

DataSite Electronic Flow Meter and Remote Terminal Unit



Catalog Numbers 1758-FLO301, 1758-FLO302, 1758-RTU201, 1758-RTU202
Hardware User Manual



Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication [SGI-1.1](#) available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com>) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING 	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to: personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.
SHOCK HAZARD 	Labels may be on or inside the equipment, such as a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD 	Labels may be on or inside the equipment, such as a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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

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

Who Should Use this Manual

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

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

Purpose of this Manual

This publication is a hardware user manual for DataSite controllers. It describes the procedures you use to install, wire, and troubleshoot your controller.

Related Documentation

The publications listed in this table contain more information on the DataSite controllers.

Related publications for DataSite controllers

Pub. Title	Pub. Number	Description
DataSite Electronic Flow Meter and Remote Terminal Unit Installation Instructions	1758-IN001	Information on how to install a DataSite controller.
DataSite Electronic Flow Meter and Remote Terminal Unit Software Tools User Manual	1758-UM002	Information on how to install and use the software tools, DS Settings, DS FloConfig, and DS DNP3 to configure and monitor DataSite controllers.
Customized Function Blocks for DataSite Reference Manual	1758-RM001	Description of the customized function blocks used for programming DataSite controllers.
DataSite Screen Builder user documentation available on the DataSite CD and from http://www.isagraf.com	—	Information on using the DataSite Screen Builder to create graphical user interfaces.
DataSite Workbench user documentation available on the DataSite CD and from http://www.isagraf.com	—	Information on using the DataSite Workbench to develop multi-process control projects for use with DataSite controllers.
Modbus Protocol Specifications Available from www.modbus.org	—	Information about the Modbus protocol.
Allen-Bradley Programmable Controller Grounding and Wiring Guidelines	1770-4.1	In-depth information on grounding and wiring Allen-Bradley programmable controllers.
Application Considerations for Solid-State Controls	SGI-1.1	A description of important differences between solid-state programmable controller products and hard-wired electromechanical devices.

Related publications for DataSite controllers (Continued)

Pub. Title	Pub. Number	Description
National Electrical Code - Published by the National Fire Protection Association of Boston, MA.	—	An article on wire sizes and types for grounding electrical equipment.
Allen-Bradley Publication Index SD499	—	A complete listing of current documentation, including ordering instructions. Also indicates whether the documents are available on CD-ROM or in multi-languages.
Allen-Bradley Industrial Automation Glossary	AG-7.1	A glossary of industrial automation terms and abbreviations.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

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

Overview

Introduction

The Allen-Bradley DataSite controller is an excellent remote terminal unit for service in harsh and extreme industrial environments such as oil, gas, pipeline, and electrical utility applications. It is ideal for applications that require wide temperature ratings and low power consumption, and applications that are remote and powered by solar cells or wind power.

The DataSite controller has a high-performance 32-bit ARM processor with several communications options. An Ethernet port, two serial ports (RS232/RS485) and one HART multi drop interface are built in. Native protocols include Modbus RTU, Modbus ASCII, Modbus TCP/IP and DNP 3.0.

The DataSite controller can store a total of:

- 700 event records
- 300 alarm records
- Hourly records of up to 35 days for each meter run
A maximum of 30 items for each day can be stored.
- Daily records of up to 35 days for each meter run

The DataSite controller can be programmed by using DataSite Workbench. Workbench is a software environment designed to facilitate the task of automation throughout the life cycle of a system, from system design to commissioning, operation, and maintenance. To view valves, pumps and meters over the Internet, use DataSite Screen Builder. Screen Builder is an embedded web technology which allows the DataSite controller to act as a web and event-based data server.

1758-FLO DataSite controllers

In addition to the features listed in preceding sections, the 1758-FLO DataSite controllers provide the additional feature of being able to calculate gas flow. 1758-FLO DataSite controllers contain the 1758-FLO flow measurement algorithm which conforms to the following standards:

- AGA-3 (1992 version)⁽¹⁾ orifice metering of natural gas and other related hydrocarbon fluids;
- AGA-7⁽¹⁾ measurement of gas by turbine meters;
- AGA-8⁽¹⁾ compressibility factors of natural gas and other related hydrocarbon gases.

The 1758-FLO controller can be configured by using the DS FloConfig software. This tool provides functions such as reading and revising parameters, reading historical data and monitoring measurement results.

Features at a Glance

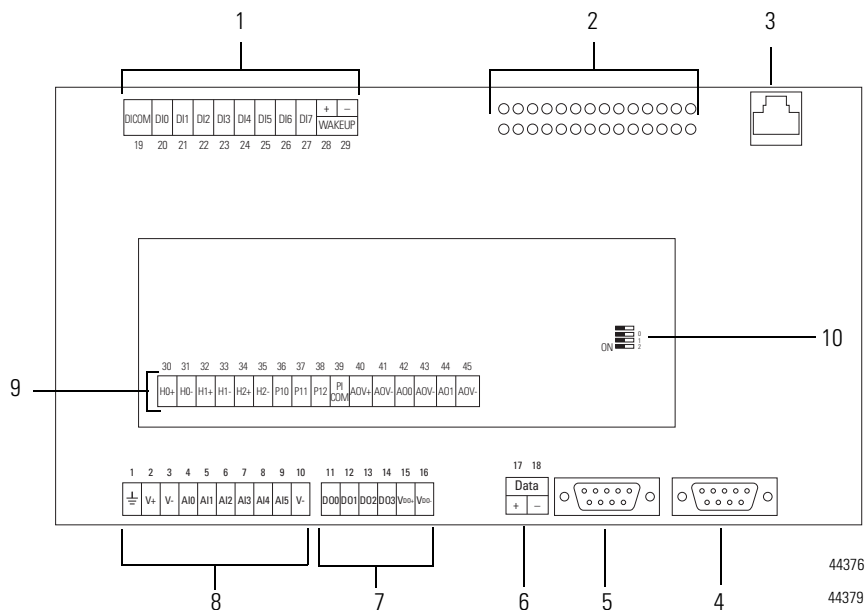
- Advanced 32-bit processor with embedded real-time multi-task operating system (RTOS).
- 8 analog inputs (2 with point-to-point HART interface), 2 analog out, 8 discrete inputs, 4 discrete outputs, and 3 pulse inputs.
- Embedded Ethernet, two serial ports (RS232/RS485) and one HART multi-drop interface; native protocols include Modbus RTU, Modbus ASCII, and Modbus TCP.
- 6M Flash, 1M RAM, and 32K ferroelectric RAM for long-term storage of configured parameters.
- HiBeam technology that allows the DataSite controller to act as a web and event-based data server. HiBeam also has tools for interfacing with your controller-based data through a standard web browser.
- Conformity to IEC61131-3. Supports LD, FBD, IL, ST and SFC programming languages.
- Isolation of power supply, signal output and input terminals from the main control circuit.
- Standard industrial design and DIN rail mounting option, which are convenient for field installation and configuring interior hardware.

