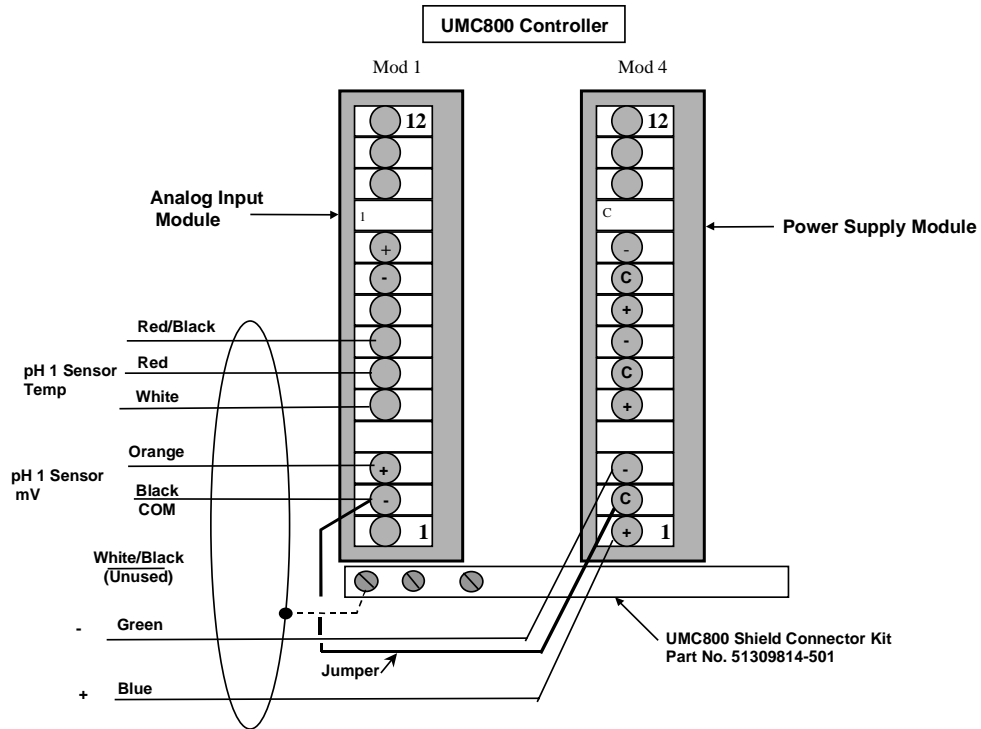
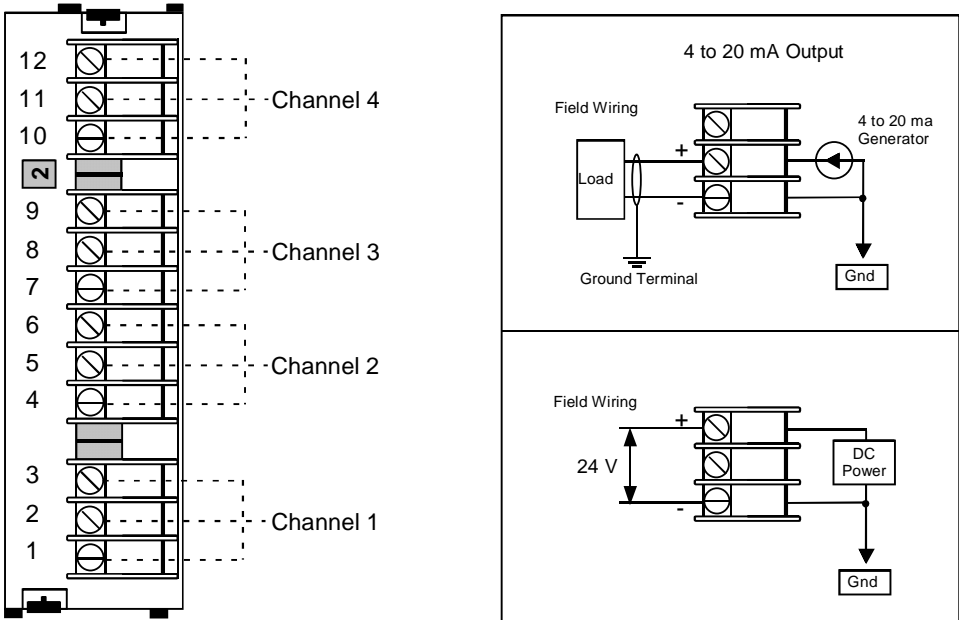


Figure 14 Recommended wiring for one pH sensor input

**Analog outputs (module ID 2)**

The Analog Output (AO) module provides four outputs at 0 mA to 20 mA (configurable for 4 mA to 20 mA or any span between 0 mA to 20 mA). When not used for an analog output, an output channel may be used to power a transmitter with 24 Vdc power. The controller will support up to 4 AO modules, for a total of 16 outputs. Figure 15 shows the terminal connections for the AO module. See *Specifications* section for details on all I/O module specifications.



**ATTENTION**

Channels not used as analog outputs can be used to supply a transmitter with 24 Vdc power.

**Figure 15 AO module terminal block connections**

## Digital inputs

Three types of Digital Input (DI) modules accept four types of input signals.

1. Logic Input (Module ID 3 and B)
2. DC Input (Module ID 4)
3. AC Input (Module ID 5)
4. Pulse/Frequency Input (Module ID D)

Each type is described on the following pages. Figure 16 shows the terminal block connections for all DI modules. See *Specifications* section for details on all I/O module specifications.



### ATTENTION

16 Point Digital Input module (ID B) has 32 terminals. If you are using 2 wires per DI, use 22 gage wires so all 32 wires can fit through the rubber grommet in the controller case. See Figure 16.

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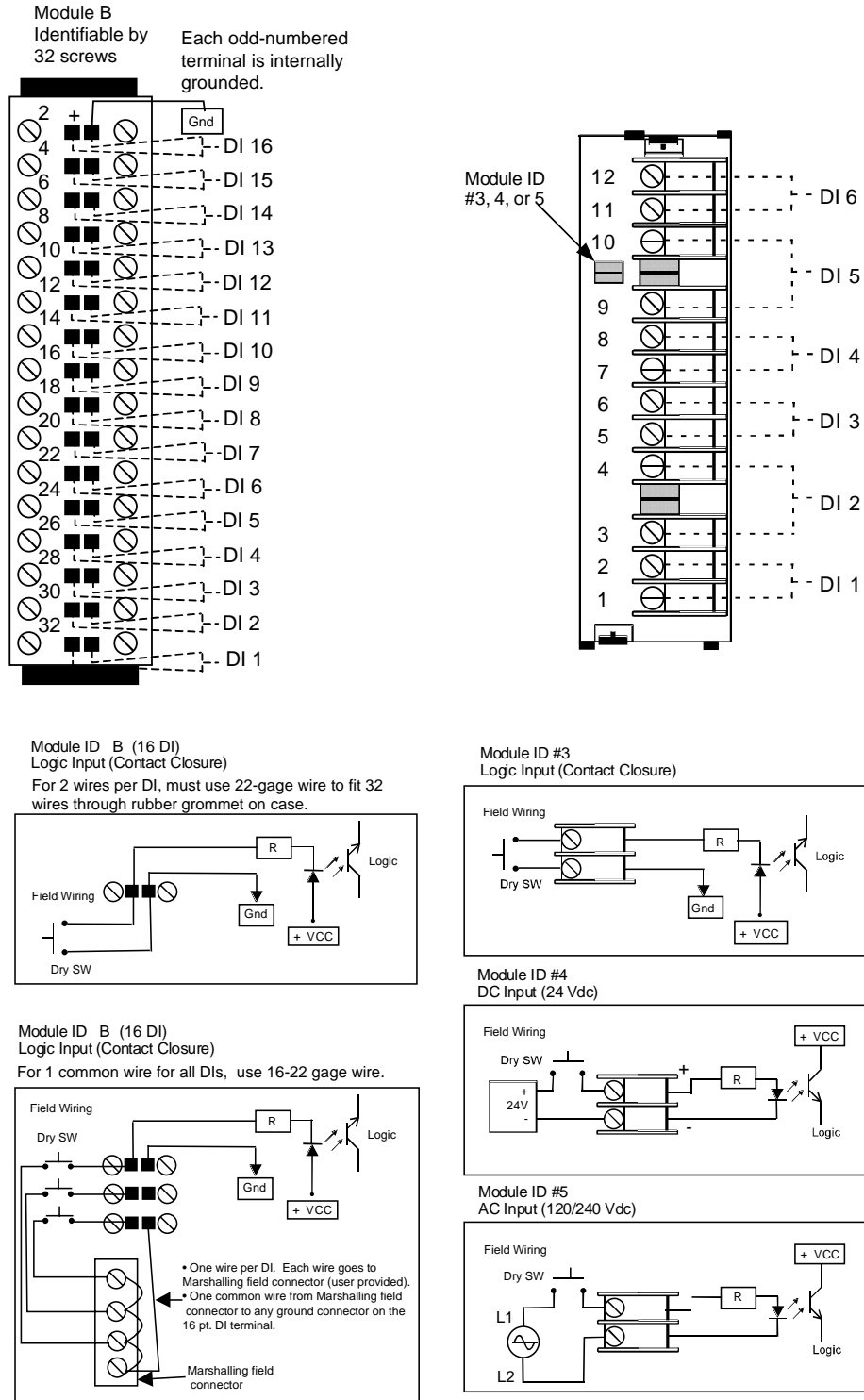


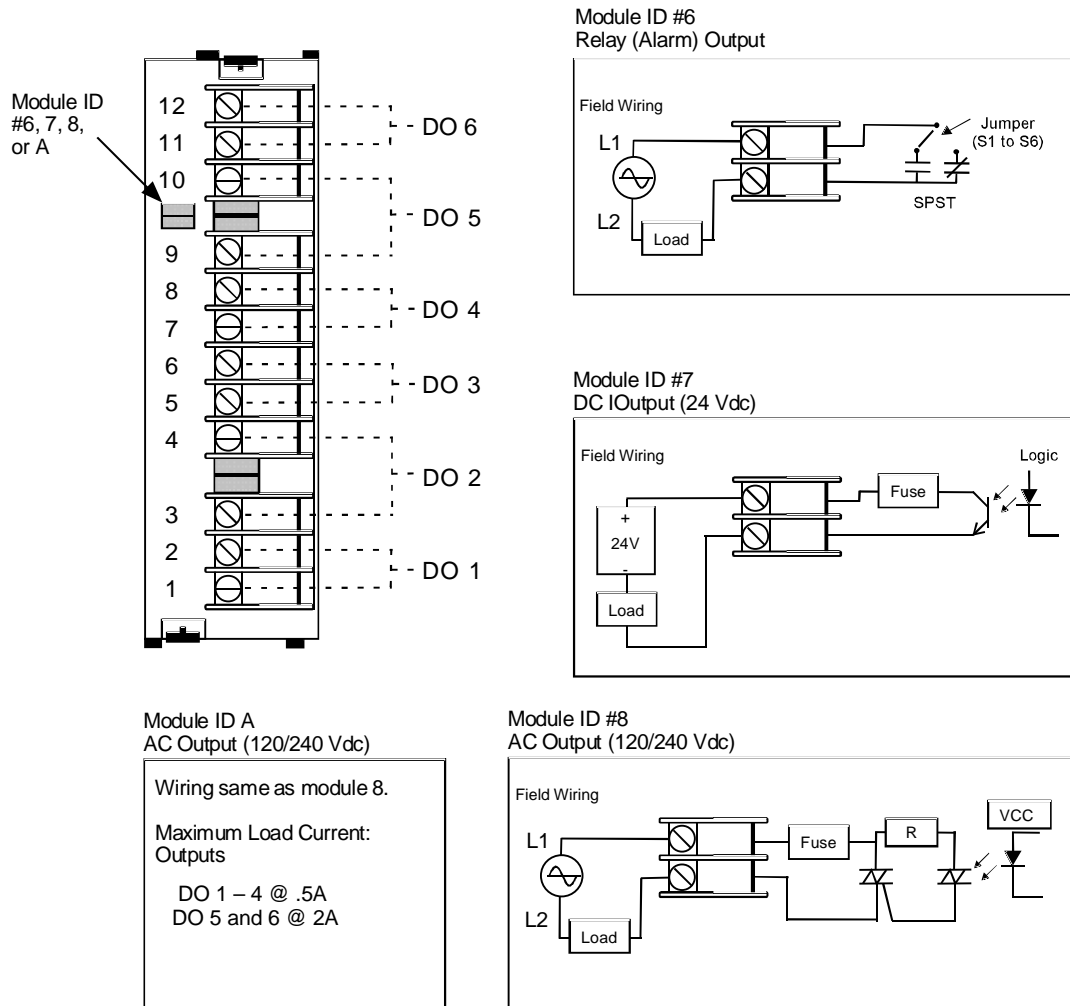
Figure 16 DI module terminal block connections

### Digital outputs

There are four types of Digital Output (DO) modules that provide three types of Off/On control.

1. Relay (alarm) output (Module ID 6) 46190308-503
2. DC output (Module ID 7) 46190341-501
3. AC output (Module ID 8) 46190344-501
4. AC high output (Module ID A) 46190344-502

Figure 17 shows the terminal block connections for the DC output and AC output DO modules. See *Specifications* section for details on all I/O module specifications.



**Figure 17 DO module terminal block connections**

The Digital Output module with relay outputs (Module ID 6) contain jumpers to set the de-energized state of the relay contacts. The relays are factory set to normally open (NO) for each output on the relay alarm module, as shown in Figure 18.

To change the state of the contacts: Use a pair of needle-nose pliers and move the jumper from the location NO (normally open) to the location NC (normally closed).

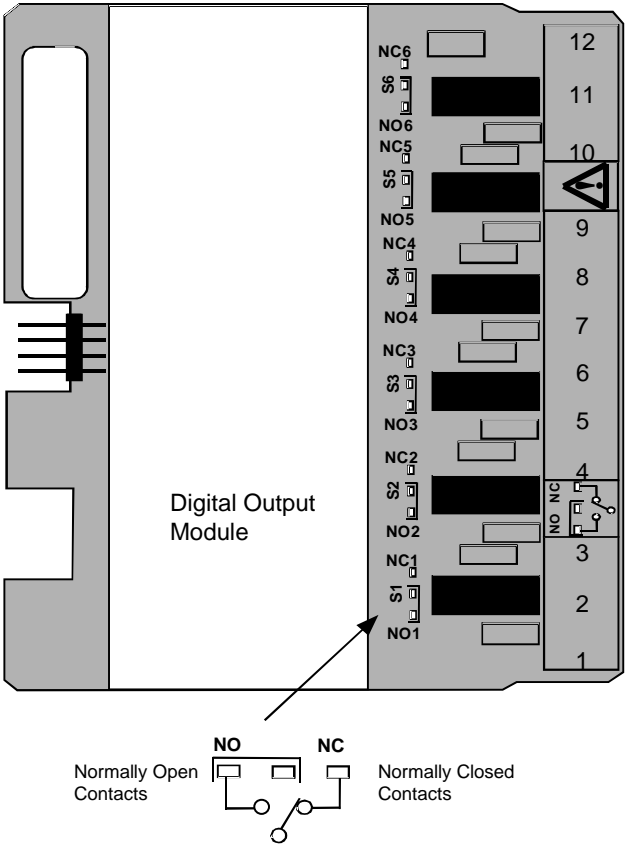


Figure 18 DO module relay contact setting

### Pulse input/frequency input module with digital outputs

Figure 19 shows the terminal block connections for Pulse/Frequency Input Module. See *Specifications* section for details on all I/O module specifications.



#### ATTENTION

16 Point Digital Input module (ID D) has 32 terminals. If you are using 2 wires per DI, use 22 gage wires so all 32 wires can fit through the rubber grommet in the controller case. See Figure 19.

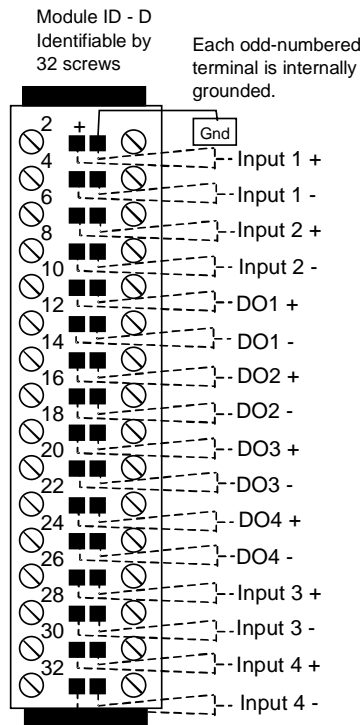
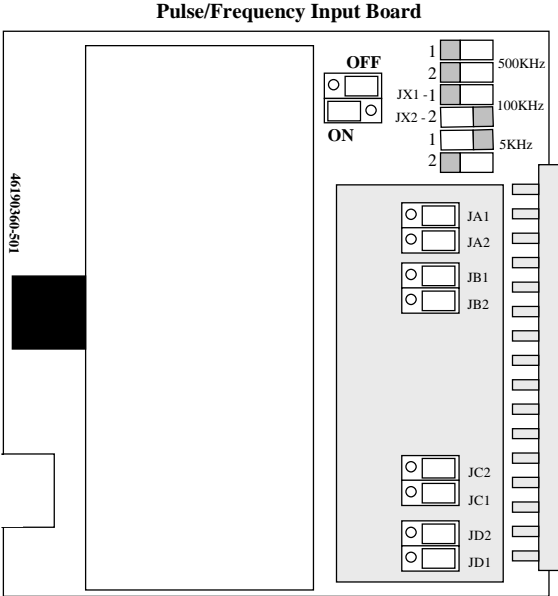


Figure 19 PI/FI module terminal block connections



**Pulse input/frequency input jumpers**

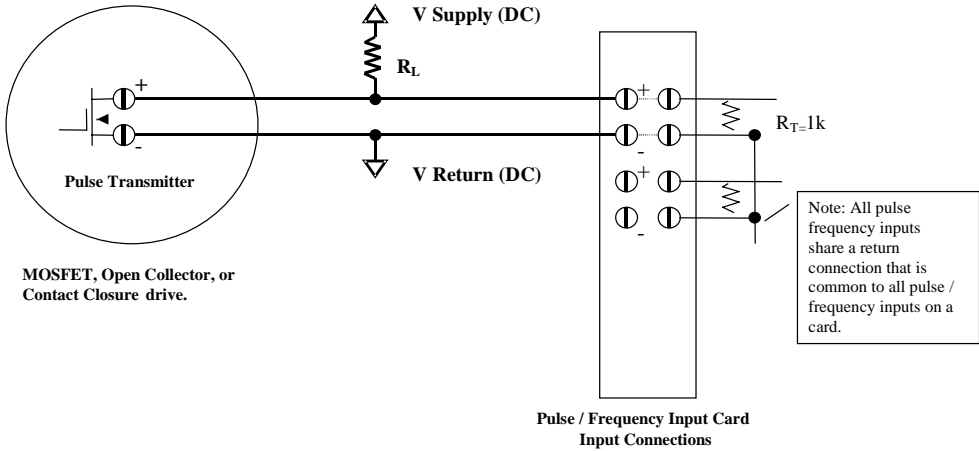
The Pulse/Frequency Input Module with Digital Outputs (Module ID D) contain jumpers to set the de-energized Input Filter Cutoff Frequency. All four inputs are factory set to 500 KHz as shown in Figure 23. To change, use needle nose pliers and move the jumper(s) to the desired position. See the figure below for the default positions and jumper settings for 100 KHz and 5 KHz.