⁽¹⁾ The 1758-RTU controller does not have AGA-3, AGA-7 or AGA-8 calculations.

- Working temperature of -40...70 °C, humidity: 5...95% RH, which is applicable for a range of different environments.

Controller Description

The components of the DataSite controller are shown here.



Item	Description
1	Discrete Input and wake-up connectors
2	Status indicators
3	Ethernet connector
4	RS232 COM 2 connector
5	RS232 COM 1 connector
6	RS485 COM 1 connector
7	Discrete Output connectors
8	Power Input and Analog Input connectors
9	HART, Pulse Input, and Analog Output connectors
10	Pulse Input Filter switches

Notes:

Installing the Controller

This chapter shows you how to install the DataSite controller. The only tool you require is a Phillips head screwdriver.

Agency Certifications

- UL Listed Industrial Control Equipment for use in Class I, Division 2, Hazardous Locations, Groups A, B, C, D
- cULus Listed Industrial Control Equipment for use in Canada
- CE marked for all applicable directives
- C-Tick marked for all applicable acts

Compliance to European Union Directives

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

EMC Directive

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

- EN 61000-6-4EMC - Part 6-4: Generic Standards - Emission Standard for Industrial Environments
- EN 61000-6-2EMC - Part 6-2: Generic Standards - Immunity for Industrial Environments

This product is intended for use in an industrial environment.

Installation Considerations

Most applications require installation in an industrial enclosure (Pollution Degree 2⁽¹⁾) to reduce the effects of electrical interference (Over Voltage Category II⁽²⁾) and environmental exposure.

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

⁽²⁾ Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

Locate your controller as far as possible from power lines, load lines, and other sources of electrical noise such as hard-contact switches, relays, and AC motor drives. For more information on proper grounding guidelines, see the *Industrial Automation Wiring and Grounding Guidelines*, publication [1770-4.1](#).

ATTENTION

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

ATTENTION

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

Safety Considerations

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

Hazardous Location Considerations

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

WARNING**EXPLOSION HAZARD**

- Substitution of components may impair suitability for Class I, Division 2.
 - Do not replace components or disconnect equipment unless power has been switched off.
 - Do not connect or disconnect components unless power has been switched off.
 - This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
 - All wiring must comply with N.E.C. article 501-10(b).
-

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

Communication Cables for Class I, Division 2 Hazardous Locations

Description	Catalog No.
This 3.96 m (12 ft) cable has two 9-pin DTE connectors and is used to connect the RS232 channel (Channel 1 or 2) on the DataSite controller to a serial port on a personal computer.	1747-CP3

Environnements dangereux

Cet équipement est conçu pour une utilisation en environnements dangereux de Classe I, Division 2, Groupes A, B, C, D. La mise en garde suivante s'applique à utilisation en environnements dangereux.

WARNING



DANGER D'EXPLOSION

- La substitution de composants peut rendre cet équipement impropre à une utilisation en environnement de Classe I, Division 2.
- Ne pas remplacer de composants ou déconnecter l'équipement sans s'être assuré que l'alimentation est coupée.
- Ne pas connecter ou déconnecter des composants sans s'être assuré que l'alimentation est coupée.
- Ce produit doit être installé dans une armoire. Tous les câbles connectés à l'appareil doivent rester dans l'armoire ou être protégés par une goulotte ou tout autre moyen.
- L'ensemble du câblage doit être conforme à la réglementation en vigueur dans les pays où l'appareil est installé.

Utilisez uniquement les câbles de communication suivants dans les environnements dangereux de Classe I, Division 2.

Classification des environnements	Câbles de communication
Environnement dangereux de Classe I, Division 2	1747-CP3 RS232 Serial Communications Cable

Disconnecting Main Power

WARNING



Explosion Hazard

Do not replace components, connect equipment, or disconnect equipment unless power has been switched off.

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

Safety Circuits

WARNING



Explosion Hazard

Do not connect or disconnect connectors while circuit is live.

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

Power Distribution

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

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

Periodic Tests of Master Control Relay Circuit

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

Power Considerations

The following explains power considerations for the DataSite controller.

Loss of Power Source

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

Input States on Power Down

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

Other Types of Line Conditions

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

Preventing Excessive Heat

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

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

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

TIP

Do not bring in unfiltered outside air. Place the controller in an enclosure to protect it from a corrosive atmosphere. Harmful contaminants or dirt could cause improper operation or damage to components.

Master Control Relay

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

ATTENTION

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

TIP

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

The AC line of the DC output power supply should be fused.

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

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

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

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

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

TIP

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

Using Emergency-Stop Switches

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

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

TIP

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

Using the Lithium Battery

The DataSite controller is equipped with a non-replaceable lithium battery that is fixed onto a battery seat on the circuit board.

IMPORTANT

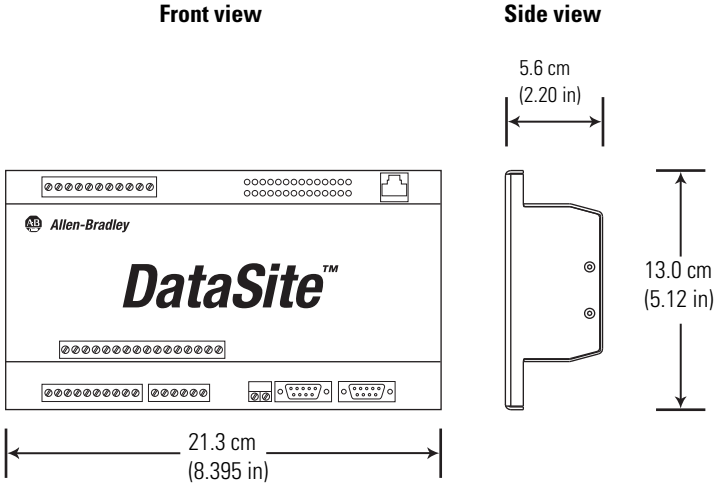
Contact your local Rockwell Automation representative to arrange for a battery replacement if the battery needs to be replaced.

For more information on the battery, see [Lithium Battery on page 54](#).

Controller Mounting Dimensions

The dimensions of the DataSite controller are shown in this diagram. The dimensions are identical for all DataSite catalog numbers.

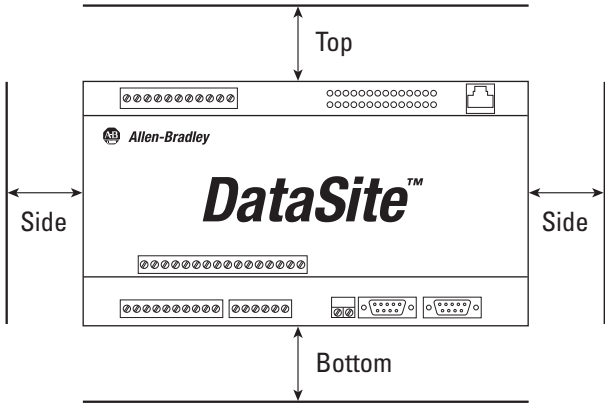
1758-FLO301, 1758-FLO302, 1758-RTU201, 1758-RTU202



44374

Controller Spacing

When mounting the controller, allow 25 mm (1 in.) of space on all sides for adequate ventilation. Maintain spacing from enclosure walls, wireways, adjacent equipment, and the like, as shown below.



44375

Mounting the Controller

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

ATTENTION

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

DIN Rail Mounting

You can mount the controller either horizontally or vertically on DIN rails, but horizontal mounting is recommended for thermal considerations. You need a small Phillips head screwdriver for the installation or removal of the controller. You can mount the controller on EN50022-35x7.5 DIN rails.

Follow these steps to install your controller on the DIN rail.

1. Mount your DIN rail.
Make sure that the placement of the controller on the DIN rail meets the recommended spacing requirements. See [Controller Spacing on page 19](#).
2. Loosen the two clamp screws until the clamp can slide out.

IMPORTANT

Do not remove the screws from the clamp, otherwise they will drop into the chassis.

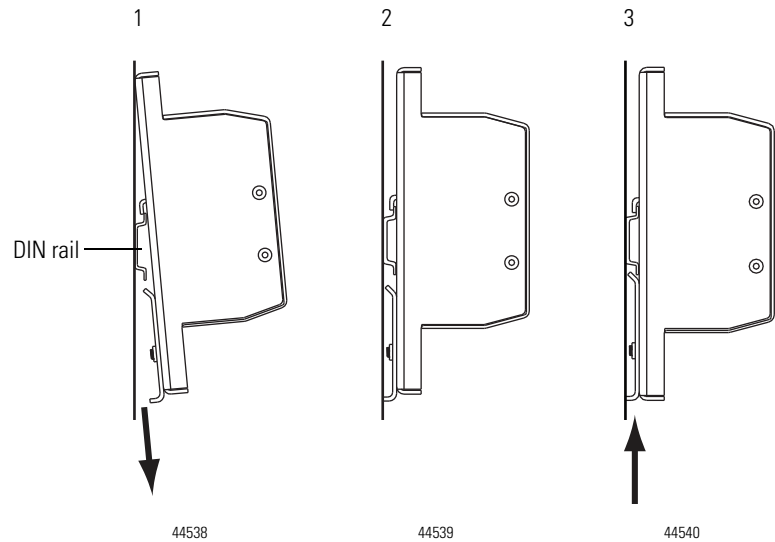
3. Place the controller onto the DIN rail, using the rail hooks on the back of the controller.

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

⁽²⁾ Over Voltage Category II is the load level section of the electrical distribution system. At this level transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.

⁽³⁾ Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

- Slide the clamp out while pushing the controller fully onto the DIN rail (1). When the controller is properly aligned on the DIN rail (2), slide the clamp in, so that it make direct contact with the lower edge of the DIN rail (3).



- Tighten the clamp screws.

Follow these steps to remove your controller from the DIN rail.

- Loosen the two clamp screws until the clamp can slide out, taking care not to dislodge the clamp screws from the clamp.
- Remove the controller.

Notes:

Wiring the Controller

This chapter describes how to wire the DataSite controller.