**Figure 20 PI/FI module input filter cutoff frequency setting**

**Pulse/frequency card wiring**

The pulse frequency card input is designed to accept a contact closure type transmitter. The typical wiring circuit is shown below.



**Figure 21 Pulse/frequency input connections**

### V supply

Choose a supply that is compatible with the environmental requirements of your application. The supply voltage must be within the requirement of both the transmitter and the pulse input card. Typically a low cost 12 Vdc unregulated supply can be used in most applications provided it meets applicable regulatory requirements. 1k ohm termination resistors ( $R_T$ ) are built into the pulse frequency card. The voltage across the internal resistor must meet pulse frequency card requirements. The circuit in Figure 21 provides for a 1 k ohm load resistor and a 12 V supply. The actual pulse voltage seen across the pulse \ frequency input is divided by  $R_T/(R_L+R_T)$   $V_{Supply} = 6 V$ . The  $V_{IH}$  minimum pulse threshold voltage for the pulse input card is 3 volts. For a 1 k ohm load the minimum V supply will be  $3 V (R_L+R_T)/ R_T = 6V$ .

### V return

The pulse / frequency cards pulse inputs are optically isolated from other circuitry but share a common isolated supply common. When multiple inputs are used the supply voltage returns will be connected to a common reference internal to the pulse frequency card. The pulse / frequency cards digital outputs are optically isolated from all inputs and each other.

### $R_L$

The maximum sink current specified by the pulse transmitter specifies the minimum load resistance. Typically  $R_L$  is within the range of 100 to 100k ohms. A 1 k ohm resistor is typically recommended.

The transmitter often provides a selection for the pulse duration or width. The pulse input card internal R/C filtering will attenuate short pulse widths. Below is a table for filter and pulse width settings for several pulse frequency ranges.

Max Pulse Frequency	Typical Filter Jumper Setting	Pulse Width Range
100kHz	500 K Hz	2 uSec to 9 uSec
10kHz	100 K Hz	9 uSec to 90 uSec
1kHz	5 K Hz	180 uSec to 900uSec
100Hz	5 K Hz	180 uSec to 9mSec

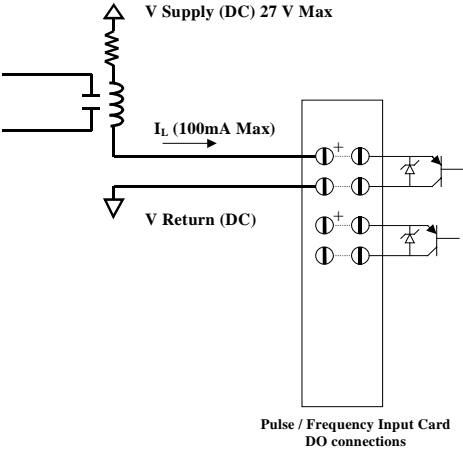
( $V_{supply} = 12 Vdc$ ,  $R_L = 1 K ohm$ )

The minimum pulse frequency is 10 Hz regardless of the filter jumper settings.

The pulse frequency card input wiring requirements must be compatible with both the pulse frequency card and the transmitter manufactures specifications. A typical transmitter will specify the maximum supply voltage and the maximum sink current.

**Pulse frequency card outputs**

The pulse frequency card outputs are open collector drivers designed to drive a maximum of 100 mA. All Pulse Frequency card digital outputs are optically isolated from each other. The maximum supply voltage must not exceed 27 Volts dc.



**Figure 22 Pulse/frequency card digital output connections**

## Wiring Communication Links

### Serial communications ports

The controller communicates through a number of serial ports. The CPU module contains two serial ports. One is an RS 232 connection to a PC and another is dedicated for connection to the operator interface. The CPU with optional communications features two additional RS 485 serial ports.

The serial port connectors on the CPU module are shown in Figure 23. Table 10 summarizes the communication link connections to the controller and other reference data for wiring details.

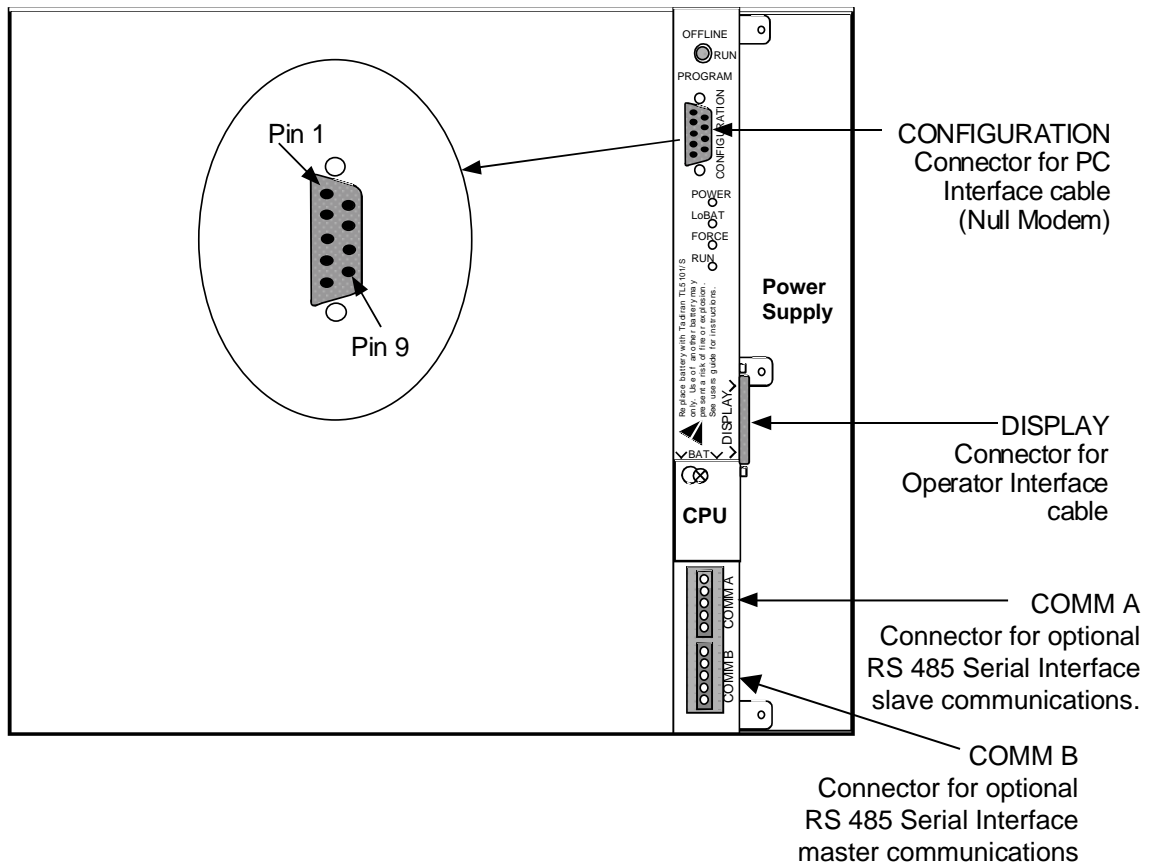


Figure 23 Communication port connectors

**Table 10 Summary of communication link connections to controller**

Communication Link to . . .	Link Type	From Controller Port	Connect Cable	To Port	Reference Data
PC or laptop (via Null Modem cable or via modem)	RS 232	<b>CONFIGURATION</b>  (9-pin "D" connector)	Up to 50 ft cable lengths (Supplied by user)	Serial port of PC.	Null Modem cable, 9-pin Male/Female See Table 11.  Modem: See Remote Access (page 44)
Operator interface	RS 422	<b>DISPLAY</b>  (15-pin "D" connector)	10 ft or 50 ft cable lengths available.	Terminal connector of operator interface.	See Table 12.
Modbus Link (optional communications board)	RS 485 (Half Duplex)	<b>COMM A</b>  (4-wire + shield or 2-wire shielded with external jumpers)	Up to 2000 ft cable lengths (Supplied by user)	Modbus communications and PC host.	See Figure 26.
Modbus Link (optional communications board)	RS 485 (Half Duplex)	<b>COMM B</b>  (4-wire + shield or 2-wire shielded with external jumpers)	Up to 2000 ft cable lengths (Supplied by user)	Modbus communications and slave devices.-	See Figure 26.

**CONFIGURATION connector**

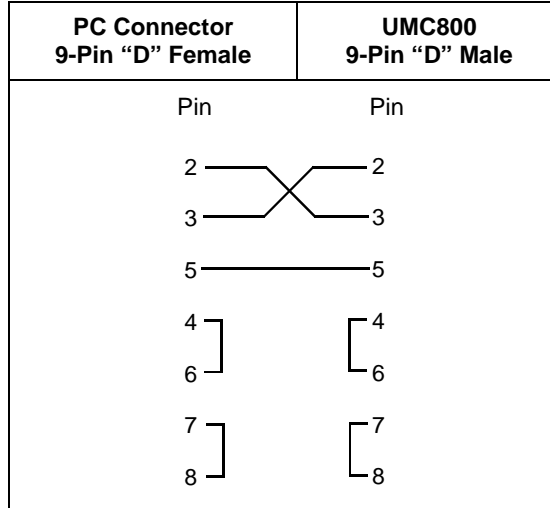
The Configuration connector accommodates a 9-pin D-type Null Modem cable connection to the serial RS-232 input of a PC or laptop computer. Table 11 describes the pinouts for the connector. See Figure 23 for the pin numbering. If you need to construct the cable, Table 12 shows the make up of the cable.

**Table 11 Configuration connector pinouts**

<b>Configuration Connector Pinouts (For Null Modem Cable)</b>	
<b>Signal Name</b>	<b>Terminal No.</b>
DCD	1
RXD	2
TXD	3
DTR	4
GND	5
DSR	6
RTS	7
CTS	8
RI	9

**CONFIGURATION cable**

**Table 12 Null modem cable construction**



**Order part number -**

51404755-501

### Installing ferrite clamp for CE compliance

This procedure ensures that unwanted radio frequency noise is filtered. It is required for CE compliance.

#### Parts needed

Part #	Quantity	Description
047260	1	Ferrite cable clamps
089037	2	Nylon cable ties

#### Installing ferrite clamp

Step	Action
1	Disconnect all power to the instrument.
2	See Figure 24. Attach the ferrite clamp around all the wires as close to the Configuration port terminals as possible (within ½" of the terminals). For maximum shielding you must minimize the amount of unshielded exposed wire. The ferrite clamp should overlap or abut the cable shield enclosing the wires.
3	Snap the ferrite clamp closed, making sure to not pinch the wires.
4	To prevent the ferrite clamp from sliding, attach cable ties around the wires snugly against each end of the ferrite clamp.
5	Trim the cable tie but leave a "tail" of approximately 1".

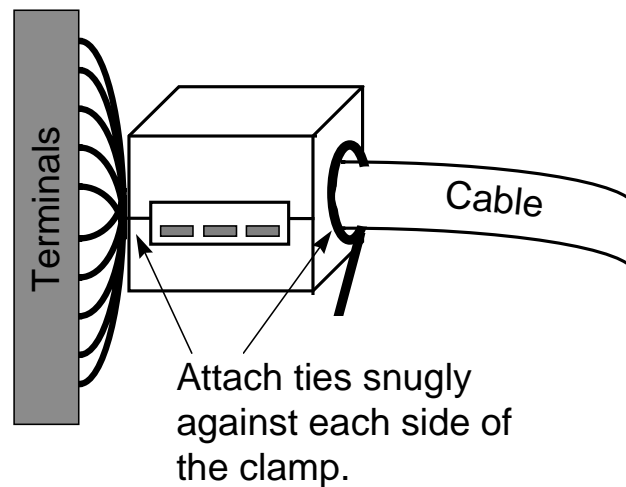





Figure 24 Ferrite clamp installation

**DISPLAY connector (to operator interface)**

The controller is connected to the operator interface through a 15-pin D-Type connector cable. One cable end is connected to the DISPLAY connector of the controller. The other end connects to a 10-pin in-line connector at the rear of the operator interface case. This cable end must be made, since some installations may require the cable to be run through conduit. Table 13 shows the pinouts for the operator interface end of the cable. Figure 25 shows the connector location at the rear of the operator interface.

**Table 13 Operator interface connector pinouts**

Operator Interface Connector Wiring		
Signal Name	Wire Color	Terminal No.
Receive – Receive +	Black White	1 2
Receive Shield Transmit Shield	Shield Shield 	3
Transmit – Transmit +	Black Red	4 5
Signal Ground Signal Ground 	Black Green 	6
Outer Shield -----	Shield -----	7 8
+24 Vdc * +24 Vdc *	Black Blue	9 10

\*



**CAUTION:** For 24 Vdc, make sure that **the wiring is on terminals #9 and #10**. The CPU board may be damaged if the wiring is accidentally connected to terminals #1 and #2.



Connector location at the rear of the operator interface

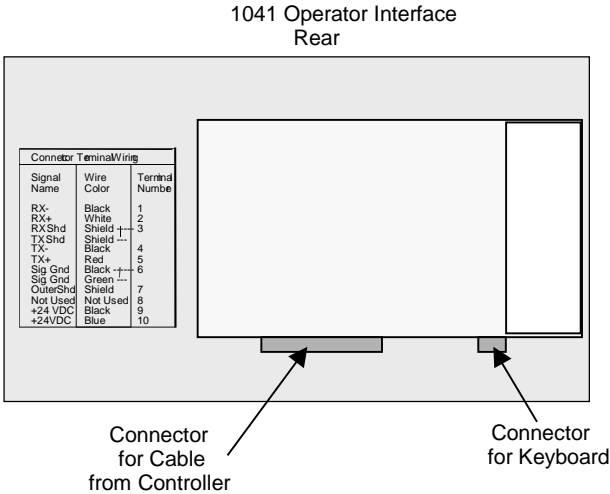
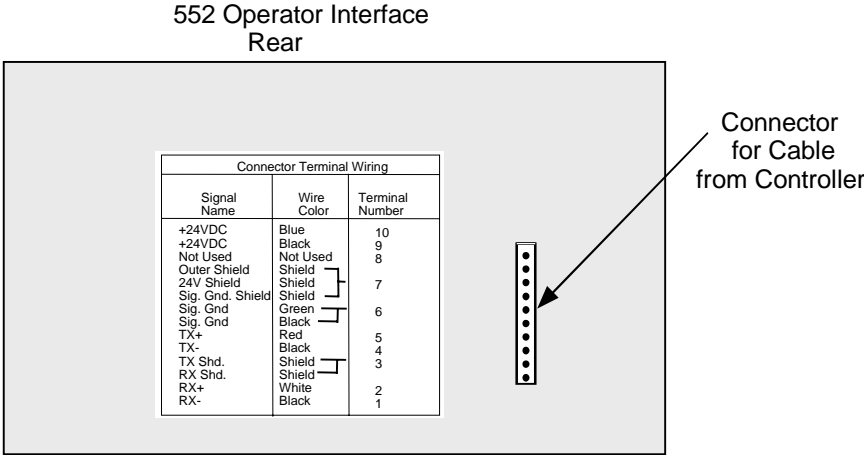
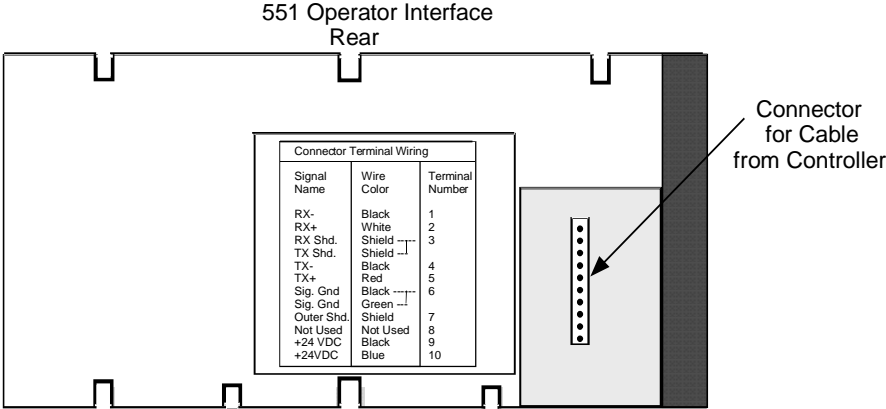


Figure 25 Terminal connections

### COMM A and B connectors (optional)

The CPU module equipped with the optional communication board provides two additional RS 485 communications ports with Modbus RTU protocol support. COMM A port allows the UMC800 controller to network with up to 31 other slave UMC800 controllers and devices on a Modbus link. COMM B port allows the UMC800 controller to be a master to up to 16 slave UMC800 controllers and devices on a Modbus link.

Figure 26 shows the COMM A and B connector wiring when using either a shielded twisted pair or 4-wire shielded cable.

NOTE: When using the RS 485 communications, it is recommended that an RS 485 to RS 232 converter (such as Black Box model IC901A) be used to interface with the host PC. Also, be certain that the Half Duplex Turnaround Delay parameter for the converter set to 1 millisecond or less.

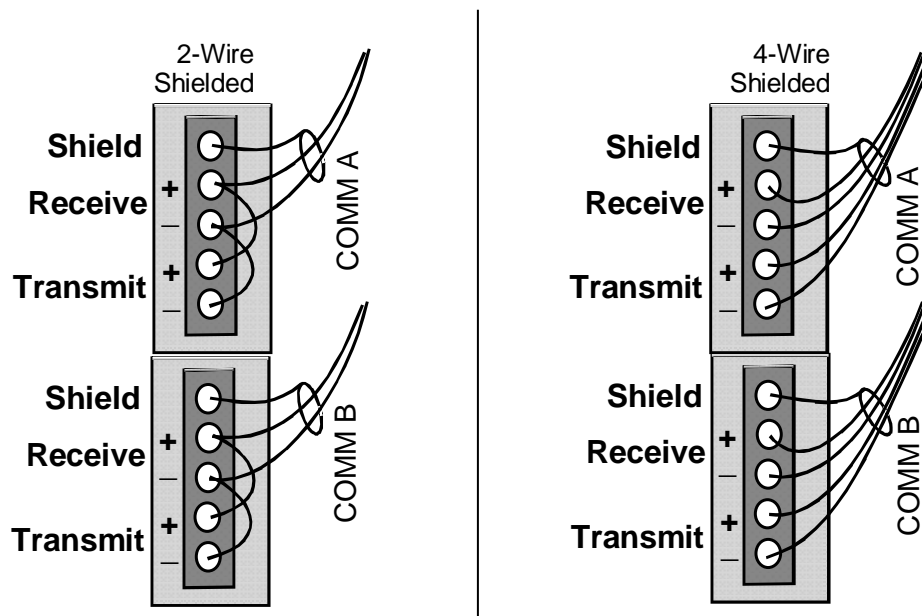


Figure 26 COMM A and B port wiring (2-wire and 4-wire)



#### ATTENTION

Make sure you connect the correct polarity. If the TX+ and TX- connections are reversed from the correct connections, an error message will be generated when attempting to do any communications and the program then self-terminates.

---

### RS 485 serial communications

When connecting the controller to a RS 485 communication link (see Figure 27), you must use termination resistors at each end of the link. The following cables with the listed resistor values can be used for connecting the controller.