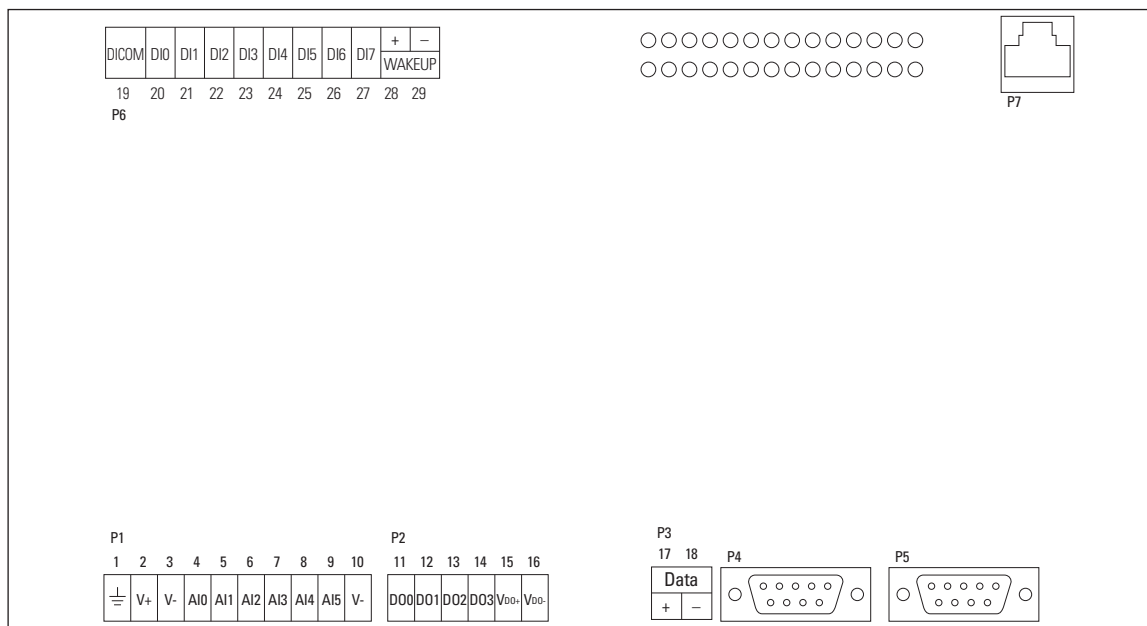
Connectors on the DataSite Controller

The connecting terminal of the DataSite controller can be divided into three parts:

- Power supply input terminal
- I/O signal wire connecting terminal, such as AI, DI, DO, AO, PI, Wake up, and HART.
- Local/long-distance communication terminal, such as COM1 (RS232/RS485), COM2 (RS232), and the Ethernet interface.

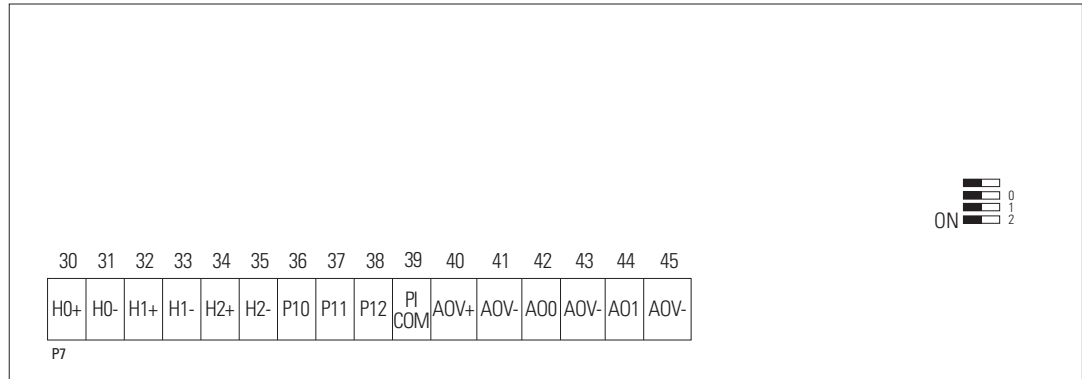
The distribution of terminal groups is shown as follows:

Lower Board



44624

Upper Board



44625

Wiring Requirements

This section contains recommendations and instructions for wiring the controller.

Wiring Recommendation

ATTENTION

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

ATTENTION

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

United States Only: If the controller is installed within a potentially hazardous environment, all wiring must comply with the requirements stated in the National Electrical Code 501-10 (b).

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

TIP

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

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

Wire Requirements

Wire Type		Wire Size (2 wire maximum per terminal screw)	
		1 wire per terminal	2 wire per terminal
Solid	Cu-90°C (194°F)	#12 to #22 AWG	#16 to #22 AWG
Stranded	Cu-90°C (194°F)	#14 to #22 AWG	#18 to #22 AWG

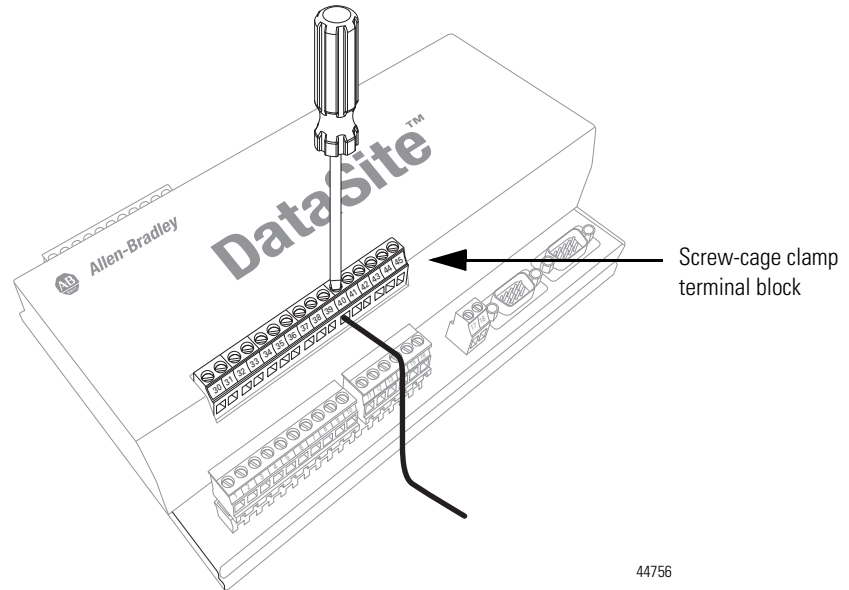
Wiring torque = 0.8 Nm (7.0 in-lb) rated

Wiring the Terminal Block

The DataSite controllers have screw-cage clamps on the input and output terminal blocks. With screw-cage clamp terminal blocks, there is no need to attach additional hardware such as a spade lug to the wire, or to use a finger-safe cover.