RS 485 Cables: Belden #9271 (or equivalent) with 120 ohm termination resistors (2,000 ft. maximum)

Belden #9182 (or equivalent) with 150 ohm termination resistors (4,000 ft. maximum)

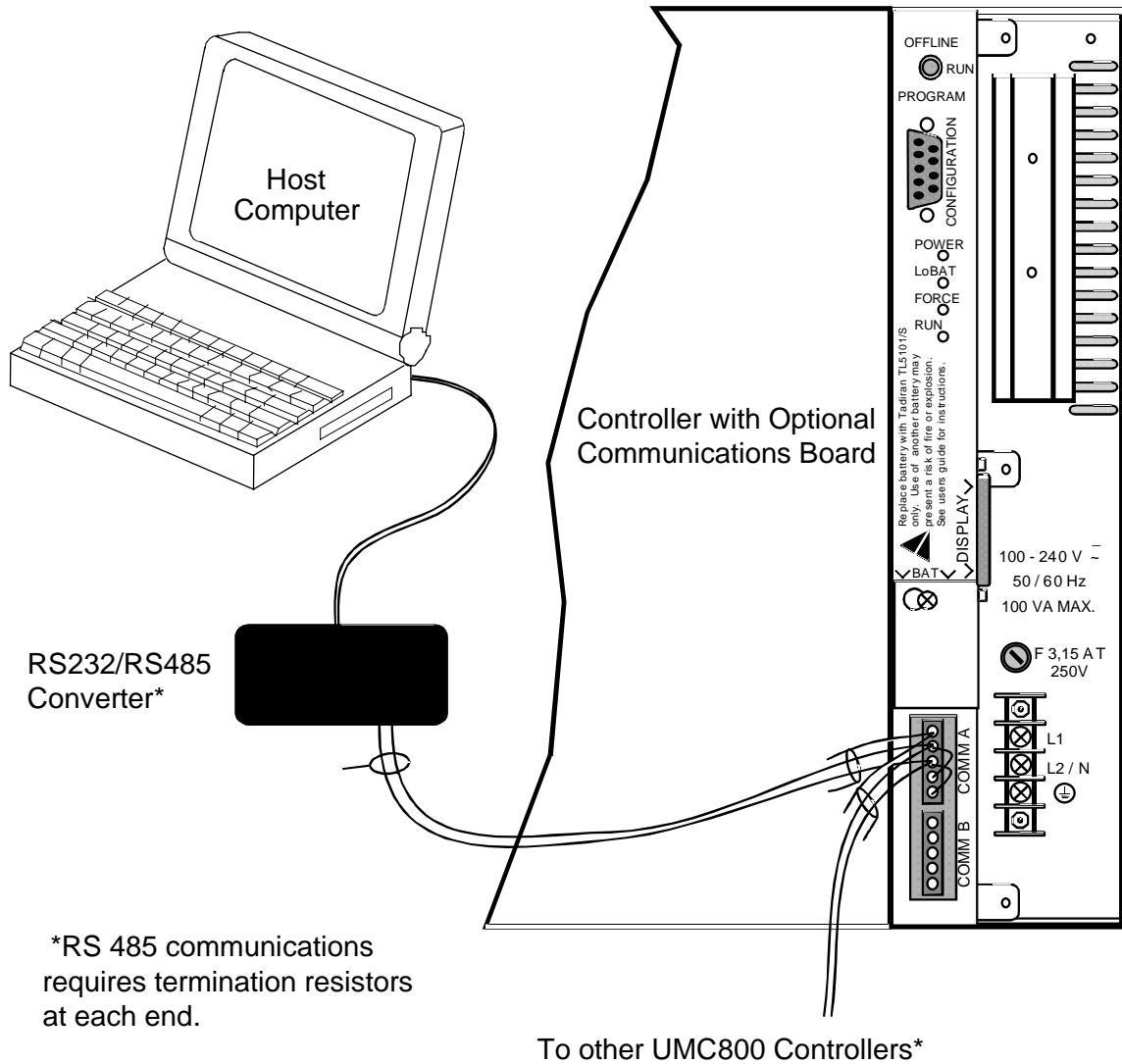


Figure 27 RS 485 port wiring (2 wire)

## Remote Access

### Overview

Remote controller access via dial-up modem is available via the communication setup. An external modem is required at the controller and is connected to the standard RS232 configuration port (marked “CONFIGURATION”). All functions of the Control Builder and User Utility programs can be performed over this link. Remote access functions include on-line monitoring, configuration upload and download, and firmware upgrade.

### Modem requirements

Most commercially available modems can be used with the UMC800 controller. The modem must have the following capabilities:

- RS232 interface
- Auto answer
- Can operate at 9600 baud, 8 data bits, 1 stop bit, and no parity
- Hardware handshaking can be disabled
- Software handshaking can be disabled
- Data Terminal Ready (DTR) input can be disabled
- Result codes can be suppressed
- Echo can be disabled
- Must be equipped with non-volatile memory (NVRAM) so that settings that are configured using command strings can be retained during a power-outage
- Must be able to load the NVRAM settings automatically on power-up

### Cable requirements

You will need an interface cable to connect the modem to the DB-9 female connector (marked “CONFIGURATION”) on the controller. If your modem has a 25-pin connector, be sure to use a DB-25 to DB-9 **modem** cable.



#### TIP

The Null Modem cable used to directly connect a PC running Control Builder Software to the controller may typically not be used to connect the PC to the modem or to connect the modem to the controller.

---

If your modem requires command string configuration, you will need an interface cable to connect the modem to your PC. Refer to your modem and computer documentation to determine this cable’s requirements.

## Modem configuration

Before connecting a modem to the controller's RS232 port (marked "CONFIGURATION"), the modem must be configured with the following settings:

- Baud Rate = 9600
- Parity = None
- 1 stop bit
- 8 data bits
- No handshaking
- Ignore DTR
- Suppress result codes
- Suppress echo
- Auto answer
- Disable command recognition (only necessary if the modem has this capability)

Some of these settings may be settable via switches. Others may require command strings to be written to the modem using a PC terminal program such as Hyperterminal. You will need to refer to your modem's documentation to make this determination. Those settings that are configured using command strings must be saved to the modem's non-volatile RAM (NVRAM), and the NVRAM must be configured as the profile that gets loaded when the modem is powered up.

Most modems are equipped with auto-recognition to set the baud rate, parity, stop bits, and data bits. If your modem has no means of setting these using switches, then most likely it is equipped with auto-recognition. To configure the port settings of a modem with auto recognition, do the following:

Step	Action
1	Connect the modem to a PC.
2	Power up the modem.
3	Start up a PC terminal program such as Hyperterminal.
4	Configure the port for 9600 baud, no parity, 1 stop bit, and 8 data bits.
5	Establish communications with the modem. <i>A common way of doing this is simply entering the AT E1 Q0 command and seeing if the modem responds with OK.</i>  Once you establish communication to the modem, its port settings are configured.
6	Save the port settings to the profile that gets loaded on power-up.

### Modem configuration examples

Below are procedures for setting up the following commercially available modems:

- 3Com US Robotics 56K Data/Fax External Modem
- Zoom 56K Dualmode External Modem
- Best Data 56SX Data Fax External Modem
- SixNet VT-MODEM Industrial External Modem

#### 3Com US Robotics 56K Data/Fax External Modem

Step	Action																																				
1	Ensure that the switches are set to the factory settings: <table border="1"><thead><tr><th>Switch</th><th>Setting</th><th>Position</th><th>Function</th></tr></thead><tbody><tr><td>1</td><td>OFF</td><td>UP</td><td>Normal DTR operations</td></tr><tr><td>2</td><td>OFF</td><td>UP</td><td>Verbal (word) results</td></tr><tr><td>3</td><td>ON</td><td>DOWN</td><td>Enable result codes</td></tr><tr><td>4</td><td>OFF</td><td>UP</td><td>Displays keyboard commands</td></tr><tr><td>5</td><td>ON</td><td>DOWN</td><td>Disables auto answer</td></tr><tr><td>6</td><td>OFF</td><td>UP</td><td>Modem sends CD signal when it connects with another modem</td></tr><tr><td>7</td><td>OFF</td><td>UP</td><td>Loads Y0-Y4 configuration from user-defined nonvolatile memory (NVRAM)</td></tr><tr><td>8</td><td>ON</td><td>DOWN</td><td>Enables recognition (smart mode)</td></tr></tbody></table>	Switch	Setting	Position	Function	1	OFF	UP	Normal DTR operations	2	OFF	UP	Verbal (word) results	3	ON	DOWN	Enable result codes	4	OFF	UP	Displays keyboard commands	5	ON	DOWN	Disables auto answer	6	OFF	UP	Modem sends CD signal when it connects with another modem	7	OFF	UP	Loads Y0-Y4 configuration from user-defined nonvolatile memory (NVRAM)	8	ON	DOWN	Enables recognition (smart mode)
Switch	Setting	Position	Function																																		
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7	OFF	UP	Loads Y0-Y4 configuration from user-defined nonvolatile memory (NVRAM)																																		
8	ON	DOWN	Enables recognition (smart mode)																																		
2	Connect the modem to a PC. If your computer's RS232 port has a 25-pin connector, use a DB-25 male to DB-25 female <b>RS232</b> cable. If your computer's RS232 port has a 9-pin connector, use a DB-25 male to DB-9 female <b>modem</b> cable.																																				
3	Power-up the modem.																																				
4	Run a serial communication port program such as Hyperterminal.																																				
5	Within the communication program, select the port to which the modem is connected.																																				
6	Configure the port to these settings: baud rate = 9600 data bits = 8 parity = none stop bits = 1 flow control = none																																				
7	In the program's terminal window, type in the letters "AT" followed by the enter key. The modem should give an OK response.																																				
8	Power down the modem and disconnect it from the PC.																																				

---

<b>Step</b>	<b>Action</b>
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- 9** Set the modem switches to the following:

<b>Switch</b>	<b>Setting</b>	<b>Position</b>	<b>Function</b>
1	ON	DOWN	Modem ignores DTR (Override)
2	OFF	UP	Verbal (word) results
3	OFF	UP	Suppresses result codes
4	ON	DOWN	Suppresses echo
5	OFF	UP	Modem answers on first ring
6	ON	DOWN	CD always ON (Override)
7	OFF	UP	Loads Y0-Y4 configuration from user-defined nonvolatile memory (NVRAM)
8	OFF	UP	Disables command recognition (dumb mode)

- 10** Connect the modem to the RS232 port of the UMC800 using a DB-25 male to DB-9 male **RS232** cable. Null modem cable may not work.
- 11** Connect the modem to a telephone jack.
- 12** Power up the modem and the UMC800.
- 13** On a remote computer, run Control Builder software.
- 14** Setup Control Builder to dial the UMC800.
- 15** Verify that communications is established with the remote UMC800.
-

### **Zoom 56K Dualmode External Modem**

<b>Step</b>	<b>Action</b>
<b>1</b>	Connect the modem to a PC. If your PC's RS232 port has a 25-pin connector, use a DB-25 male to DB-25 female <b>RS232</b> cable. If your PC's RS232 port has a 9-pin connector, use a DB-25 male to DB-9 female <b>modem</b> cable.
<b>2</b>	Connect power to the modem.
<b>3</b>	Power up the modem.
<b>4</b>	Run a serial communication port program such as Hyperterminal.
<b>5</b>	Within the communication program, select the port to which the modem is connected.
<b>6</b>	Configure the port to these settings:  baud rate = 9600 data bits = 8 parity = none stop bits = 1 flow control = none
<b>7</b>	In the program's terminal window, type in the letters "AT E1 Q0" followed by the enter key. The modem should give an OK response.
<b>8</b>	Enter the following command string:  AT &Y0 &C0 &D0 &R1 &S0 &K0 S0=1  Modem should respond with OK.
<b>9</b>	Enter the following command string:  AT E0 Q1 &W0  Modem will not respond.
<b>10</b>	Power down the modem and disconnect it from the PC.
<b>11</b>	Connect the modem to the RS232 port of the UMC800 using a DB-25 male to DB-9 male <b>RS232</b> cable. Null modem cable may not work.
<b>12</b>	Connect the modem to a telephone jack.
<b>13</b>	Power up the modem and the UMC800.
<b>14</b>	On a remote computer, run Control Builder software.
<b>15</b>	Set up Control Builder to dial the UMC800.
<b>16</b>	Verify that communications is established with the remote UMC800.

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**Best Data 56SX Data Fax External Modem**

Step	Action
1	Connect the modem to a PC. If your PC's RS232 port has a 2-pin connector, use a DB-9 male to DB-25 female <b>modem</b> cable. If your PC's RS232 port has a 9-pin connector, use a DB-9 male to DB-9 female <b>RS232</b> cable.
2	Connect power to the modem.
3	Power-up the modem.
4	Run a serial communication port program such as Hyperterminal.
5	Within the communication program, select the port to which the modem is connected.
6	Configure the port to these settings: baud rate = 9600 data bits = 8 parity = none stop bits = 1 flow control = none
7	In the program's terminal window, type in the letters "AT E1 Q0" followed by the enter key. The modem should give an OK response.
8	Enter the following command string: AT &C0 &D0 &K0 &R1 &S0 &Y0 S0=1 Modem should respond with OK.
9	Enter the following command string: AT E0 Q1 &W0 Modem will not respond.
10	Power down the modem and disconnect it from the PC.
11	Connect the modem's serial cable to the RS232 port of the UMC800 using a DB-9 male to DB-9 male RS232 cable. Null modem cable may not work.
12	Connect the modem to a telephone jack.
13	Power up the modem and the UMC800.
14	On a remote computer, run Control Builder software.
15	Set up Control Builder to dial the UMC800.
16	Verify that communications is established with the remote UMC800.

### **SixNet VT-MODEM Industrial External Modem**

<b>Step</b>	<b>Action</b>
<b>1</b>	Connect the modem to a PC. If your PC's RS232 port has a 25 pin connector, use a DB-9 male to DB-25 female <b>modem</b> cable. If your PC's RS232 port has a 9 pin connector, use a DB-9 male to DB-9 female <b>RS232</b> cable.
<b>2</b>	Connect power to the modem. You will need to supply an external power supply with a DC voltage between 10 and 30 VDC.
<b>3</b>	Power-up the modem.
<b>4</b>	Run a serial communication port program such as Hyperterminal.
<b>5</b>	Within the communication program, select the port to which the modem is connected.
<b>6</b>	Configure the port to these settings: baud rate = 9600 data bits = 8 parity = none stop bits = 1 flow control = none
<b>7</b>	In the program's terminal window, type in the letters "AT E1 Q0" followed by the enter key. The modem should give an OK response.
<b>8</b>	Enter the following command string: AT &Y0 &C0 &D0 &R1 &S0 &K0 S0=1 Modem should respond with OK.
<b>9</b>	Enter the following command string: AT E0 Q1 &W0  Modem will not respond.
<b>10</b>	Power down the modem and disconnect it from the PC.
<b>11</b>	Connect the modem to the RS232 port of the UMC800 using a DB-9 male to DB-9 male <b>modem</b> cable. Null modem cable may not work.
<b>12</b>	Connect the modem to a telephone jack.
<b>13</b>	Power-up the modem and the UMC800.
<b>14</b>	On a remote computer, run Control Builder software.
<b>15</b>	Setup Control Builder to dial the UMC800.
<b>16</b>	Verify that communications is established with the remote UMC800.

## Power Supply Wiring

The power wiring is connected to the power terminals of the power supply in accordance with accepted wiring practices and is summarized in Table 14 shows the terminal connections for the power wiring.

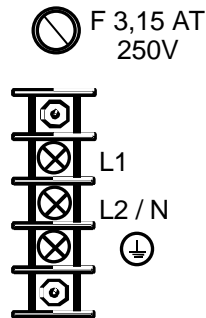


Figure 28 Power supply terminal connections



### CAUTION

Do not apply power to the controller at this time.

Table 14 Power supply wiring

Wire Designation	Connect to Power Terminal Designated
Hot	L1 (+ DC)
Neutral	L2 / N (- DC)
Ground	

### Ground wiring

PROTECTIVE BONDING (grounding) of this controller and the enclosure in which it is installed shall be in accordance with National Electrical Code (ANSI/NFPA 70) and local electrical codes.

### Prepower checks

Before applying power to the controller file, verify that:

- The controller has been mounted in accordance with the instructions in this manual.
- The power wiring is correct and meets all local and national electrical codes.

# Operation

## Power Up / Power Down

### Power-up

A sequence of checks are performed by the controller anytime power is applied to the controller. These checks are a set of internal diagnostics that are completed in less than 10 seconds after power up and verify the integrity of the controller hardware, the configuration database and firmware. Communication between the operator interface and controller is established automatically after these checks are completed. All outputs are OFF until addressed by the CPU.

Two start up routines are used for initializing the controller configuration.

A **warm start** is the default routine that is used to restart the controller operation. A warm start begins the scan cycle of data points using all dynamic data retained from the previous legitimate scan.

A **cold start** (New start) initializes all control functions to their default initial state, (if default output values are defined in the configuration). If defined, these values are used as the starting values for controller operation.

Status indicators on the CPU module consist of four LEDs that indicate normal operation and diagnostic fault conditions. See *Status Indicators* (page 59).

When power is applied to the controller, it will power up and initialize to the mode determined by the mode switch setting on the CPU. See *Mode control* (page 53) for further information.

### Power-down

The controller does not require the configuration to be reloaded when power is restored after a power loss or power down. During a power interruption, the controller configuration is maintained in battery-backed RAM and a flash PROM on the CPU module. When the controller power is restored, and provided that the battery power to the CPU RAM is not interrupted, the controller will perform a warm start. However, if battery power to the RAM is interrupted, the controller configuration (which was last stored in the flash PROM on the CPU), will be restored to the RAM when controller power is restored and then the controller will perform a cold start.



#### CAUTION

Controller configuration is stored in RAM as well as the flash PROM on the CPU. However, if you make changes to the configuration while the controller is in Run mode, the changes are stored in RAM and not in the flash PROM. Therefore, if battery power is interrupted to RAM during a power down condition, the configuration changes will be lost since controller configuration will be restored from flash PROM.

Also, the real time clock will need to be set if battery power is interrupted during a power down condition.

---

## Operational Modes and Controls

There are three operational modes defined in the UMC800 to provide safe operating environments for users to implement changes and perform tasks on the controller and operator interface.

1. PROGRAM Mode
2. RUN Mode
3. OFFLINE Mode

Safeguards are built into the operating system to prevent conditions that could otherwise cause process upsets or equipment malfunctions.

### PROGRAM mode

The Program mode is used to download controller configuration files that contain signal flow and processing details of the control configuration. When the controller is set to Program mode, all input signal processing is stopped and all output signals and logic status are held at their last values. Also, DO function blocks that are configured as Time Proportional Outputs (TPOs) are turned off.

When the controller is switched from Program mode to Offline or Run, the controller performs a cold start and controller configuration is backed up to flash PROM.

### RUN mode

The Run mode is used for normal operation of the control system. All I/O processing is active and operator actions are supported.

### OFFLINE mode

The OFFLINE mode is used to download controller files such as setpoint profiles, recipes and data storage files. Calibration of I/O modules and setting the real-time clock can also be performed with the controller in the OFFLINE mode. When the controller is set to OFFLINE mode, all input signal processing is stopped and all output signals and logic status are held at their last values. Also, DO function blocks that are configured as Time Proportional Outputs (TPOs) are turned off. When the controller is switched from OFFLINE mode to RUN, the controller performs a warm start.

### Mode control

The controller mode can be set and changed in a number of ways (with certain restrictions) by:

1. **A manual switch located on the CPU module of the controller.** OFFLINE – RUN – PROGRAM). See Table 15.  
The switch on the controller CPU is a “pull and set” locking toggle that allows you to manually switch the controller to one of the three operational modes. When the switch is set to either RUN or OFFLINE, the mode can be overridden and changed by a command through the Configuration port. However, when the manual switch is set to PROGRAM, the mode cannot be overridden.



#### CAUTION

The manual switch on the controller CPU module always determines the mode (PROGRAM, RUN or OFFLINE) by reading the position of the switch when power is applied to the controller. The controller will power up and initialize to the state of the manual switch position, regardless of the controller mode before the controller was powered down.

---

## 2. From the Operator Interface.

Mode changes can be made from SET MODE display or the Calibrate AI and AO displays of the operator interface with certain restrictions. When the manual switch is set to PROGRAM, you cannot change the mode to RUN or OFFLINE using the operator interface. The operator interface is active in all modes.

## 3. Through the CONFIGURATION Port.

A PC, running the Control Builder software, connected to the Configuration port can initiate mode changes to the controller. The control builder places the controller in PROGRAM mode when downloading files to the controller.

### Restrictions on mode control

Mode control of the controller has the following restrictions:

- When the controller manual switch is set to RUN, the mode can be changed to OFFLINE or PROGRAM by commands from the configuration port or the operator interface.
- When the manual switch is set to OFFLINE, the mode can be changed to PROGRAM by commands from the configuration port or the operator interface. The mode cannot be changed to RUN from the configuration port or the operator interface.
- When the manual switch is set to PROGRAM, no mode changes can be made by commands from the configuration port or the operator interface.

Table 15 summarizes the mode change interactions and restrictions.

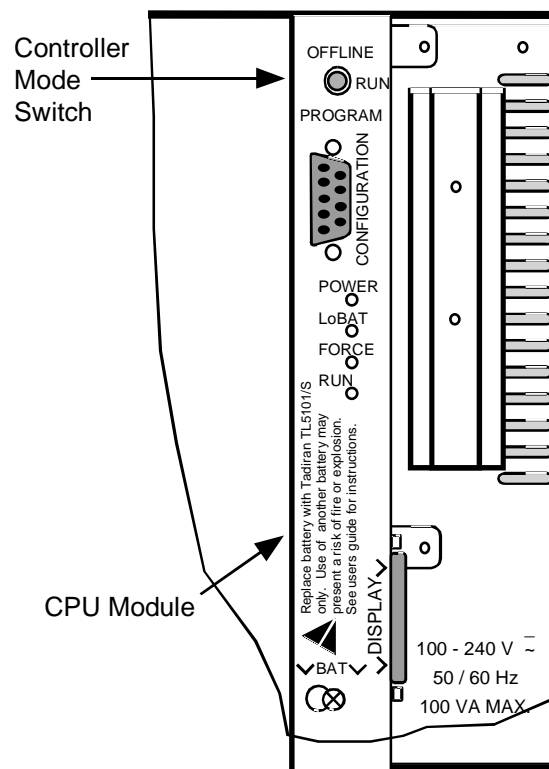


Figure 29 Controller mode switch location

**Table 15 Controller mode switch summary**

Controller Mode Manual Switch setting	Mode Control through the Configuration Port or Operator Interface
RUN	Unrestricted mode changes.  The mode selected via the Configuration port or operator interface overrides the controller manual mode switch position.
OFFLINE	Can override OFFLINE mode to set controller to PROGRAM mode.
PROGRAM	No mode changes can be made.

**Setting mode switch to PROGRAM and then to RUN**

Setting the controller mode switch to PROGRAM and then to RUN forces the controller to perform a cold start and other actions depending upon the condition of the database RAM. When the mode switch is changed from PROGRAM to RUN, the controller verifies that a valid database configuration is present in RAM before starting control loops.

So that,

If . . . ( <i>Condition of RAM</i> )	Then . . . ( <i>Controller Action</i> )
A valid database configuration is present in RAM,	Configuration is written to flash PROM. (User-defined variables are initialized to zero.)
Database configuration in RAM is found to be bad, but the configuration in flash PROM is good,	RAM is restored from the flash PROM that contains the configuration values from the last cold start. [See CAUTION in <i>Power Up / Power Down</i> (page 52).]
If the database configuration is found to be bad in both RAM and flash PROM,	Controller is set to a null default configuration. A system diagnostic INVALID CONFIG. is generated.

In all cases the controller performs a cold start when the controller mode is set to PROGRAM and then to RUN regardless of what method is used to change the mode. Whether the mode was set through the Configuration port or the operator interface, this action causes the PROGRAM mode to be cleared. Additionally, setting the mode switch to PROGRAM and then RUN allows you to change the controller mode if communications were disconnected to the Configuration port or operator interface while the controller was still in PROGRAM mode.

## File Downloading

Downloading configuration files, recipes and other files to the controller can be accomplished two ways:

1. Download from a PC or other device connected the Configuration port (serial port) of the controller.
2. Using the operator interface to download files stored on a floppy disk. These files include recipes, setpoint profiles and data storage files.

There are mode restrictions on the downloading of certain configuration files. For example, the controller must be in the Program mode before downloading a controller configuration file. (Program mode is set using either the controller manual mode switch, the SET MODE display of the operator interface or issuing a command to the controller through the Configuration port.)

Downloading recipe information and read/write of specific parameters is permitted when the controller is in the Program mode, as well as the Run or Offline modes. See Table 16 for a file downloading summary.

**Table 16 Controller downloading summary**

Downloading . . .	Permitted When Controller is in . . .		
	PROGRAM Mode	RUN Mode	OFFLINE Mode
<b>Controller Configuration Files</b>	Yes	No	No
<b>Setpoint Profiles / Setpoint Schedule</b>	Yes	Yes	Yes
<b>Recipe Files</b>	Yes	Yes	Yes
<b>Data Storage Configuration Files</b>	Yes	No	Yes
<b>Data Storage Non-volatile parameters</b>	Yes	Yes	Yes
Also, there are mode restrictions for these procedures . . .			
<b>Calibration</b>	Yes	No	Yes
<b>Real-time Clock Change</b>	Yes	Yes	Yes



### Download via CONFIGURATION port

A downloading tool in the control builder software can be used to download configuration files to the controller. The downloading tool first verifies that a valid configuration file exists for the controller. Next, a dialog box asks if you want to set the controller to Program mode in preparation for downloading. If the configuration file is verified to be valid, then the existing controller configuration in the controller's memory is deleted before the new configuration is downloaded.

A download dialog box appears on the PC after a successful file download to the controller. Upon completion of the download, a command is sent to set the controller to Run mode.

### Download via floppy disk

The optional floppy disk drive allows the user to download configuration files stored on a floppy disk to the controller using the operator interface. The DISK UTILITIES display provides menu selections to load and store controller configuration files. The controller must be in the Program mode in order to load configuration files in the controller. Successful download status and failures are indicated at the operator interface display. Downloading restrictions are noted in Table 16.

### File uploads

Controller configuration files, setpoint profiles and recipe files can be uploaded for storage and archiving to a floppy disk as well as to the PC. Using the PC, the Upload function is accessed from the Communications pull-down menu of the control builder. At the operator interface, the DISK UTILITIES display contains menu selections for storing the files to disk.

## Code Download

### Controller firmware upgrade

In order to implement new features for controller operation or correct any software bugs, an upgrade of the controller firmware may be required. The User Utility software program contains the code download utility that allows a newer version of the controller firmware to be loaded into the CPU.



#### CAUTION

Before performing a code download:

- Perform a backup of all controller configuration files.
- Be certain that the controller does not show a low battery (LoBatt) diagnostic.

After the download is successful reload the controller's configuration files, recipes, profiles and schedules.

---

### Controller code download in the user utility

A PC running the user utility is connected to the controller's Configuration port. The code download utility is accessed from the Maintenance pull down menu. Refer to the *UMC800 User Utility User's Guide* and on-line help for more details on performing the download.

## Warm Start / Cold Start

Housekeeping and diagnostic routines are performed during power up sequence of the controller and prior to the controller microprocessor starting normal scan processing. During this sequence all logic outputs are OFF and all analog outputs are held to their zero output states.

After this activity, the controller may perform either a cold start or a warm start of the controller configuration. Warm start is the default mode of start-up.

### Warm start

A warm start begins the scan cycle with all dynamic data retained from the previous valid scan. A warm start occurs after a power up sequence with the configuration database integrity in RAM being verified. A warm start is initiated when the controller mode is set from Offline mode to run.

### Cold start

A cold start initializes all functions to their default initialized states. If default output values are defined, these values are used as the starting values for restart of the controller.

A cold start is performed when:

- A file download is performed through the control builder program.
- The mode is set from PROGRAM to RUN through the SET MODE display of the operator interface.
- Setting the controller manual mode switch from PROGRAM to OFFLINE or RUN. In this case, the controller always performs a cold start.
- The configuration database in RAM is found to be invalid during power up sequence.

### Scan rates

The analog input scan rate is a function of the total number of configured inputs in the controller as well as the number and type of configured function blocks. Table 17 shows the fastest scan rate time for the number of analog input cards, although the actual scan rate will be the slower of either the analog input rate or the function block execution rate. Analog outputs are always scanned at the analog input scan rate, as well as function blocks and digital I/Os that are not configured for fast logic. Function blocks and digital I/Os that are configured for fast logic are updated every 100 milliseconds.

**Table 17 Scan rates per inputs configured**

Number of analog input cards	Time to complete one full scan (in milliseconds)
1	333
2	500
3	700
4	900
5	1100
6	1300
7	1500

Number of analog input cards	Time to complete one full scan (in milliseconds)
8	1700
9	1900
10	2100
11	2300
12	2500
13	2700
14	2900
15	3100
16	3300

## Status Indicators

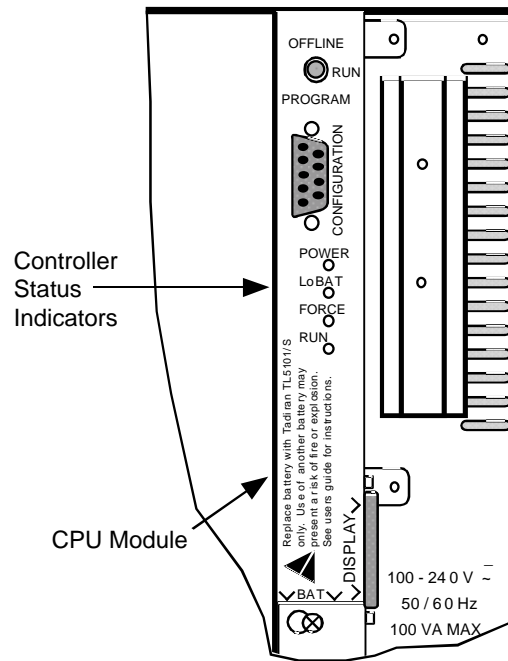
### Status LEDs

Four LEDs on the CPU module (shown in Figure 30) indicate the operating status of the controller and are described in Table 18.

**Table 18 Controller status LEDs**

Designation	State	Indication
<b>POWER</b>	Steady on	Power is applied to the controller backplane.
	Blinking	Diagnostic indication. See <i>NOTE</i> .
<b>LoBAT</b>	On	The CPU battery is low and needs replacement.
<b>FORCE</b>	On	One or more function block output values have been forced.
<b>RUN</b>	On	Controller is in RUN mode.
	Blinking	Controller is in OFFLINE mode
	Off	Controller is in PROGRAM mode.  <i>OR</i> If <b>POWER</b> LED is blinking a fault has been detected in controller. See <i>NOTE</i> .

NOTE: See Table 20 for the details of the indications and their meaning.



**Figure 30 Controller status LEDs**

### Controller Status

The status of various controller parameters can be viewed through a number of displays.

1. The operator interface features a CONTROLLER STATUS display listing the status of various parameters and is accessed from the UNIT SETUP display on the operator interface. See *UMC800 Operator Interface User Guide* for more details on the Controller Status display.
2. The User Utility program contains a Controller Diagnostic Summary window listing numerous operating parameters and communication status. See *UMC800 User Utility User's Guide* and the on-line help for more details on the Controller Diagnostic Summary window.

### Alarm and status blocks

Additional controller status parameters can be monitored through the Analog System Status and Fast Logic System Status blocks. These blocks are configured using the control builder. Outputs from these status blocks can be wired to alarm groups and inputs to other function blocks. Controller parameters such as low battery, hardware integrity, communications failure, and function block cycle times are monitored by these status blocks. See document 51-52-25-64 *UMC800 Function Block Reference Guide* for more details on these status blocks.

## RS 485 Port Configuration (Communication Board Option)

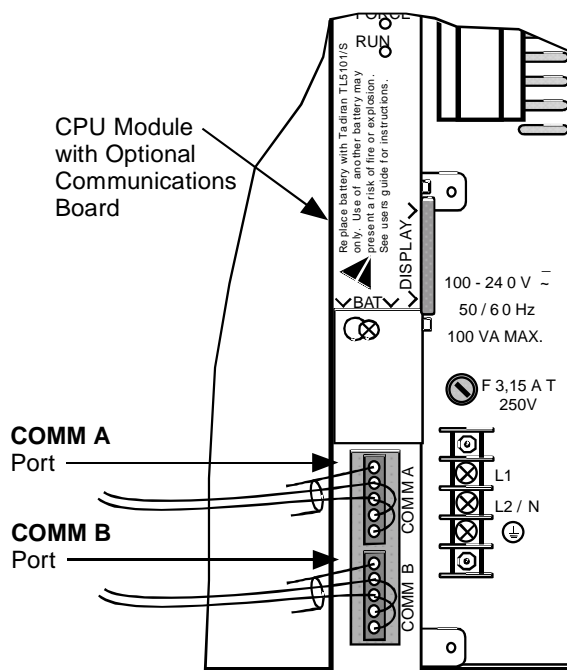
### COMM A and B ports

UMC controllers equipped with the optional communications board feature two RS 485 serial communications ports (COMM A and COMM B) on the CPU module. See Figure 31 for location of the port connectors. See *Wiring Communications links, Page(36)* for more details on the port wiring. The controller firmware supports Modbus RTU protocol for the ports.

The COMM A and COMM B ports must be set up so that the controller can communicate when connected to a communication link. Set up is accomplished through the operator interface or the user utility software program. The Communications screen in the operator interface for COMM A is used to enable the port, set the device (station) address of the controller and set the baud rate. The COMM B screen is used to set the baud rate. See *UMC800 Operator Interface User Guide* for details on communications port setup. See *UMC800 User Utility User's Guide* and the on-line help for more details on setting up the COMM ports.

### COMM port status

COMM A status can be checked through the COMMUNICATIONS menu item on the operator interface. COMM B status can be monitored with the User Utility. Slave device statuses can be viewed after loading a configuration into User Utility via upload or floppy disk. Slave devices must first be enabled through the operator interface COMMUNICATIONS menu item or the User Utility.



COMM A and B shown with 2-wire connections. See *Wiring Communications links, Page(36)* for 4-wire details.

**Figure 31 COMM A and B ports on CPU module**



# Maintenance

## Overview

This section covers procedures in the maintenance, calibration and replacement of the controller and its components.

Maintenance to the controller consists of the following procedures:

- Routine maintenance
- Calibration of I/O modules. (The backplane is factory calibrated only.)
- Field replacement of controller components

## Warranty

- Warranty repair is by board replacement.
- Non-warranty service provides for field repair at the board level with option to return to factory for repair.

## Servicing

The power supply, CPU, and all I/O modules plug into the backplane for easy removal and replacement. The I/O modules can be replaced without removal of the field wiring from the terminal screws.

The battery is accessible for easy replacement while the controller file is powered and operational to prevent loss of configuration data.



### CAUTION

TO PRESERVE THE CONTROLLER CONFIGURATION PRIOR TO PERFORMING ANY REPLACEMENT PROCEDURES OR REMOVING POWER TO THE CONTROLLER:

- Be certain that the LoBatt LED is OFF. (MEMORY – LOW BATTERY diagnostic is not active.)
- Force a cold start of the controller by setting the manual mode switch on the controller to PROGRAM and then to RUN and allow the controller to complete its start up sequence. Controller configuration files will be backed up to the flash PROM on the CPU



### WARNING – SHOCK HAZARD

Troubleshooting may require access to hazardous live circuits, and should only be performed by qualified service personnel. More than one switch may be required to de-energize unit before servicing.

---

## Routine Maintenance

### Controller maintenance

Normal routine maintenance of the controller is not necessary other than a periodic physical inspection of the controller enclosure and wiring for any signs of deterioration or dust and dirt.

### Battery replacement

Replace the battery located on the CPU when the LoBATT LED lights or the low battery diagnostic is indicated. Also, It is recommended that the battery be replaced once a year to ensure back up power for the RAM and the real time clock. Refer to procedure in *Replacing the battery (page 73)* for specific instructions.



## Controller Calibration

---



### ATTENTION

All Analog Input (AI) and Analog Output (AO) modules are factory calibrated to 0.1% accuracy. If this accuracy is sufficient for your applications, there is not need to recalibrate the modules. If greater accuracy is required, the field calibration procedures will provide a 0.05% accuracy.

Please keep in mind that if you field calibrate AI or AO modules, you may have to recalibrate these modules after performing certain replacement procedures. [See *Replacement Procedures (page 70)*.]

---

### Calibration overview

Field Calibration of AI and AO modules in the controller is accomplished through either the operator interface or the user utility program.

- Using the operator interface – Calibration displays are accessed from the UNIT SETUP display and provide menu selections and display prompts that guide you through the desired calibration procedure.
- Using the user utility – Calibration dialog windows are accessed through menu selections in the Maintenance menu.

**Analog Input** modules can be calibrated to a number of references.

1. Calibration using 0% and 100% reference values applied at the terminal blocks of each module channel.
2. Copying calibration values from one module channel to another. For example, you can copy the calibration from one channel of a AI module to another channel of the same module, or to a channel of a different AI module.
3. Calibration of the cold junction compensation references.
4. Restoring factory calibration values.

**Analog Output** modules also can be calibrated using measured values from the channel outputs, or they can be restored to the initial factory calibration.

## Factory calibration

Factory calibration of controller components is performed before shipment to 0.1% accuracy. Calibration values are contained in a number of the controller components, namely: the CPU, Backplane, and AI and AO modules.

Figure 32 shows the various components in which calibration data is stored.

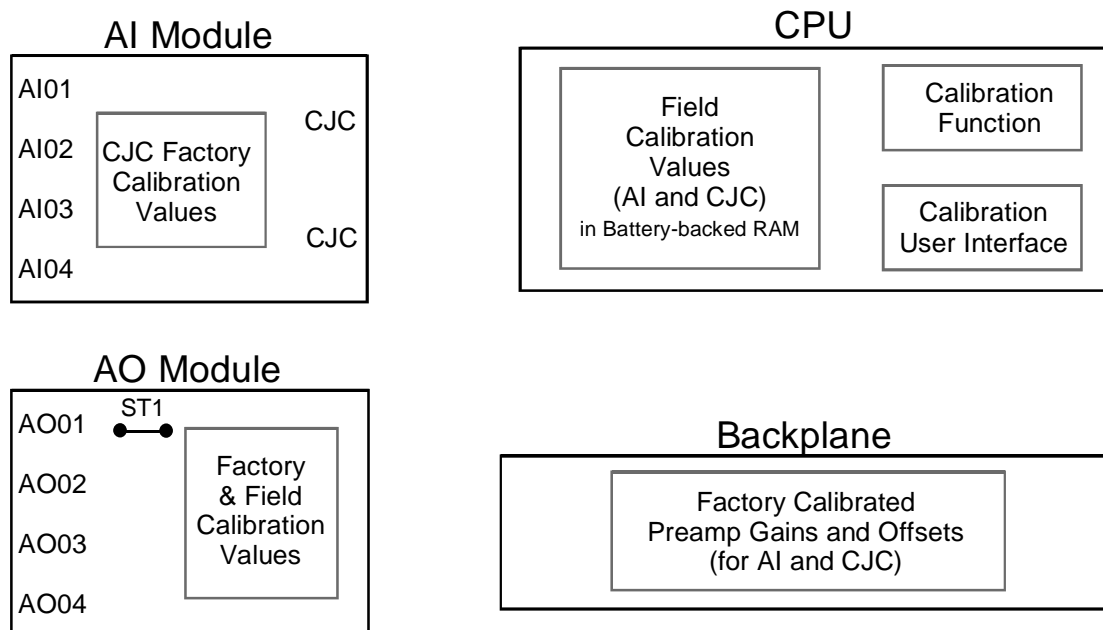
- Calibration functions and parameters for the user interface are stored in memory on the CPU.
- Each AI module contains two (2) cold junction compensation (CJC) references that are factory calibrated. Factory calibration data for the CJC references is stored in a non-volatile memory on the AI module.
- Field calibration values for the AI modules (both zero offset and span calibration and CJC reference values) are stored on the CPU.
- Factory calibration values (zero offset and span corrections) for AO modules are stored in non-volatile memory on the AO module and can be changed only if the write protect jumper is not cut. See *Write Protect Jumper ST1*.
- The gains and offsets of the preamp are factory calibrated and the calibration data is stored in a non-volatile memory on the backplane. No field calibration of these values is possible.