To wire the terminal block:

1. Strip the end of the wire.
The recommended length for the stripped end of the wire is 11.0 mm (0.440 in.).
2. Insert it into an open clamp.
3. Using a small, flat-blade screwdriver, tighten the terminal screw. To ensure that the wire conductor is secured inside the clamp, tighten it to the rated torque, 0.8 Nm (7.0 in-lb).

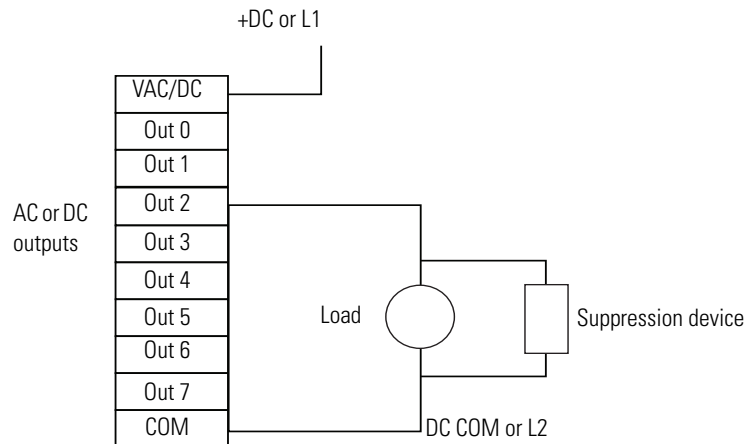


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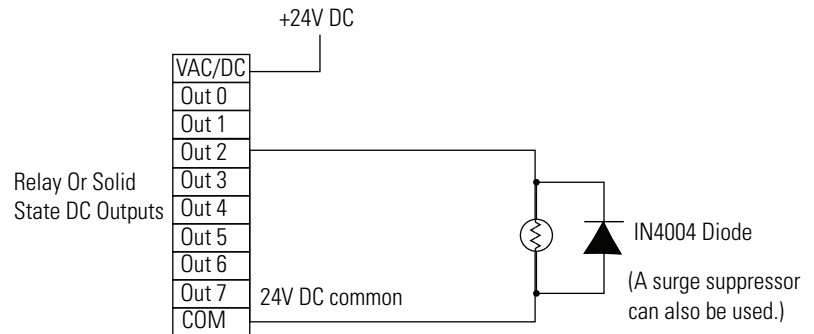
Using Surge Suppressors

Because of the potentially high current surges that occur when switching inductive load devices, such as motor starters and solenoids, the use of some type of surge suppression to protect and extend the operating life of the controllers output field effect transistors (FETs) or contacts is required. Switching inductive loads without surge suppression can significantly reduce the life expectancy of the output channel. By adding a suppression device directly across the coil of an inductive device, you prolong the life of the output or relay contacts. You also reduce the effects of voltage transients and electrical noise from radiating into adjacent systems.

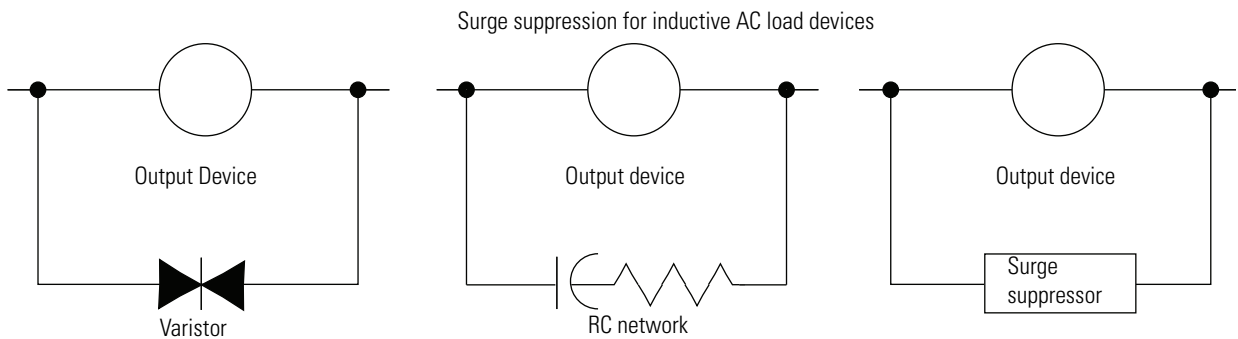
The following diagram shows an output with a suppression device. We recommend that you locate the suppression device as close as possible to the load device.



If the outputs are DC, we recommend that you use an 1N4004 diode for surge suppression, as shown below. For inductive DC load devices, a diode is suitable. A 1N4004 diode is acceptable for most applications. A surge suppressor can also be used. See [Recommended Surge Suppressors on page 28](#) for recommended suppressors. As shown below, these surge suppression circuits connect directly across the load device.



Suitable surge suppression methods for inductive AC load devices include a varistor, an RC network, or an Allen-Bradley surge suppressor, all shown below. These components must be appropriately rated to suppress the switching transient characteristic of the particular inductive device. See [Recommended Surge Suppressors on page 28](#) for recommended suppressors.



Recommended Surge Suppressors

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

Recommended Surge Suppressors

Device	Coil Voltage	Suppressor Catalog Number
Bulletin 509 Motor Starter Bulletin 509 Motor Starter	120V AC 240V AC	599-K04 ⁽¹⁾ 599-KA04 ⁽¹⁾
Bulletin 100 Contactor Bulletin 100 Contactor	120V AC 240V AC	199-FSMA1 ⁽²⁾ 199-FSMA2 ⁽²⁾
Bulletin 709 Motor Starter	120V AC	1401-N10 ⁽²⁾
Bulletin 700 Type R, RM Relays	AC coil	None Required
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	12V DC 12V DC	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	24V DC 24V DC	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	48V DC 48V DC	199-FSMA9
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	115-125V DC 115-125V DC	199-FSMA10
Bulletin 700 Type R Relay Bulletin 700 Type RM Relay	230-250V DC 230-250V DC	199-FSMA11
Bulletin 700 Type N, P, or PK Relay	150V max, AC or DC	700-N24 ⁽²⁾
Miscellaneous electromagnetic devices limited to 35 sealed VA	150V max, AC or DC	700-N24 ⁽²⁾

⁽¹⁾ Varistor – Not recommended for use on relay outputs.

⁽²⁾ RC Type – Do not use with Triac outputs.

Power Source Requirements

ATTENTION



The DataSite controllers (catalog numbers 1758-FLO301, 1758-FLO302, 1758-RTU201, 1758-RTU202) must be powered by a National Electrical Code (NEC) or Canadian Electrical Code (CEC) Class 2 power source when used in locations covered by Underwriters Laboratories.

In locations governed by International Electrotechnical Commission (IEC) or EN standards, a Safety Extra Low Voltage (SELV) power source must be used.

Grounding the Controller

In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground terminal of the controller to the ground bus prior to connecting any devices. Use AWG #14 wire.

ATTENTION



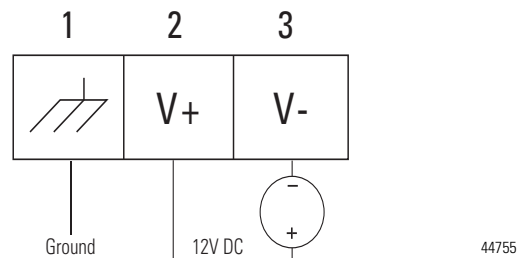
All devices connected to the RS232/RS485 communication port must be referenced to controller ground, or be floating (not referenced to a potential other than ground). Failure to follow this procedure may result in property damage or personal injury.

You must also provide an acceptable grounding path for each device in your application. For more information on proper grounding guidelines, refer to the *Industrial Automation Wiring and Grounding Guidelines*, publication [1770-4.1](#).

Power Wiring

Connect the "V+" terminal to the "+" end of 12V DC.

Connect the "V-" terminal to the "-" end of 12V DC.



WARNING



Do not reverse the polarity of the current.

Refer to [Power Source Requirements on page 28](#) for details on wiring.

I/O Wiring

For the orifice plate metering (AGA3), the input signals are differential pressure, static pressure, and temperature. For the turbine metering (AGA7), the input signals are pulse counting, static pressure, and temperature. The Datasite controller has 8-analog input channels (two channels also provide a HART point-to-point interface), a 13 device HART multi-point interface, and 3-channel pulse counting (PI) acquisition channels.

Refer to [Power Source Requirements on page 28](#) for details on wiring.

Minimizing Electrical Noise

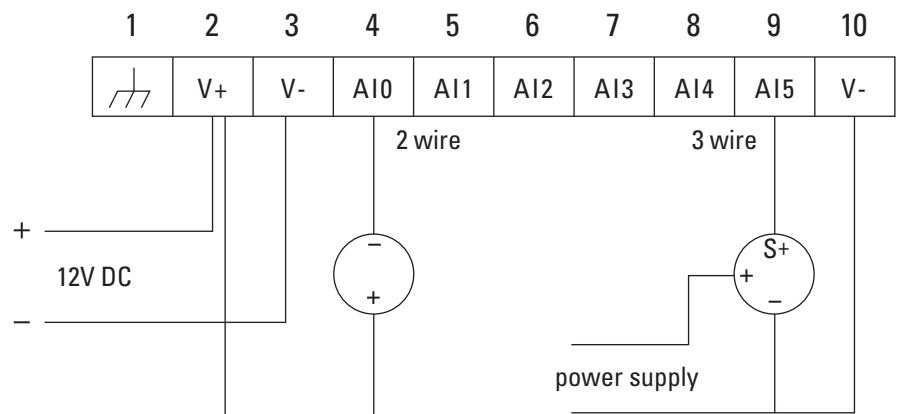
Because of the variety of applications and environments where controllers are installed and operating, it is impossible to ensure that all environmental noise will be removed by input filters. To help reduce the effects of environmental noise, install the DataSite controller in a properly rated enclosure, for example a NEMA enclosure. Make sure that the DataSite controller is properly grounded.

A system may malfunction due to a change in the operating environment after a period of time. Periodically check system operation, particularly when new machinery or other noise sources are installed near the DataSite controller.

Wiring for Analog Input (AI)

The analog input circuits are equipped with overvoltage and overcurrent protection to avoid damage due to false field connection. The field connection can be divided into two-wire system and three-wire system.

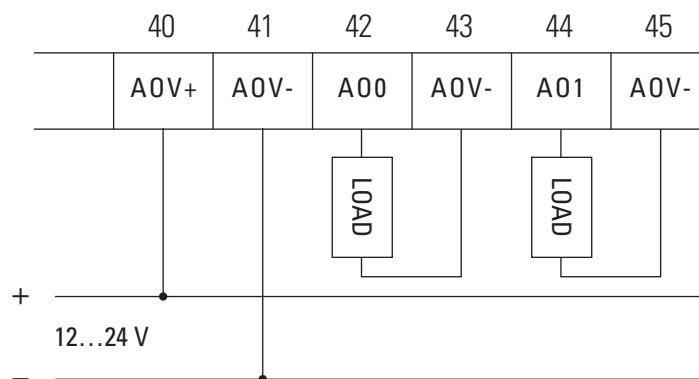
There are two types of adjustable input ranges for analog inputs, 0...10V for the 1758-FLO301 and 1758-RTU201 controllers, and 4...20 mA for the 1758-FLO302 and 1758-RTU202 controllers.