### Write Protect Jumper ST1



#### ATTENTION

A jumper (ST1) on the AO module PWA can be cut to prevent changes to calibration values. This will write protect the AO and prevent further calibration of these values.



**Figure 32 Controller components that contain calibration values**

## Field calibration

Field calibration of controller components is limited to AI modules and AO modules. Individual channels of the modules can be calibrated at 0% and 100% of their range. Individual channels can be calibrated at a single point within the range through zero offset (bias) adjustment.

## Calibration procedures

Calibration routines are initiated from either the operator interface or a PC running the user utility program by first placing the controller in the Program or Offline mode. This can be done manually at the Controller or through the Calibration displays. Calibration displays are accessed from the UNIT SETUP display of the operator interface or under the Maintenance menu of the user utility.

Refer to the *UMC800 Operator Interface User Guide* and the *UMC800 User Utility User's Guide* for details on these and other calibration procedures.

## AI module calibration

Selecting the CALIBRATE AI lists a number of calibration functions you can perform.

Selecting the CALIBRATE AI CHANNEL allows you to specify the AI module and channel in which to calibrate. When you Select Input, you must apply a 0% reference value to the terminal block of the module channel. See Figure 33 for terminal connection points. Then select Calibrate 0% Input to start the calibration routine. After calibration of 0% value is completed, apply a 100% range value to the channel input terminals and then begin the calibration routine for 100% input.



### ATTENTION

Handheld calibrators do not work with the UMC800 when calibrating RTDs because they are resistance simulators with active components, not actual resistors.

---

When 100% range value calibration is completed, the controller compares the new 0% and 100% range values against the current 0% and 100% values. If the span of the 0% and 100% readings is less than 20% of the sensor range, the new values are rejected and the current calibration is retained.

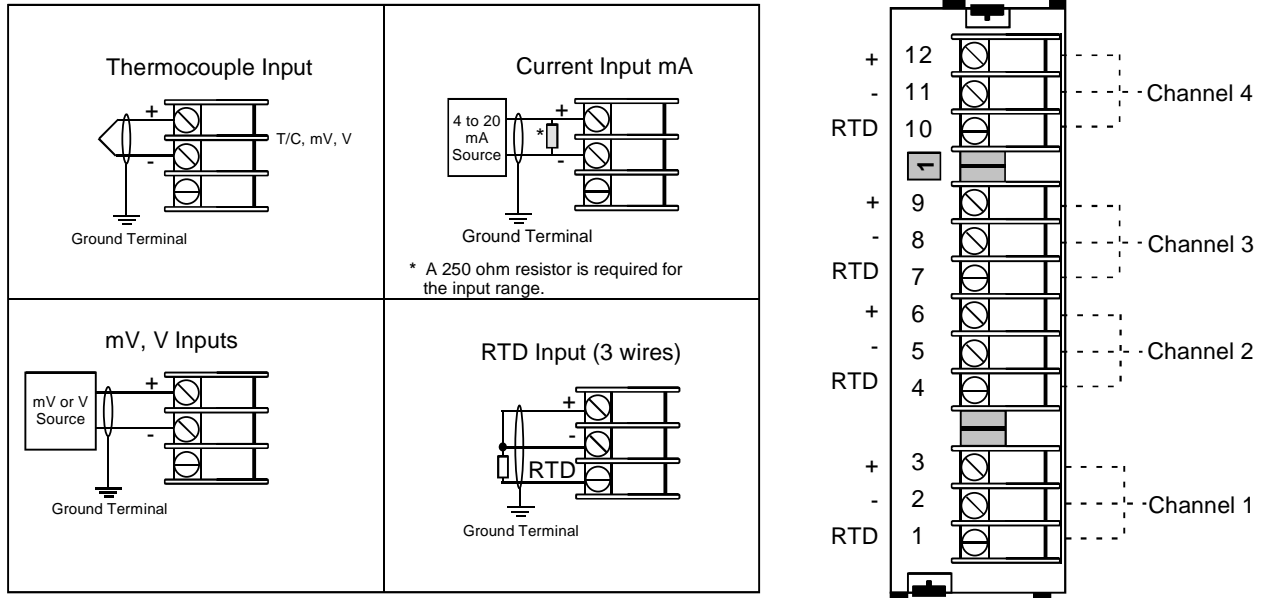


Figure 33 AI module terminal block

### Other AI module calibration selections

Additional calibration selections allow you to perform other AI module calibration procedures:

- CALIBRATE CJ TEMP – for calibrating the two Cold Junction (CJ) references on the AI module
- COPY CALIBRATION – for copying calibration values from one AI module channel to another
- RESTORE AI FACTORY CAL – to restore AI module channels to their factory calibration
- RESTORE CJ FACTORY CAL – to restore CJ reference to their factory

### AO module calibration values

Two calibration selections are accessible under the CALIBRATE AO menu selection

1. CALIBRATE AO CHANNEL – to calibrate the zero offset and span values of the AO module channels to user-defined values.
2. RESTORE AO FACTORY CAL – to restore factory calibrated to an AO module channel.

The AO module contains a wire jumper (labeled ST1) on the PWA. Cutting this jumper will prevent any changes to initial calibration values of the module and prevent any further field calibration. See Figure 34 for the location of the jumper. More details on module calibration are given in the *UMC800 Operator Interface User Guide* and the *UMC800 User Utility User's Guide*.

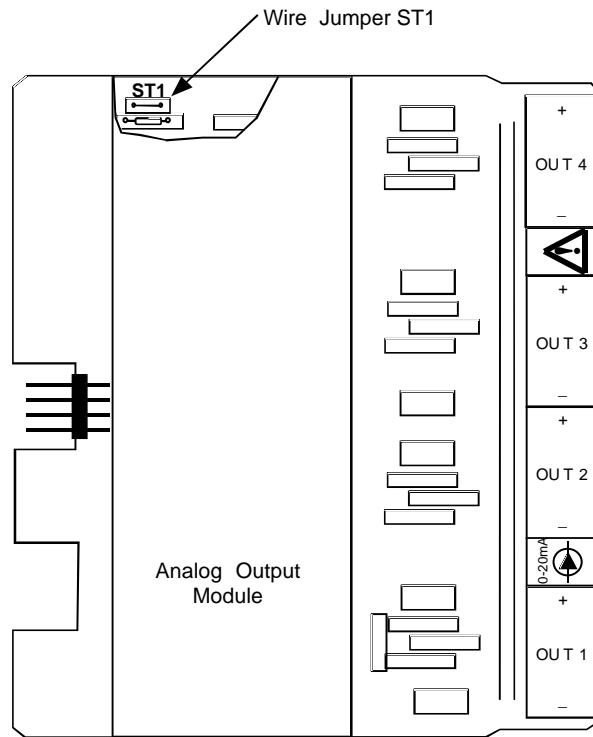


Figure 34 AO module jumper ST1

## Replacement Procedures

The following tables outline the procedures for replacement of the controller components. Field replacement is limited to the Printed Wiring Assembly (PWA) level. Use Figure 35 to locate controller components for replacement.

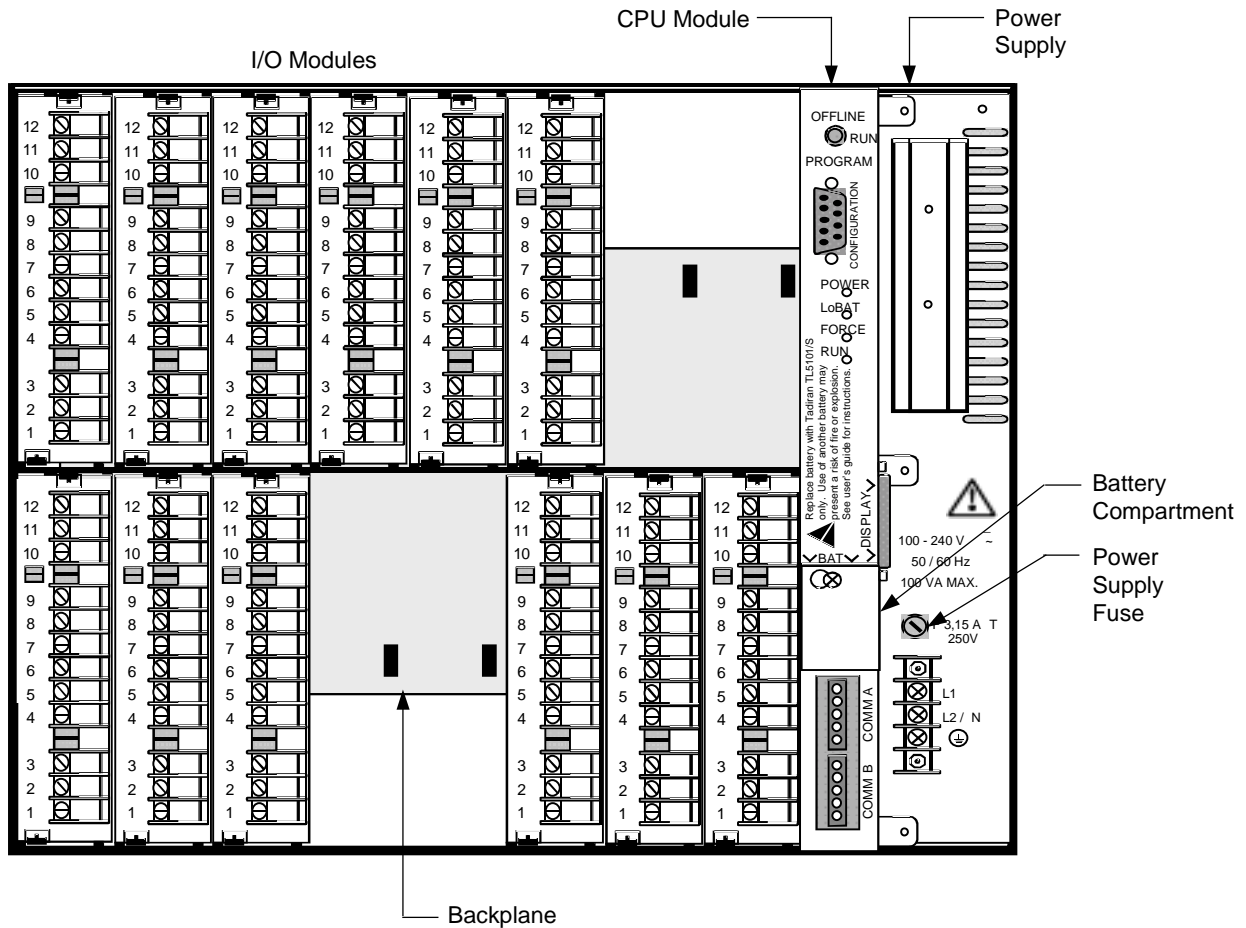


Figure 35 Controller components and location



**CAUTION**

TO PRESERVE THE CONTROLLER CONFIGURATION PRIOR TO PERFORMING ANY REPLACEMENT PROCEDURES OR REMOVING POWER TO THE CONTROLLER:

- Be certain that the LoBatt LED is OFF. (MEMORY – LOW BATTERY diagnostic is not active.)
  - Force a cold start of the controller by setting the manual mode switch on the controller to PROGRAM and then to RUN and allow the controller to complete its start up sequence. Controller configuration files will be backed up to the flash PROM on the CPU.
  - When powering up the controller, the controller performs a warm start provided that the battery power to the RAM has not been interrupted. If battery power to the RAM has been interrupted, the controller performs a cold start at power up and,
    - The controller real time clock setting is lost and must be reset.
    - Any field calibration values to the AI modules and CJ references are lost. If AI modules or CJ references were required to be field calibrated to achieve greater than 0.1 % accuracy, you must recalibrate those modules.
  - If the CPU module is replaced, a valid configuration file must be downloaded to the controller. Also field calibration of the AI module and the CJ reference are lost. If greater than 0.1 % accuracy is required for the AI module or CJ reference, you must field calibrate the module.
-

### Replacing the power supply fuse

The power supply input circuit is protected with a fuse. Use the steps in the table below to replace the fuse on the power supply module.

Step	Action
1	Remove power from the controller.
2	Locate the fuse holder located on the power supply module. See Figure 36.
3	Using a slotted screwdriver, remove the fuseholder cap by rotating it counterclockwise.
4	Replace the fuse with the proper size and type. <ul style="list-style-type: none"> <li>For 100-240 V supply: Size 5x20, F 3.15 A Time Delay 250 V, or equivalent.</li> <li>For 24 V supply: Size 5x20, 6.3 A Slow Blow, or equivalent.</li> </ul>
5	Replace the cap by pressing in and rotating it clockwise with the screwdriver.

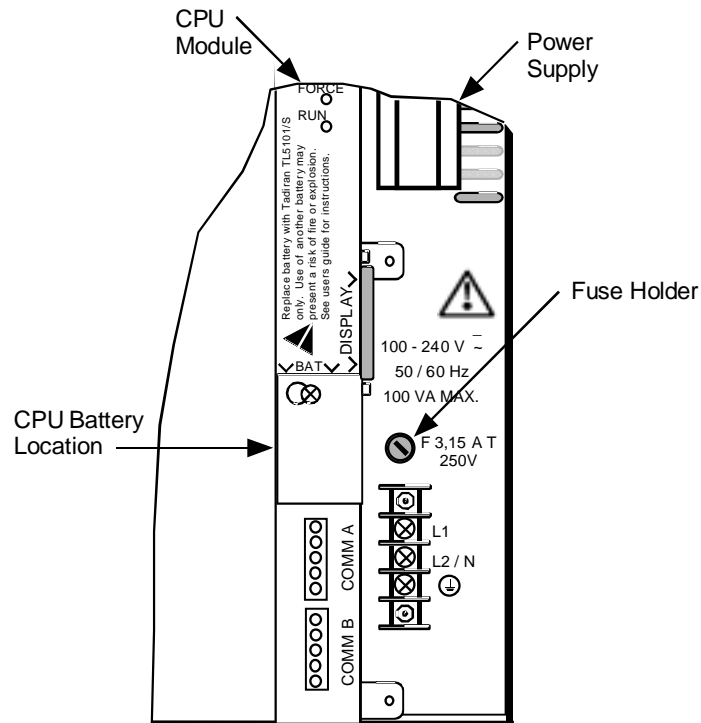


Figure 36 Power supply fuse and CPU battery location



## Replacing the battery

A lithium battery is used as a keep alive voltage for the volatile memory (RAM) that contains the controller configuration. The battery is installed in a compartment on the CPU module. Follow the steps in the table below to replace the CPU battery.



### CAUTION

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 212 °F (100 °C), or incinerate. Replace battery with Tadiran TL-5101/SBP only. Use of another battery may present a risk of fire or explosion.

Step	Action
1	Locate the battery and the battery compartment location on the CPU module. See Figure 36.
2	Using a Phillips-head screwdriver, loosen the screw and remove the battery compartment cover.
3	<p><i>For the standard CPU module –</i></p> <ul style="list-style-type: none"> <li>Using a screwdriver, insert it through the screw hole on the front and carefully pry the battery out of its holder. Carefully remove battery from the holder.</li> </ul> <p><i>For the CPU module option –</i></p> <ul style="list-style-type: none"> <li>The battery holder is contained on the battery compartment cover. See figure. Carefully remove battery from the holder.</li> </ul> <div style="text-align: center;"> <p>Battery Compartment Cover</p> <p>Battery</p> </div>
4	Observing the correct polarity, insert a new battery into the holder.
5	<p>Verify that the LoBATT LED is off.</p> <p>If LED is lit, the battery may installed incorrectly. Check polarity of battery and reinstall, if necessary.</p>
6	Replace the compartment cover and secure with the screw.

**NOTE:** If controller power is restored and the battery-backed RAM has failed, field calibration of the AI modules must be performed if greater than 0.1% accuracy is required.



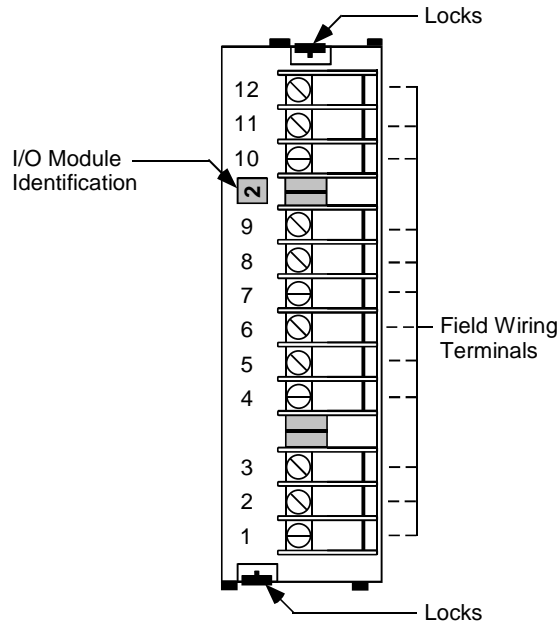
### WARNING

Dispose of used battery promptly.  
Keep away from children. Do not disassemble and do not dispose of in fire.

### Replacing I/O modules

If any I/O modules need to be replaced, follow the steps in the table below.

Step	Action
1	<b>Remove power from controller.</b>
2	Remove front cover by loosening the two screws at the top of the enclosure.
3	<p>Locate the I/O module you want to replace. See figure. Remove terminal board from front of module by pressing the two locks at top and bottom of the terminal block and pulling the block straight out. See Figure 37.</p> <div data-bbox="604 619 1230 1144" style="text-align: center; border: 1px solid black; padding: 10px;"> <p>The diagram shows a grid of 16 I/O module slots. The top row contains slots 9, 10, 11, 12, 13, 14, 15, and 16. The bottom row contains slots 1, 2, 3, 4, 5, 6, 7, and 8. A label 'I/O Module Slots' is positioned between the two rows, centered over slots 12-16. To the right of the slot grid are two vertical sections labeled 'CPU' and 'Power Supply'.</p> </div>
4	Unplug I/O module PWA from controller slot by pulling the PWA straight out from its slot.
5	Carefully insert the replacement I/O module PWA into controller slot making sure the PWA is properly aligned in the guides.
6	Plug in the terminal block to the I/O module PWA so it is securely attached.
7	Install front cover. Secure with two screws.
8	Restore power to controller.
9	Verify calibration of I/O module (AI or AO modules). Perform calibration of AI modules and CJC references (if using T/C) for all channels if greater than 0.1% accuracy is required.



**Figure 37 I/O module terminal blocks (not shown: 16 point DI)**

### Replacing the CPU module

Follow the steps in the table below for replacement of the CPU module in the controller. Please note that field calibration values for AI modules and CJC references are stored on the CPU. These values must be restored, if necessary, after a CPU is replaced. [See *Controller Calibration* (page 65).]

Step	Action
1	Remove power from controller.
2	Remove front cover by loosening the two screws at the top of the enclosure.
3	Remove three screws securing the CPU module to the power supply.
4	Unplug CPU module from controller slot by pulling the PWA straight out from its slot.
5	Observing the correct polarity, install battery into the battery holder on the replacement CPU.
6	Carefully insert CPU module into the enclosure slot and secure with three screws.
7	Replace front cover and secure with two screws.
8	Restore power to controller.
9	Place controller in PROGRAM mode and download controller configuration file.  NOTE: Controller configuration is stored in the battery backed RAM and also in the flash PROM memory. Since the CPU has been replaced, you must download a valid controller configuration file to the controller.
10	Verify controller configuration.
11	Perform calibration of AI modules and CJC references (if using T/C) for all channels if greater than 0.1 % accuracy is required.

### Replacing the power supply module

Step	Action
1	<b>Remove power from controller.</b>
2	Disconnect power wiring from power supply terminals.
3	Remove front cover by loosening the two screws at the top of the enclosure.
4	Remove five screws on the front of power supply securing the CPU module and power supply.
5	Unplug CPU module from controller slot by pulling it straight out from its slot.
6	Unplug power supply module from controller by pulling it straight out from its slot.
7	Plug in the replacement power supply into the enclosure slot and carefully insert CPU module into its slot.
8	Secure power supply and CPU with five screws.
9	Reconnect power wiring to proper terminals on power supply as shown. <div style="text-align: center; margin-top: 20px;"> </div>
10	Replace front cover and secure with two screws.
11	Restore power to controller.
12	Verify configuration.

## Replacing the backplane

Step	Action
<b>1</b>	<b>Remove power from controller.</b>
<b>2</b>	Disconnect power wiring from power supply terminals.
<b>3</b>	Remove front cover by loosening the two screws at the top of the enclosure.
<b>4</b>	Remove five screws on the front of power supply securing the CPU module and power supply.
<b>5</b>	Unplug CPU module from controller slot by pulling it straight out from its slot.
<b>6</b>	Unplug power supply module from enclosure by pulling it straight out from its slot.
<b>7</b>	Remove all terminal blocks from front of modules by pressing the two locks at top and bottom of each terminal block and pulling the block straight out. <div style="text-align: center;"> </div>
<b>8</b>	Unplug all I/O module PWAs from controller slot by pulling the PWA straight out from its slot. Be sure to note the slot position of the I/O modules.
<b>9</b>	Remove two screws (one on each side) at top of enclosure and slide top of enclosure forward.
<b>10</b>	Remove ten screws securing the backplane to the enclosure.
<b>11</b>	Lift backplane up through the top of the enclosure.
<b>12</b>	Carefully install replacement backplane in enclosure and secure with screws.
<b>13</b>	Slide metal top of enclosure in place and secure with two screws.
<b>14</b>	Plug in each I/O module PWA into its proper slot.
<b>15</b>	Insert all terminal blocks onto the front of each module.
<b>16</b>	Plug in the power supply into the enclosure slot and carefully insert CPU module into its slot.
<b>17</b>	Secure power supply and CPU with five screws.

Step	Action
18	<p>Reconnect power wiring to proper terminals on power supply as shown.</p> <div style="text-align: center;"> </div>
19	Replace front cover and secure with two screws.
20	Restore power to controller.
21	<p>Verify configuration. Perform calibration of AI modules and CJC references (if using T/C) for all channels if greater than 0.1 % accuracy is required.</p>

# Diagnostics and Troubleshooting

## Overview

This section provides diagnostic and troubleshooting information to help in evaluating controller operating status, diagnosing fault conditions and taking actions to correct faults. An overview of diagnostic routines and detail of the indicators used to inform users of controller operating status is provided. Status conditions are listed, as well as the possible cause and recommended user action for correcting fault conditions, if necessary.

## Controller Diagnostics

Diagnostic routines are executed upon power up of the controller CPU and performed continuously during controller operation. A number of methods are used to indicate controller status to the operator. LEDs on the CPU panel provide indication of controller power, operating mode, CPU battery status and diagnostic status. The operator interface and the user utility program contain displays that show status and operating parameters in more detail.

### Power up diagnostics

When power is applied to the controller, a sequence of checks are performed by the controller and completed in less than 10 seconds after power is applied. These checks are a set of internal diagnostics to verify the integrity of the hardware, the configuration database and firmware.

- A hardware check verifies the type of I/O module present in each slot and if the module present is the correct type for the control strategy in the controller database.
- The controller verifies that a valid configuration database is present in memory.

Communication between the operator interface and controller is established automatically after both components have completed their restart routines and are ready to begin normal operation.

## Controller status LEDs

Status indicators on the controller consist of four LEDs that indicate good and fault conditions in the controller. These LEDs indicate controller status and help to aid troubleshooting when the operator interface is not nearby or when the controller is not communicating with the operator interface or PC. Table 19 describes the LEDs and the possible states with their meaning. Refer also to Table 20 and Table 21 for further details on the meaning of the status LEDs.

**Table 19 Controller status LEDs**

Status LED	State	Meaning
<b>POWER</b>	Steady on	Power is applied to the controller backplane.
	Blinking	Diagnostic indication. See Table 20 for the details of the indications and their meaning.
<b>LoBAT</b>	On	The CPU battery is low and needs replacement.
<b>FORCE</b>	On	One or more function block output values have been forced.
<b>RUN</b>	On	Controller is in Run mode.
	Blinking	Controller is in Offline mode
	Off	Controller is in Program mode.  OR If POWER LED is blinking a fault has been detected in controller. See Table 20 for details of the indications and their meaning.

## Diagnostic displays

### Controller diagnostic summary

Status information, which indicates normal and/or fault conditions in the controller as a result of diagnostic routines, is accessed through either the operator interface or the user utility program.

- Using the operator interface – the DIAGNOSTIC SUMMARY display lists various controller components and their current status.
- Using the user utility program – the Controller Diagnostic Summary window provides a more extensive list of controller parameters and communications status.

### I/O module diagnostics

Another status display (or window), I/O Module Diagnostics, shows the status of each of the 16 I/O module slots in the controller. Each module slot is listed along with the status of the module in that slot.

Table 20 gives the details of the messages shown in the Controller Diagnostic Summary and Table 21 describes I/O Module Diagnostics messages that may appear in each field.



## Fault Detection and Troubleclearing

Interpreting the controller status and determining if any corrective action is necessary can be done by referring to Table 20 and Table 21. Actions to clear fault conditions usually consist of restarting the controller, and if the fault reoccurs, replacing the suspected faulty component. It is recommended that you replace controller components only after performing all other actions listed for that fault condition.

NOTE: The controller status POWER LED is used to indicate a number of faults. A diagnostic fault causes the POWER LED to flash. The LED will flash a number of times to indicate the type of fault detected. (See the column “Controller LED on CPU” in Table 20.) The LED flashes quickly a number of times followed by a long off period. This is similar to a telephone answering machine which uses a flashing LED to indicate the number of messages. This indication is helpful when the operator interface or PC is not connected or is not communicating with the controller.



### ATTENTION

When replacement of a controller component is necessary, refer to procedures in *Maintenance* section.

**Table 20 Details of the diagnostic summary display**

Controller Diagnostic Summary (In the User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
–	–	POWER LED flashes 1 time.	RAM failed on power-up.	Executes an infinite loop that toggles the LED. Communications and control are disabled.	Cycle power; If fault reappears, replace CPU.
<b>SYSTEM</b>	GOOD	RUN LED on	Controller is in RUN mode.	Executes the run mode.	None
<b>SYSTEM</b>	OFFLINE MODE	RUN LED flashes.	Controller is in OFFLINE mode.	Executes the Offline mode.	None
<b>SYSTEM</b>	PROGRAM MODE	RUN LED off.	Controller is in PROGRAM mode.	Function blocks are not executed.	None
<b>SYSTEM</b>	INVALID CONFIG.	RUN LED off.  <i>And</i> POWER LED strobes 12 times.	A configuration with more than 8 loops was downloaded to an 8 loop controller.  Incomplete download of configuration files.	Empty database created.	Download previous valid configuration.

Controller Diagnostic Summary (In the User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
<b>SYSTEM</b>	TASK FAULT	RUN LED off.  <i>And</i> POWER LED flashes 3 times.	Software failure.	Function blocks are not executed.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Upgrade controller software.</li> <li>3. Replace CPU board.</li> <li>4. Contact Honeywell.</li> </ol>
<b>CPU</b>	GOOD	–	–	–	none
<b>CPU</b>	WATCHDOG	POWER LED flashes 3 times.	Watchdog reset resulting from software failure.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Upgrade controller software.</li> <li>3. Replace CPU board.</li> <li>4. Contact Honeywell.</li> </ol>
<b>CPU</b>	BUS ERROR	POWER LED flashes 4 times.	Bus Error Detected.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Isolate system from noise and force a cold start.</li> <li>3. Replace CPU board.</li> </ol>

Controller Diagnostic Summary (In the User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
<b>CPU</b>	ADDRESS ERROR	POWER LED flashes 4 times.	Address Error Detected.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Isolate system from noise and force a cold start.</li> <li>3. Replace CPU board.</li> </ol>
<b>CPU</b>	INSTRUCTION ERROR	POWER LED flashes 4 times.	Bad Instruction Detected.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Isolate system from noise and force a cold start.</li> <li>3. Replace CPU board.</li> </ol>
<b>CPU</b>	VECTOR ERROR	POWER LED flashes 4 times.	Bad Vector Interrupt.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Isolate system from noise and force a cold start.</li> <li>3. Replace CPU board.</li> </ol>

Controller Diagnostic Summary (In the User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
<b>CPU</b>	SPURIOUS INTERRUPT	POWER LED flashes 4 times.	Spurious Interrupt.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. Isolate system from noise and force a cold start.</li> <li>3. Replace CPU board.</li> </ol>
<b>MEMORY</b>	GOOD	–	–	–	none
<b>MEMORY</b>	LOW BATTERY	Lo BATT LED on.	Battery voltage is low.	Executes normally.	Replace battery.
<b>MEMORY</b>	FLASH ERROR	POWER LED flashes 5 times.	Flash PROM failed to burn.	Executes normally.	<ol style="list-style-type: none"> <li>1. Force a cold start. (Toggle controller mode switch from PGM to RUN.)</li> <li>2. If fault reappears, replace CPU board.</li> </ol>
<b>RTC</b> (Real Time Clock)	GOOD	–	–	–	none
	NOT PROGRAMMED	POWER LED flashes 6 times.	RTC not programmed	Time and date is set to 00:00:00, January 1, 1970.	Enter correct time and date.
<b>RTC</b>	BAD DATA	POWER LED flashes 7 times.	Bad time and date.	Time and date is to 00:00:00, January 1, 1970.	<ol style="list-style-type: none"> <li>1. Program RTC.</li> <li>2. Cycle power.</li> <li>3. Replace CPU.</li> <li>4. Replace boards in backplane.</li> <li>5. Replace backplane.</li> </ol>

Controller Diagnostic Summary (In the User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
RTC	BATTERY FAILURE	POWER LED flashes 8 times	RTC battery failed on power-up	Time and date is set to 00:00:00, January 1, 1970.	<ol style="list-style-type: none"> <li>1. If Lo BAT LED is off, cycle power.</li> <li>2. If Lo BAT LED is on, replace battery and cycle power.</li> </ol>
RTC	PROGRAMMING FAILURE	POWER LED flashes 7 times	RTC failed to program	Time and date is set to 00:00:00, January 1, 1970.	<ol style="list-style-type: none"> <li>1. Program RTC.</li> <li>2. Cycle power.</li> <li>3. Replace CPU.</li> <li>4. Replace boards in backplane.</li> <li>5. Replace backplane.</li> </ol>
RTC	READ FAILURE	POWER LED flashes 7 times	Unable to read RTC	Time and date is set to 00:00:00, January 1, 1970.	<ol style="list-style-type: none"> <li>1. Program RTC.</li> <li>2. Cycle power.</li> <li>3. Replace CPU.</li> <li>4. Replace boards in backplane.</li> <li>5. Replace backplane.</li> </ol>
I/O	GOOD	–	–	–	none
I/O	MODULE ERROR	N/A	One of the I/O board diagnostics failed.	N/A	Access the I/O MODULE DIAGNOSTICS display.
I/O	BAD BACKPAN	POWER LED flashes 9 times.	Bad backplane EEPROM	Analog inputs use default coefficients.	<ol style="list-style-type: none"> <li>1. Cycle power.</li> <li>2. Replace backplane board.</li> </ol>
I/O	BAD BACKPAN ID	POWER LED flashes 9 times.	Incompatible backplane board	Analog inputs use default coefficients.	<ol style="list-style-type: none"> <li>1. Cycle power.</li> <li>2. Replace backplane board.</li> </ol>

<b>Controller Diagnostic Summary</b> (In the User Utility and Operator Interface)		<b>Controller LED on CPU</b>	<b>Fault Detection / Troubleclearing</b>		
<b>Menu Item</b>	<b>Status</b>		<b>Possible Cause</b>	<b>Controller Action</b>	<b>User Action</b>
<b>COMM A</b>	GOOD	–	–	–	none
<b>COMM A</b>	BOARD FAILURE	POWER LED flashes 13 times.	The COMM A port hardware has a serious failure.	Executes normally.	Replace Comm board.
<b>COMM A</b>	BOARD NOT FOUND	POWER LED flashes 13 times	The main CPU board has a non-default address and no COMM port installed.	Executes normally.	Install CPU with optional RS 485 communications (if not installed) or set COMM A station address to 255.
<b>COMM B</b>	GOOD	–	–	–	none
<b>COMM B</b>	BOARD FAILURE	POWER LED flashes 13 times.	The COMM B port hardware has a serious failure.	Executes normally. All Modbus read block outputs are frozen at their last read values.	Replace CPU.
<b>COMM B</b>	BOARD NOT FOUND	POWER LED flashes 13 times	The control file configuration requires a master port and no Comm Port is installed.	Executes normally. All Modbus read block outputs are frozen at their last read values.	Install Comm Board or download a configuration that has no Modbus slave blocks
<b>PANEL (OI)</b>	NORMAL	–	–	–	none

### Fault detection and troubleclearing

Table 21 describes the status messages that appear on the I/O Module Diagnostics displays in the user utility and operator interface, as well as the status indications of the POWER LED located on the controller CPU module.

**Table 21 Details of the I/O module diagnostics display**

I/O Module Diagnostics (In The User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
<b>MODULE 1 through MODULE 16</b>	GOOD	–	–	–	–
<b>MODULE 1 through MODULE 16</b>	HI CJ TEMPERATURE	POWER LED flashes 10 times	High cold junction temperature on AI module.	Executes normally.	<ol style="list-style-type: none"> <li>1. Improve ventilation to rack.</li> <li>2. Replace AI module</li> </ol>
<b>MODULE 1 through MODULE 16</b>	WRONG MODULE	POWER LED flashes 11 times	The module does not agree with the module required for the control strategy.	These function block types do the following:  AI – sets its output to failsafe  DI – sets its output to OFF	<ol style="list-style-type: none"> <li>1. Replace module.</li> <li>2. Check configuration.</li> </ol>
<b>MODULE 1 through MODULE 16</b>	NO MODULE	POWER LED flashes 11 times.	No module found in the slot that requires a module for the control strategy.	These function block types do the following:  AI – sets its output to failsafe  DI – sets its output to OFF	<ol style="list-style-type: none"> <li>1. Install the correct type of module.</li> <li>2. Check configuration.</li> </ol>

I/O Module Diagnostics (In The User Utility and Operator Interface)		Controller LED on CPU	Fault Detection / Troubleclearing		
Menu Item	Status		Possible Cause	Controller Action	User Action
<b>MODULE 1 through MODULE 16</b>	BAD MODULE	POWER LED flashes 11 times.	Analog input or analog output board does not have factory coefficients, or the I/O board is not a supported type.	<ol style="list-style-type: none"> <li>1. If the error is an analog input board with no factory coefficients, default coefficients will be used for the cold-junction calculations.</li> <li>2. If the error is an analog output board with no factory coefficients, default coefficients will be used for the outputs.</li> <li>3. If the board is an unsupported type, these block types do the following:             AI – sets its output to failsafe             DI – sets its output to OFF</li> </ol>	Replace module.



## Modem troubleshooting

Controller modem problems will typically show one of two symptoms.

- The modem does not answer, or
- the modem answers but does not establish communications.

**Table 22 Controller modem troubleshooting**

<b>Modem does not answer</b>	
<b>Cause</b>	<b>Solution</b>
Modem not powered.	Apply power.
Modem not configured for auto answer.	Check modem configuration and correct.
Modem not properly connected to phone line.	Verify phone line is correctly inserted in modem port and wall jack.
Bad cable connecting modem to phone line.	Replace cable with known good cable.
<b>Modem answers but does not establish communications</b>	
<b>Cause</b>	<b>Solution</b>
Controller not powered.	Apply power.
Modem set to wrong baud rate.	Follow procedure to set modem to 9600 baud.
Modem configuration does not match specification.	Follow procedure to configure modem. See <i>Remote Access (page 44)</i> .
Modem does not have non volatile memory.	Replace modem with one of the recommended types. See <i>Remote Access (page 44)</i> .
Bad cable between modem and controller.	Replace with a known good cable.
Wrong cable between modem and controller.	Replace with correct cable (not a null modem cable).
Controller failure.	Contact Honeywell service.



## Parts List

### UMC800 Controller

If you require replacement or spare parts for the UMC controller, you can order them by referring to the table below and contacting your Honeywell representative.

#### Replacement parts

Part Description	Part Number
Analog Input Card	46190305-503
Analog Output Card	46190314-503
DO Relay Output Card	46190308-503
DO AC Output	46190344-501
DO AC Output (2 @ 2 A and 4 @ 0.5 A)	46190344-502
DO DC Output	46190341-501
DI Contact Input (6)	46190311-503
DI Contact Input (16)	46190353-501
DI AC Input	46190350-501
DI DC Input	46190347-501
Pulse/Frequency Input Card	46190360-501
± 15 Vdc pH Power Module	51450921-501
Controller Terminal Board Cover	51309474-501
RS 485 Comm Card Kit (for controllers purchased 3-99 to 2-00)	51404868-501
RS 485 Comm Card Kit (for controllers purchased after 2-00)	51404868-502
Ethernet Communications Card Upgrade Kit (for controllers purchased after 12-00)	51500651-501
Power Supply 100-240 V ac or dc 24 V ac or dc (Optional)	46190250-502 46190250-504
Controller CPU Kits (for controllers purchased 3-99 to 2-00): Up to 8 PID Loops Up to 16 PID Loops Up to 8 PID Loops with RS 485 Communications Up to 16 PID Loops with RS 485 Communications	51404865-501 51404865-502 51404865-503 51404865-504
Controller CPU Kits (for controllers purchased after 2-00): Up to 8 PID Loops Up to 16 PID Loops Up to 8 PID Loops with RS 485 Communications Up to 16 PID Loops with RS 485 Communications	51404865-505 51404865-506 51404865-507 51404865-508
Battery (for CPU)	51198364-501
Backplane Assembly	46190329-502
I/O Black Terminal Block	46190202-501

Part Description	Part Number
I/O Red Terminal Block	46190204-501
Controller Fuse for 100-240 V supply (1 each)	46182886-002
Controller Fuse for 24 V supply (1 each)	
Grommet Kit (Power Terminal Cover, Grommets (16)	51404796-501
Shield Termination*	51309814-501
Ferrite Suppressor*	51404883-501
250 Ohm Shunt Resistor Kit (for mA ranges) (4)	46181080-503
Null Modem 9-pin "D" connector** (Cable for connecting Controller to PC)	51404755-501
Cable for connecting Controller to Operator Interface	
10 ft cable	51404523-501
50 ft cable	51404523-502

\*Shielded analog connections and a ferrite filter on the operator interface cable are required for CE approval.