44691

Wiring for Analog Output (AO)

AO has one type of output range, 4...20 mA. The output end is equipped with short-circuit protection. It can be used to control the transducer, control valve, temperature controller and other devices that need analog signal control.



44692

Minimizing Electrical Noise on Analog Channels

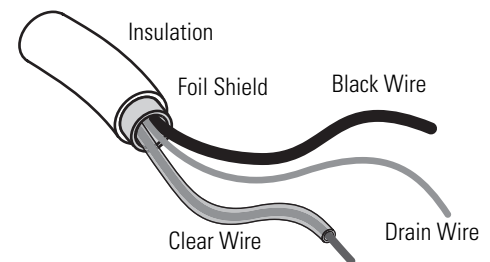
Inputs on analog channels employ digital high-frequency filters that significantly reduce the effects of electrical noise on input signals. However, because of the variety of applications and environments where analog controllers are installed and operated, it is impossible to ensure that all environmental noise is removed by the input filters.

Several specific steps can be taken to help reduce the effects of environmental noise on analog signals:

- install the DataSite controller system in a properly rated (i.e., NEMA) enclosure. Make sure that the DataSite controller system is properly grounded.
- use Belden cable #8761 for wiring the analog channels, making sure that the drain wire and foil shield are properly earth grounded.
- route the Belden cable separately from any AC wiring. Additional noise immunity can be obtained by routing the cables in grounded conduit.

Grounding Your Analog Cable

Use shielded communication cable (Belden #8761). The Belden cable has two signal wires (black and clear), one drain wire, and a foil shield. The drain wire and foil shield must be grounded at one end of the cable.

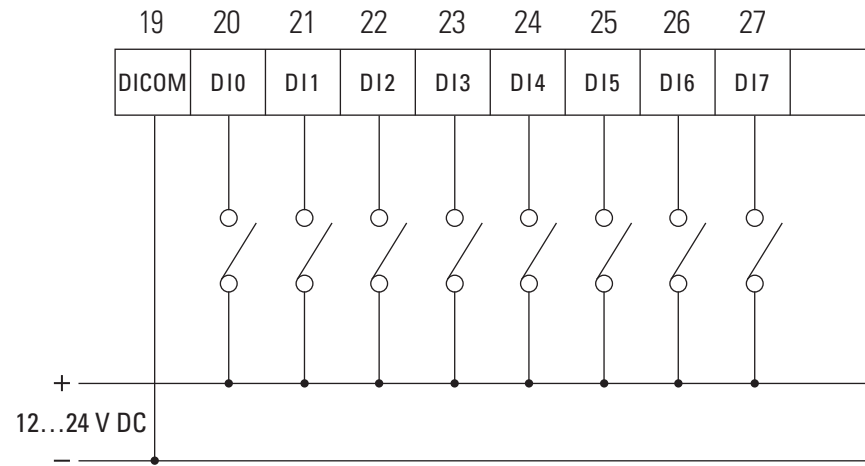


IMPORTANT

Do not ground the drain wire and foil shield at both ends of the cable.

Wiring for Digital Input (DI)

Keep the DI effective high level input voltage range within 12...24V DC.
The DI signal can be used to measure digital quantity such as the on/off state.

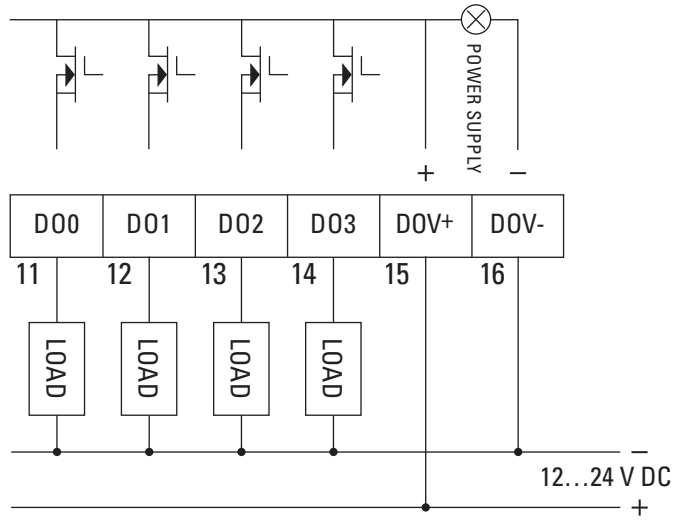


44693

Wiring for Digital Output (DO)

The DO output is in the form of FET outputs. The FET output capacity is 24V DC @ 200 mA.

DO arrays are DO0...DO3 on the connecting terminal.



44694

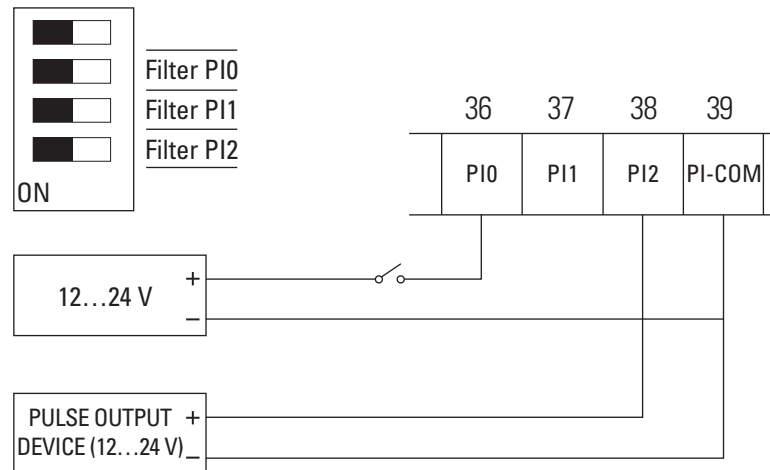
ATTENTION



If a high voltage or a large current is required, an interposing relay should be connected.