\*\*Required for connection from configuration PC to controller.

# Specifications

## Introduction

The following tables contain electrical, physical, safety and performance specifications for the UMC800 controller.

## Controller Design

Parameter	Description
<b>Controller</b>	CPU with two serial communication ports,* power supply, and backplane assembly. Capable of supporting up to 16 input /output modules.  *CPU option provides additional RS 485 communications with Modbus RTU protocol.

## I/O Module Configuration

Component	Parameter	Description
<b>Universal Analog Inputs</b> <i>(Module ID 1)</i>	<i>Input Types</i>	mV, V, mA, T/C, RTD, Ohms
	<i>Number of Inputs</i>	4 per module, up to 16 modules per controller (64 inputs)
	<i>Signal Source</i>	Thermocouple with cold junction compensation Line resistance up to 1000 ohms, T/C, mV, mA, V RTD Pt 100 ohms, 3-wire connections, 40 ohms balanced maximum
	<i>Input Impedance</i>	10 megohms for T/C and mV inputs; >1 megohm for volt inputs
	<i>Input Isolation</i>	400 Vdc point-to-point 3.75K Vac RMS A/D converter to logic
	<i>Stray Rejection</i>	Series mode >60 dB. Common mode at 120 Vac >130 dB.
	<i>Burnout</i>	T/C, mV, V (except following ranges) configurable to upscale, downscale, or none.  <i>Volt:</i> -500 mV to 500 mV; -1 V to 1 V; -2 V to 2 V; -5 V to 5 V; 0 V to 10 V; -10 V to 10 V; inherent to zero volt  <i>RTD:</i> Inherent upscale  <i>mA:</i> Inherent downscale
	<i>T/C Break Detection</i>	Via current pulse

Component	Parameter	Description	
	<i>Accuracy (at reference conditions)</i>	Factory configured accuracy = $\pm 0.1\%$ of range Cold junction accuracy = $\pm 0.5\text{ }^{\circ}\text{C}$ Field calibration accuracy = $\pm 0.05\%$ of range  <i>Reference conditions:</i> Temperature = $25\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ ( $77\text{ }^{\circ}\text{F} \pm 5\text{ }^{\circ}\text{F}$ ) Humidity = 10 % to 55 % RH non-condensing Line voltage = Nominal $\pm 1\%$ Source resistance = 0 ohm Series mode and common mode = 0 V Frequency = Nominal $\pm 1\%$	
	<i>A/D Converter Resolution</i>	Better than 1 part in 50,000 at 50 Hz. Better than 1 part in 41,667 at 60 Hz.	
	<i>Temperature Effect on Accuracy</i>	0.15 % per 10 $^{\circ}\text{C}$ in the rated limits	
	<i>Long Term Stability</i>	0.1 % per year	
<b>Analog Outputs</b> <i>(Module ID 2)</i>	<i>Number of Outputs</i>	4 per module (isolated), up to 4 modules per controller (16 outputs)	
	<i>Isolation from Logic</i>	3.25 K Vac RMS	
	<i>Accuracy</i>	Factory configured accuracy = 0.1 % at reference conditions Field calibration accuracy = 0.1 %	
	<i>Temperature Effects</i>	0.1 % per 10 $^{\circ}\text{C}$ in the rated limits	
	<i>D/A Resolution</i>	16 bits	
<b>Digital Inputs</b>		<b>AC Inputs</b> <i>(Module ID 5)</i>	<b>DC Inputs</b> <i>(Module ID 4)</i>
	<i>Inputs per Module</i>	6	6 (sink/source)
	<i>Input Voltage Range</i>	80 Vac to 264 Vac	10.2 Vdc to 26.4 Vdc
	<i>Peak Voltage</i>	264 Vac	26.4 Vdc
	<i>AC Frequency</i>	47 Hz to 63 Hz	N/A
	<i>ON Voltage Level</i>	75 Vac minimum	9.5 Vdc minimum
	<i>OFF Voltage Level</i>	20 Vac maximum	3.5 Vdc maximum
	<i>Input Impedance</i>	12K @ 60 Hz	2.7 K
	<i>Input Current</i>	13 mA @ 100 Vac, 60 Hz 11 mA @ 100 Vac, 50 Hz	4.0 mA @ 12 Vdc 8.5 mA @ 24 Vdc
	<i>Minimum ON Current</i>	5 mA	3.5 mA
	<i>Maximum OFF Current</i>	2 mA	1.5 mA
	<i>Base Power Required *</i>	50 mA maximum	50 mA maximum
	<i>OFF to ON Response</i>	5 ms to 30 ms	1 ms to 8 ms
	<i>ON to OFF response</i>	10 ms to 50 ms	1 ms to 8 ms

Component	Parameter	Description	
<b>Logic Inputs</b> <i>(Module ID 3 and B)</i>	<i>Inputs per Module</i>	6 (ID 3) or 16 (ID B) dry contact	
	<i>Switching Voltage</i>	5 Vdc	
	<i>Switching Current</i>	5 mA	
<b>Digital Outputs</b>		<b>AC Outputs</b> <i>(Module ID 8)</i>	<b>DC Outputs</b> <i>(Module ID 7)</i>
	<i>Outputs per Module</i>	6	6 (current sinking)
	<i>Operating Voltage</i>	15 Vac to 240 Vac	10.2 Vdc to 26.4 Vdc
	<i>Output Type</i>	SSR (Triac)	NPN open collector
	<i>Peak Voltage</i>	264 Vac	40 Vdc
	<i>AC Frequency</i>	47 Hz to 63 Hz	N/A
	<i>ON Voltage Drop</i>	<1.5 Vac (>0.1A) <3.0 Vac (<0.1A)	1.5 Vdc maximum
	<i>Maximum Load Current</i>	0.5 A per point or 2 outputs at 2.0 A and 4 outputs at 0.5 A	0.3 A per point
	<i>Maximum Leakage Current</i>	4 mA (240 Vac, 60 Hz) 1.2 mA (100 Vac, 60 Hz) 0.9 mA (100 Vac, 50 Hz)	0.1 mA @ 40 Vdc
	<i>Maximum Inrush Current</i>	10 A for 10 ms	1 A for 10 ms
	<i>Minimum Load</i>	10 mA	0.5 mA
	<i>Base Power required *</i>	20 mA / ON pt. 250 mA maximum	100 mA maximum 5 V
	<i>OFF to ON Response</i>	1 ms	1 ms
	<i>ON to OFF response</i>	1 ms +1/2 cycle	1 ms
<i>Fuses</i> <i>5 x 20mm</i>	1 per output, 1.5 A slow blow	1 per output 1 A fast blow	

Component	Parameter	Description
<b>Pulse/Frequency Inputs with Digital Outputs</b>	<i>Input 1 to 4 Voltage Levels</i>	Logic Input High Vih: 3.0 Vdc Logic Input Low Vil: 1.0 Vdc Absolute Max: 27 Vdc Absolute Min: 0.0 Vdc
	<i>Digital Output (Open Collector Circuit)</i>	Max On DC Impedance: 330 ohms Min Off DC Impedance: >10 Mohms Max Source Voltage: 27 Vdc Min Load DC Impedance: 0 ohms
	<i>Frequency Mode Limitations</i>	Frequency Min: 10 Hz frequency mode Frequency Max: 100 kHz frequency mode Min Frequency Duty Cycle @ 100 kHz: 10 % Max Frequency Duty Cycle @ 100 kHz: 90 %
	<i>Pulse Mode Limitations</i>	Pulse Width Min: 100 uSec Pulse Width Max: unlimited
<b>Relay (Alarm) Outputs</b> <i>(Module ID 6)</i>	<i>Outputs per Module</i>	6
	<i>Contact Rating</i>	4 A, 250 Vac on resistive load
	<i>Contact Type</i>	SPST normally closed (NC), individually configurable to normally open (NO) via jumper
<b>Time Proportional Outputs (TPO)</b>	<i>Time Resolution</i>	4 msec.
	<i>Module</i>	Any Digital Output may be configured.
	<i>Synchronization</i>	Individual TPOs are not synchronized with others.

\*Base Power Required is the power required to provided module operation within specifications.



## Design

Parameter	Description
<b>Scan Rate</b>	<p>1 AI module – (1 to 4 analog inputs): 333 milliseconds            2 AI modules – (5 to 8 analog inputs): 500 milliseconds            3 AI modules – (9 to 12 analog inputs): 700 milliseconds            4 AI modules – (13 to 16 analog inputs): 900 milliseconds            5 AI modules – (17 to 20 analog inputs): 1100 milliseconds            6 AI modules – (21 to 24 analog inputs): 1300 milliseconds            7 AI modules – (25 to 28 analog inputs): 1500 milliseconds            8 AI modules – (29 to 32 analog inputs): 1700 milliseconds            9 AI modules – (33 to 36 analog inputs): 1900 milliseconds            10 AI modules – (37 to 40 analog inputs): 2100 milliseconds            11 AI modules – (41 to 44 analog inputs): 2300 milliseconds            12 AI modules – (45 to 48 analog inputs): 2500 milliseconds            13 AI modules – (49 to 52 analog inputs): 2700 milliseconds            14 AI modules – (53 to 56 analog inputs): 2900 milliseconds            15 AI modules – (57 to 60 analog inputs): 3100 milliseconds            16 AI modules – (61 to 64 analog inputs): 3300 milliseconds</p> <p>Scan rate dependent upon the number and type of configured function blocks.</p> <p>Analog outputs will be updated at the same rate as analog inputs.</p> <p>Fast Logic digital I/O will be serviced one time every 100 msec.</p>
<b>Setpoint Programmers</b>	<p>Up to four independent setpoint programs can be configured with up to 50 segments each. Up to 70 programs maximum storage.</p>
<b>Power Supply</b>	<p><i>Standard:</i> 100 Vac to 240 Vac, 50 Hz or 60 Hz; or 100 Vdc to 240 Vdc  <i>Fuse:</i> 3.15 A T 250v, or equivalent.</p> <p><i>Optional:</i> 24 V dc or ac, 50 Hz or 60 Hz  <i>Fuse:</i> 6.3 A slow blow, or equivalent.</p>
<b>Power Consumption</b>	<p>100 VA maximum</p>
<b>CPU Battery</b>	<p>Lithium: Tadiran TL5101/SPD ½ AA, 3.6 Vdc</p>
<b>Wiring</b>	<p>Removable terminal blocks with cross-slotted screw terminals; accepts 16 AWG to 22 AWG.</p>
<b>Communications</b>	<p>Two ports for external connections –</p> <p><i>CONFIGURATION:</i> RS232 port dedicated connection of the controller to a PC running the Control Builder Configuration software.</p> <p><i>DISPLAY:</i> RS422 port dedicated connection to the Operator Interface.</p> <p><i>Optional:</i> Two RS 485 Serial Communication ports, Modbus® RTU Protocol, Ethernet protocol.</p> <p><i>Connection:</i> Twisted pair with shield.</p> <p><i>Distance:</i> 600 meters, (2000 feet)</p> <p><i>Communication mode:</i> Half duplex</p> <p><i>Number of devices/link:</i> COMM A: 31, COMM B: 16</p> <p><i>Baud Rates:</i> 9600, 19200, 38400</p>

Parameter	Description	
<b>System Interconnections</b>	<p>Operator Interface (DISPLAY)</p> <p><i>Maximum Distance Between Controller File and Operator Interface: 50 feet</i>  <i>Cable Type: 15 conductor, shielded</i>  <i>Cable termination: 15-pin "D" connector at the controller end; removable screw type terminal strip at operator interface end.</i></p> <p>Operator Interface power (24 Vdc) is supplied through the interface cable/connectors.</p> <p>PC Configurator (CONFIGURATION)</p> <p><i>Maximum Distance Between Controller File and PC Configurator: 50 feet</i>  <i>Cable Type: Standard 9-pin RS232, Null Modem</i>  <i>Cable termination: 9-pin "D" connector male (Controller is fitted with female)</i></p>	
<b>Dimensions</b>	<p><i>Inches: 13.25 wide x 11.87 high x 6 deep</i>  <i>Millimeters: 333.5 wide x 229.2 high x 152.4 deep</i></p>	
<b>Mounting</b>	<p>Surface mounting with four screws in back of chassis  Optional mounting brackets are available.</p>	
<b>Safety Protection</b>	<p>Compliant with UL 1092 (draft)/UL 916 Process Control Equipment, CSA, C22.2 No.1010-1 Standard. (24Vdc/ac power certification pending.)</p>	
<b>CE Conformity (Europe)</b>	<p>This product is in conformity with the protection requirements of the following European Council Directives: 73/23/EEC, Low Voltage Directive and 89/336/EEC, EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed.</p>	
<b>Product Classification:</b>	<p>Class I: Fixed, Permanently Connected, Industrial Control Equipment with protective earthing (grounding). (EN 61010-1)</p>	
<b>Enclosure Rating:</b>	<i>Controller</i>	<p>Open Equipment: IP00. This Multiloop Process Controller must be panel mounted within an enclosure (TYPE 1 minimum) installed in indoor non-hazardous locations.</p>
	<i>Operator Interface</i>	<p>Accessory Equipment: The operator interface may be surface mounted (IP20, TYPE 2) or panel mounted (IP54, TYPE 12) in indoor non-hazardous locations.</p>
<b>Installation Category (Overvoltage Category):</b>	<p>Category II: energy-consuming equipment supplied from the fixed installation. Local level appliances, and industrial control equipment. (EN 61010-1)</p>	
<b>Pollution Degree:</b>	<p>Pollution degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (ref. IEC 664-1)</p>	
<b>EMC Classification:</b>	<p>Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 50082-2, immunity)</p>	
<b>Relay / Alarm Outputs:</b>	<p>Resistive Load: 2 amps @ 240 Vac</p>	

## Environmental and Operating Conditions

Parameter	Reference	Rated	Extreme	Transportation and Storage
<b>Ambient Temp.</b> °F °C	77 ± 5 25 ± 3	32 to 131 0 to 55	32 to 140 0 to 60	-40 to 151 -40 to 66
<b>Ambient Relative Humidity *</b>	10 % to 55 % RH non-condensing	10 % to 90 % RH non-condensing	5 % to 90 % RH non-condensing	5 % to 95 % RH non-condensing
<b>Mechanical Acceleration Duration</b>	0 g 0 ms	1 g 30 ms	5 g 30 ms	20 g 30 ms
<b>Vibration</b>	10 Hz to 60 Hz— amplitude 0.07 mm (peak-to-peak)  60 Hz to 150 Hz— acceleration 1 g	0 Hz to 14 Hz—amplitude 2.5 mm (peak-to-peak)  14 Hz to 250 Hz— acceleration 1 g		

\*Relative Humidity is derated above 40 °C.

## PV Inputs

	Range		Standard
	°F	°C	
<b>Thermocouples</b>			
<b>J</b>	-58 to 302 32 to 752 -328 to 1598	-50 to 150 0 to 400 -200 to 870	IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>L</b>	-58 to 302 32 to 752 -328 to 1598	-50 to 150 0 to 400 -200 to 870	DIN43710 (ITS68) DIN43710 (ITS68) DIN43710 (ITS68)
<b>K</b>	32 to 752 32 to 1472 32 to 2192 -328 to 1598	0 to 400 0 to 800 0 to 1200 -200 to 1370	IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>R</b>	-4 to 3200	-20 to 1760	IEC 584-1 (ITS90)
<b>S</b>	32 to 2912 -4 to 3200	0 to 1600 -20 to 1760	IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>N</b>	32 to 752 32 to 1472 32 to 2192 -328 to 2372	0 to 400 0 to 800 0 to 1200 -200 to 1300	IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>T</b>	-130 to 464 -58 to 302 32 to 302 122 to 302 -328 to 752	-90 to 240 -50 to 150 0 to 150 50 to 150 -200 to 400	IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>U</b>	-58 to 302 32 to 302 122 to 302 -328 to 752	-50 to 150 0 to 150 50 to 150 -200 to 400	DIN43710 (ITS68) DIN43710 (ITS68) DIN43710 (ITS68) DIN43710 (ITS68)
<b>NiNiMoly (NNM68)</b>	32 to 2552	0 to 1400	General Electric (IPTS68)
<b>NiMo-NiCo (NNM90)</b>	32 to 2552	0 to 1400	General Electric (IPTS68)
<b>WW26</b> <i>Reference Range</i>	-4 to 4208 750 to 4200	-20 to 2320 400 to 230	IPTS68 IPTS68
<b>W5W26</b> <i>Reference Range</i>	-4 to 4208 750 to 4200	-20 to 2320 400 to 230	IPTS68 IPTS68
<b>PR 20-40</b> <i>Reference Range</i>	32 to 3272 1110 to 3300	0 to 1800 600 to 180	IPTS68 IPTS68
<b>B</b> <i>Reference Range</i>	104 to 3308 752 to 3308	40 to 1820 400 to 1820	IEC 584-1 (ITS90) IEC 584-1 (ITS90)
<b>PLTNL</b>	-94 to 1382 32 to 2516	-70 to 750 0 to 1381	
<b>Honeywell Radiamatic</b>			
<b>Type RH</b>	0 to 3400	-18 to 1871	
<b>Type RI</b>	0 to 3200	-18 to 1760	

	Range		Standard
	°F	°C	
<b>RTD/Ohms</b>			
<b>Pt 100 at 0 °C</b>	-130 to 464 -58 to 302 32 to 212** 32 to 392 32 to 752 -328 to 1472	-90 to 240 -50 to 150 0 to 100** 0 to 200 0 to 400 -200 to 800	IEC 751-1986 IEC 751-1986 IEC 751-1986 IEC 751-1986 IEC 751-1986 IEC 751-1986
<b>Ni 50 ohms</b>	-112 to 608	-80 to 320	Edison #2045A-1962
<b>Ni 508 ohms</b>	-112 to 302	-80 to 150	
<b>Cu 10 ohms</b>	-4 to 482**	-20 to 250**	General Electric
<b>Ohms</b>	0 to 200 ohms 0 to 2000 ohms		
<b>JIS</b>	-58 to 302 32 to 212** 32 to 392 32 to 752 -328 to 932	-50 to 150 0 to 100** 0 to 200 0 to 400 -200 to 500	JIS C 1604-1981 JIS C 1604-1981 JIS C 1604-1981 JIS C 1604-1981 JIS C 1604-1981
<b>Linear</b>			
<b>Milliamperes</b>	0 to 20 mA* 4 to 20 mA*		
<b>Millivolts</b>	0 to 10 mV -10 to 10 mV 0 to 20 mV -20 to 20 mV 0 to 50 mV -50 to 50 mV 10 to 50 mV 0 to 100 mV -100 to 100 mV 0 to 500 mV -500 to 500 mV		
<b>Volts</b>	0 to 1 V -1 to 1 V 0 to 2 V -2 to 2 V 0 to 5 V -5 to 5 V 1 to 5 V 0 to 10 V -10 to 10 V		
<b>Carbon Oxygen</b>	0 to 1250 mV -30 to 510 mV		

\*mA inputs must be connected with a 250 ohm resistor across the input terminals.

\*\*These ranges have an accuracy of 0.25 %.



# Index

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For at undgå elektrisk stød med mulighed for personskade, skal alle sikkerhedsbestemmelser i denne manual følges nøje.



Dette symbol advarer brugeren om en potentiel berøringsfare, såfremt der kan være adgang til den livsfarlige netspænding.



Beskyttende jordterminal. Terminalen er forberedt for og skal forbindes til beskyttelsesjordledning i henhold til stærkstrømsberkendtgørelsen (DK).

- Hvis udstyret ikke bruges som specificeret i manualen, kan den beskyttelse udstyret yder blive nedsat eller forsvinde.
- Erstat kun komponenter som udtrykkeligt er specificeret som udskiftelige i manualen.
- Alle ledningsforbindelser skal følge stærkstrømsberkendtgørelsen (DK) og udføres af autoriseret erfarent personel.
- Den beskyttende jordterminal skal forbindes først af alle forbindelser (og fjernes som den sidste).
- Det anbefales jvf. stærkstrømsberkendtgørelsen, at der installeres en afbryder til frosyningsspændingen nær udstyret.

### **UDSTYRS SPECIFIKATIONER**

Strømforsyning	100 til 240 V
Frekvens	50 – 60 Hz
Nominel effekt	100 VA

### **OMGIVELSE SPECIFIKATIONER**

Placer ikke udstyret i nærheden af brandbare væsker eller dampe.

Temperatur	Rumtemperatur : 15 til 55°C
Fugtighed	10 til 90% RH - 40°C
Vibration	14 til 250 Hz acceleration 1 g

### **UDSTYRS INSTALLATION**

Skriveren skal monteres i en tavle for at forhindre adgang til bagterminaler.



Ter vermindering van het gevaar van elektrische schokken die lichamelijk letsel kunnen veroorzaken, dient u alle veiligheidsaanwijzingen in dit dokument te volgen.



Dit symbool waarschuwt de gebruiker voor een potentieel schokgevaar wanneer toegang bestaat tot onderdelen die onder gevaarlijke spanning staan.



Beschermende aarde-aansluiting. Bestemd voor aansluiting van de aardingsdraad van de voeding.

- Indien de apparatuur wordt gebruikt anders dan door de fabrikant gespecificeerd, kan de bescherming, die de apparatuur biedt ongedaan worden gemaakt.
- Alleen die onderdelen mogen worden vervangen die door de fabrikant als uitwisselbaar zijn aangemerkt.
- Alle bedrading moet in overeenstemming zijn met de lokale elektriciteiseisen en moet aangelegd worden door geautoriseerd, ervaren personeel.
- De aardingsdraad moet worden aangesloten vóórdat alle andere bedrading wordt aangesloten (en als laatste worden verbroken).
- Het verdient aanbeveling een netschakelaar aan te brengen vlakbij het instrument.

### **APPARATUUR VOORWAARDEN**

Voedingsspanning	100 tot 240 V
Frequentie	50 – 60 Hz
Vermogen of stroomvermogen	100 VA

### **OMGEVINGSCONDITIES**

Gebruik het instrument niet in de aanwezigheid van ontvlambare vloeistoffen of dampen. Het gebruik van elk elektrisch instrument in een dergelijke omgeving vormt een gevaar voor uw veiligheid.

Temperatuur	In bedrijf : 15 tot 55°C
Vochtigheid	10 tot 90% RH - 40°C
Trilling	14 tot 250 Hz versnelling 1 g

### **MONTAGE VAN DE APPARATUUR**

De recorder moet worden gemonteerd in een paneel om de toegankelijkheid tot de achterste aansluitpunten te beperken.



Noudata tämän ohjeen kaikkia turvaohjeita välttääksesi sähkötapaturman vaaraa.



Tämä merkki varoittaa käyttäjää sähköiskun vaarasta paikassa, missä voi koskettaa vaarallisia jännitteitä.



Suojamaaliitin. Kytke maadoitsjohdin tähän liittimeen.

- Jos laitetta käytetään olosuhteissa, joihin sitä ei ole suunniteltu, käyttöturvallisuus voi heikentyä.
- Älä vaihda mitään komponenttia tai osaa, jota valmistaja ei ole määritellyt käyttäjän vaihdettavaksi.
- Asennus ja johdotus on tehtävä paikallisten varmuusmääräysten mukaisesti valtuutetun sähköasentajan toimesta.
- Ensimmäiseksi on kytkettävä suojamaa-liitin (ja viimeiseksi irroitettava).
- Laitteen läheisyyteen suositellaan asennettavaksi verkkokytkin.

### **LAITTEEN VAATIMUKSET**

Syöttöjännite	100 - 240 V
Taajuus	50 – 60 Hz
Teho	100 VA

### **KÄYTTÖOLOSUHTEET**

Älä käytä laitetta paikassa jossa on syttyviä nesteitä tai kaasuja, koska laitteen käyttö aiheuttaa räjähdysvaaran.

Lämpötila	ympäröivä : 15 ... 55°C
Kosteus	10 ... 90% RH - 40°C
Tärinä	14 ... 250 Hz
	Kiihtyvyys 1 g

### **LAITTEEN ASENNUS**

Piirturi on asennettava paneeliin siten, että peräliitimille jää riittävästi tilaa.



Pour réduire tout risque de décharge électrique qui pourrait provoquer une lésion corporelle, respectez toutes les consignes de sécurité de cette documentation.



Ce symbole avertit l'utilisateur d'un risque électrique potentiel lorsqu'il peut avoir accès à des éléments sous tension.



Borne de mise à la terre. Destinée au raccordement du conducteur de mise à la terre de l'alimentation.

- Si l'équipement est utilisé dans un but non spécifié par le constructeur, la protection fournie avec cet équipement peut être affectée.
- Aucun composant (ou pièce) ne doit être remplacé s'il n'est pas explicitement spécifié comme tel par le constructeur.
- Tous les câblages doivent être conformes aux normes locales et doivent être réalisés par un personnel autorisé et expérimenté.
- La borne de masse doit être raccordée avant tout autre câblage (et débranchée en dernier).
- Il est obligatoire de connecter cet appareil sur une ligne possédant un moyen de coupure près de l'appareil.

### **CARACTERISTIQUES DE L'EQUIPEMENT**

Tension d'alimentation	100 à 240 V
Fréquence	50 – 60 Hz
Puissance ou courant	100 VA

### **CONDITIONS AMBIANTES**

Ne jamais utiliser cet équipement en présence de liquides ou vapeurs inflammables.

L'utilisation de tout instrument électrique dans un tel environnement pourrait présenter un risque pour la sécurité.

Température	Ambiante : 15 à 55°C
Humidité	10 à 90 % HR à 40°C
Vibration	Fréquence : 14 à 250 Hz Accélération 1 g

### **INSTALLATION DE L'EQUIPEMENT**

Cet appareil doit être monté dans un panneau pour limiter l'accès aux bornes arrières par l'opérateur.



Befolgen Sie alle Sicherheitshinweise in diesen Unterlagen, um das Risiko eines Stromschlags zu verringern, der zu Körperverletzung führen kann.



Dieses Symbol warnt den Benutzer vor eventueller Berührungsgefahr, wo lebensgefährliche Spannungen zugänglich sein können.



Schützende Erdung. Für den Anschluß der schützenden Erdung der Versorgungssystemleitung.

- Bei Benutzung der Ausrüstungen auf nicht vom Hersteller angegebene Art und Weise kann der von der Ausrüstung gewährleistete Schutz beeinträchtigt werden.
- Ersetzen Sie keine Komponente (oder Teil), die/das nicht ausdrücklich vom Lieferanten als ersetzbar angegeben ist.
- Die gesamte Verkabelung muß den örtlichen Normen entsprechen und von zugelassenem, erfahrenem Personal durchgeführt werden.
- Die Erde muß vor allen anderen Kabeln angeschlossen (und zuletzt abgeklemmt) werden.
- In der Nähe der Ausrüstung muß ein Schalter in der Hauptstromversorgung vorhanden sein.

### **AUSRÜSTUNGSDATEN**

Netzspannung	100 bis 240 V
Frequenz	50 – 60 Hz
Nennleistung	100 VA

### **UMGEBUNGSBEDINGUNGEN**

Betreiben Sie das Gerät nicht in Gegenwart entflammbarer Flüssigkeiten oder Dämpfe. Der Betrieb elektrischer Geräte in solchen Umgebungen stellt ein Sicherheitsrisiko dar.

Temperatur	Umgebung : 15 bis 55°C
Feuchtigkeit	10 bis 90% RH - 40°C
Vibration	14 bis 250 Hz Beschleunigung 1 g

### **ANBRINGUNG DER AUSRÜSTUNGEN**

Der Regler muß in ein Pult eingebaut sein, damit der Bediener nicht zu oft auf die hinteren Anschlüsse zugreifen muß.



Για την αποφυγή του κινδύνου ηλεκτροπληξίας που θα μπορούσε να προκαλέσει προσωπικό τραυματισμό, ακολουθείστε όλες τις υποδείξεις ασφαλείας αυτών των οδηγιών.



Το σύμβολο αυτό προειδοποιεί το χρήστη για πιθανό ηλεκτρικό κίνδυνο σε περίπτωση επαφής με επικίνδυνα μέρη της συσκευής.



Προστατευτικό τερματικό γείωσης. Παρέχεται για σύνδεση με τον αγωγό προστατευτικής γείωσης του συστήματος τροφοδοσίας.

- Εάν ο εξοπλισμός χρησιμοποιηθεί κατά τρόπο που δεν προβλέπεται από τον κατασκευαστή, διακινδυνεύεται η παρεχόμενη από τον εξοπλισμό προστασία.
- Μην αντικαταστήσετε κανένα μέρος (ή εξάρτημα) του οποίου η αντικατάσταση δεν προβλέπεται από τον κατασκευαστή.
- Όλες οι ηλεκτρικές εγκαταστάσεις πρέπει να είναι σύμφωνες με τα τοπικά πρότυπα και να πραγματοποιούνται από έμπειρους τεχνικούς.
- Το τερματικό εδάφους πρέπει να συνδέεται πριν από κάθε άλλη σύνδεση (και να αποσυνδέεται τελευταίο).
- Απαιτείται ένας διακόπτης στην κύρια ηλεκτρική εγκατάσταση τροφοδοσίας ηλεκτρικού κοντά στη συσκευή.

#### ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ ΕΞΟΠΛΙΣΜΟΥ

Τροφοδοσία ισχύος	100 ως 240 V
Συχνότητα	50 – 60 Hz
Ισχύς ρεύματος	100 VA

#### ΣΥΝΘΗΚΕΣ ΠΕΡΙΒΑΛΛΟΝΤΟΣ

Αποφεύγετε τη λειτουργία του κοντά σε εύφλεκτα υγρά ή αέρια. Η λειτουργία οποιασδήποτε ηλεκτρικής συσκευής σε τέτοιο περιβάλλον εκθέτει σε κίνδυνο για την ασφάλεια.

Θερμοκρασία	Περιβάλλοντος : 15 ως 55°C
Υγρασία	10 ως 90 % RH μη συμπυκνώσιμη / 40°C
Δόνηση	14 – 250 Hz
	Επιτάχυνση 1 γ

#### ΕΓΚΑΤΑΣΤΑΣΗ ΕΞΟΠΛΙΣΜΟΥ

Η μονάδα αυτή πρέπει να μπει μέσα σε πλαίσιο για να περιορίζεται η πρόσβαση του χρήστη στα πίσω τερματικά.



Per ridurre i rischi di scariche elettriche che potrebbero causare alle persone, seguire tutte le precauzioni circa la sicurezza indicate in questa documentazione.



Questo simbolo avverte del pericolo di scossa elettrica nelle aree in cui sono accessibili conduttori sotto tensione.



Terminale di protezione verso terra. Previsto per il collegamento del conduttore di protezione verso terra del sistema di alimentazione.

- Se lo strumento viene utilizzato in modo diverso dalla specifica del costruttore, la protezione fornita dallo strumento può essere diversa.
- Non sostituire alcun componente (o parte) non specificato esplicitamente come ricambio dal vostro fornitore.
- Tutti i cablaggi devono essere in accordo con i regolamenti locali e devono essere eseguiti da personale esperto ed autorizzato.
- Il terminale di massa deve essere collegato prima di ogni altro filo (e scollegato per ultimo).
- E necessario che sia presente un interruttore nell'alimentazione principale accanto all'apparecchio.

### **ALIMENTAZIONE APPARECCHIATURA**

Tensione di alimentazione	Da 100 a 240 V
Frequenza	50 – 60 Hz
Potenza o corrente	100 VA

### **CONDIZIONI AMBIENTALI**

Non far funzionare l'apparecchio in presenza di liquidi o gas infiammabili, in quanto questo potrebbe essere estremamente pericoloso.

Temperatura	Ambiente : da 15 a 55°C
Umidità relativa	Da 10 a 90% UR a 40°C
Vibrazioni	Da 14 a 250 Hz
	Accelerazione 1 g

### **INSTALLAZIONE DELL'APPARECCHIO**

Il apparecchio deve essere montato su un pannello per limitare l'accesso ai terminali posteriori.



Følg alle retningslinjene i dette dokumentet, slik at du reduserer risikoen for elektrisk støt og mulige personskader.



Dette symbolet advarer brukeren om tilgjengelige terminaler med farlige spenninger og en potensiell fare for elektrisk støt.



Jordingsterminal. kabelen for jording av systemet skal tilknyttes til denne terminalen.

- Dersom utstyret benyttes på en måte annerledes enn spesifisert av produsent, kan utstyrets beskyttelsesgrad forringes.
- Ingen komponenter eller deler skal skiftes ut dersom de ikke er uttrykkelig spesifisert som utskiftbare av din forhandler.
- Det er påkrevet med en hovedstrømsbryter i nærheten av utstyret.
- All kabling må utføres i henhold til gjeldende forskrifter og installeres av autoriser og erfaren installatør.
- Jord må tilknyttes før all annen kabling (og frakobles sist).

### **UTSTYRSPESIFIKASJONER**

Strømtilførsel	100 til 240 V
Nettfrekvens	50 – 60 Hz
Kraftforbruk	100 VA

### **OMGIVELSER**

Instrumentet må ikke opereres i nærheten av lettantennelige væsker eller gasser. Bruk av elektriske instrumenter i slike omgivelser utgjør en sikkerhetsrisiko.

Temperatur	omgivelse : 15 til 55°C
Fuktighet	10 til 90% HR - 40°C
Vibrasjon	14 til 250 Hz akselerasjon 1 g

### **UTSTYRSINSTALLASJON**

Pass på å montere panelene på regulatoren, slik at berøring av terminalene på baksiden forhindres.





Para reduzir o risco de choque eléctrico que pode causar danos corporais, seguir todas as normas de segurança contidas nesta documentação.



Este símbolo avisa o utilizador sobre um eventual perigo de choque quando são acessíveis voltagens sob tensão perigosas.



Terminal de protecção de terra. Fornecido para ligação do condutor do sistema da protecção de terra.

- Se este equipamento for usado de modo não especificado pelo fabricante, a protecção fornecida pelo equipamento pode não ser adequada.
- Não se deve substituir qualquer componente (ou peça) que não seja explicitamente especificado como substituível pelo nosso revendedor.
- Toda a cablagem deve estar de acordo com os códigos eléctricos locais e deve ser realizada por pessoal experiente devidamente autorizado.
- O terminal de terra deve ser ligado antes de ser feita qualquer outra cablagem (e desligado em último lugar).
- Recomenda-se um comutador na fonte de alimentação principal próximo do equipamento.

### **ESPECIFICAÇÕES DO EQUIPAMENTO**

Voltagem	100 a 240 V
Frequência	50 – 60 Hz
Potência ou consumo de corrente	100 VA

### **CONDIÇÕES AMBIENTAIS**

Não operar o instrumento na presença de líquidos ou vapores inflamáveis. A operação de qualquer instrumento eléctrico em tal ambiente constitui um perigo para a segurança.

Temperatura	Ambiente : 15 a 55°C
Humidade	10 a 90% RH a 40°C
Vibração	14 a 250 Hz aceleração 1 g

### **INSTALAÇÃO DO EQUIPAMENTO**

O Registrador deve ser montado num painel para limitar o acesso do operador aos terminais traseiros.



Para reducir el riesgo de choque eléctrico el cual podría causar lesiones personales, seguir todas las indicaciones de este documento.



Este símbolo previene al usuario de un riesgo potencial de descarga cuando se puede acceder a corrientes de tensión peligrosas.



Terminal de tierra de protección. Proporcionado para la conexión de la tierra de protección del conductor del sistema de alimentación.

- Si el equipo es utilizado de forma no especificada por el fabricante, la protección suministrada con el mismo podría resultar dañada.
- No reemplazar ningún componente (o parte) no explícitamente especificado por el suministrador.
- Todo el cableado debe realizarse de acuerdo con las normas eléctricas locales y debe ser realizado por personal experimentado.
- El terminal de tierra debe ser conectado antes que cualquier otro cable y desconectado el último.
- Se recomienda la instalación de un interruptor de la alimentación principal, cerca del equipo.

**DATOS ELECTRICOS DEL EQUIPO**

Tensión de alimentación	100 a 240 V
Frecuencia	50 – 60 Hz
Potencia o corriente	100 VA

**CONDICIONES AMBIENTALES**

No operar con el instrumento en presencia de líquidos o gases inflamables. La operación de cualquier equipo eléctrico en tal ambiente constituye un riesgo contra la seguridad.

Temperatura	Ambiente : 15 a 55°C
Humedad	10 a 90% RH a 40°C
Vibración	14 a 250 Hz aceleración 1 g

**INSTALACION DEL EQUIPO**

Este equipo debe ser montado en un panel para limitar al operador el acceso a los terminales traseros.



För att reducera riskerna av elektriska chocker som kan orsaka personskador, följ alla säkerhetsföreskrifter i denna dokumentation.



Denna symbol varnar användaren för risk för elchock vid tillfällig åtkomst av spänningsförande del.



Anslutning av skyddsjord. Avsedd för anslutning av elsystemets skyddsjordsledare.

- Om utrustningen används på ett sådant sätt, att det inte innefattas av tillverkarens specifikation, kan de inbyggda säkerhetsfunktionerna äventyras.
- Ersätt aldrig någon komponent (eller del) som inte är specificerad som ersättningsbar av tillverkaren.
- All ledningsdragnings måste utföras i enlighet med lokala bestämmelser och skall utföras av behörig personal med erfarenhet av sådant arbete.
- Skyddsjordsanslutningen skall anslutas före alla andra anslutningar (och losskopplas sist).
- En strömbrytare för näströmmen rekommenderas.

### **STRÖMFÖRSÖRJNING**

Spänning	100 a 240 V
Frekvens	50 – 60 Hz
Effekt eller märkström	100 VA

### **OMGIVNINGSVILLKOR**

Använd ej instrumentet i närhet av brännbara vätskor eller gaser. Användandet av instrumentet i sådant miljö är en direkt säkerhetsrisk.

Temperatur	Omgivande : 15 till 55°C
Fuktighet	10 till 90% RH - 40°C
Vibration	14 till 250 Hz acceleration 1 g

### **INSTALLATION**

Instrumentet skall monteras i en panel eller i en låda för att undvika att personalen kommer i beröring med bakre inkopplingsplintar.



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