Wiring for Pulse Count Input (PI)

Counter inputs operate as DC inputs or as high-speed counter inputs. This figure shows how to wire these inputs.



44695

Each pulse input has a filter circuit that allows more reliable operation in noisy environments, but at reduced counting frequency. The factory default setting of the filter is disabled, allowing operation to 10 KHz. With the filter DIP-switch set to on, maximum frequency is reduced to 30 Hz.

Wiring for RS232 Serial Communications

Shielded cabling must be used for RS232 wiring in the DataSite controller. The shield should be connected to chassis ground at one point. Failure to properly shield the cable may result in the installation not complying with FCC or DOC wireless electromagnetic interference regulations.

The following table shows the serial and protocol communication parameters supported by RS232 Serial port. These parameters are set from the DS Setting software utility for the 1758-RTU controller or the DS FloConfig software utility for the 1758-FLO controller. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

Serial and protocol communication parameters

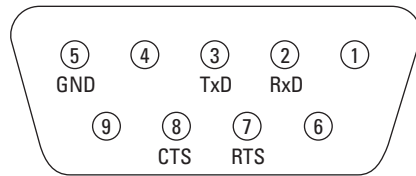
Parameter	Engineering value
Baud rate (bps)	2400, 4800, 9600, 19200, 38400, 57600
Communication duplex mode	Full Duplex, Half Duplex
Parity	Odd, None or Even
Data bits	7 or 8 bits

Serial and protocol communication parameters (Continued)

Parameter	Engineering value
Stop bits	1 or 2 bits
Communication protocol	Modbus RTU, Modbus ASCII, DNP3
Protocol mode	Master, Slave (DNP3 supports only slave mode.)
Connecting type	DB-9P

RS232 DB-9P Connector

When using RS232 serial connection, connect the interface COM of PC and interface COM1 or COM2 of controller with data cables of 9-pin standard connector (DB-9P).



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In the following table an EFFECTIVE level means a voltage of +3V or greater; a LEISURE level means a voltage of -3V or less.

Pin Assignments for RS232 Connector

Pin	Function	Type	Description
Pin 1	DCD	NC	This pin is not connected.
Pin 2	RXD	Input	LEISURE for being in waiting state. EFFECTIVE for receiving data, and the RXD LED will be blinking.
Pin 3	TXD	Output	LEISURE for being in waiting state. EFFECTIVE for transmitted data, and the TXD LED will be blinking.
Pin 4	DTR	NC	This pin is not connected.
Pin 5	GROUND	GND	This pin is connected to the system ground.
Pin 6	—	NC	This pin is not connected.
Pin 7	RTS	Output	EFFECTIVE if full duplex operation is selected for the port. EFFECTIVE just before and during transmission of data if half duplex operation is selected. LEISURE when no data is being transmitted. RTS LED is lighting for an EFFECTIVE level.

Pin Assignments for RS232 Connector (Continued)

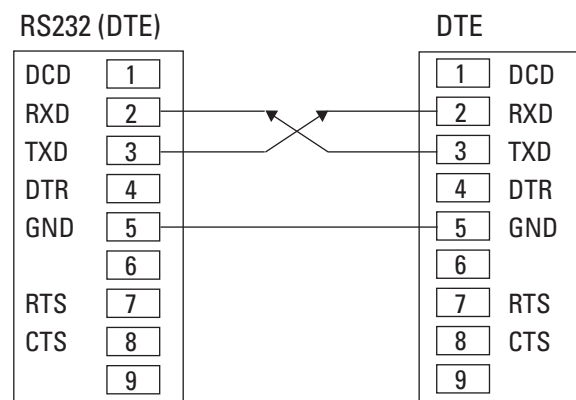
Pin	Function	Type	Description
Pin 8	CTS	Input	EFFECTIVE for the communication port to transmit data. When the attached device does not provide this signal, the controller stays at an EFFECTIVE level. When the attached device does provide this signal, it must set CTS to EFFECTIVE to allow the controller to transmit data. CTS LED is lighting for an EFFECTIVE level.
Pin 9	—	NC	This pin is not connected.

All of the peripheral connecting wires of RS232 should be shielded cables. The shielding layer should be connected with the shell at one point; the metal shell of DB-9P is a good grounding point.

There are several methods to connect RS232 port with DTE and DCE (data communication equipment). The simplest connection method is three-wire system connection: RXD, TXD and signal ground.

RS232 DTE to RS232 DTE without Handshaking

The following figure has shown a standard connection mode between RS232 port and DTE without handshaking signal.

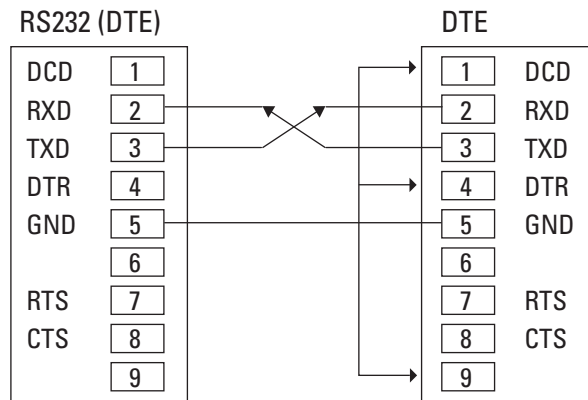


44696

RS232 DTE to RS232 DTE with Handshaking

Some DTE (Data Terminal Equipment) require handshaking signal wires. For details, refer to the relevant DTE manuals. The wires CTS, RTS, DTR and DCD are used rarely.

The following figure shows a standard connection mode between RS232 port and DTE with handshaking signal.



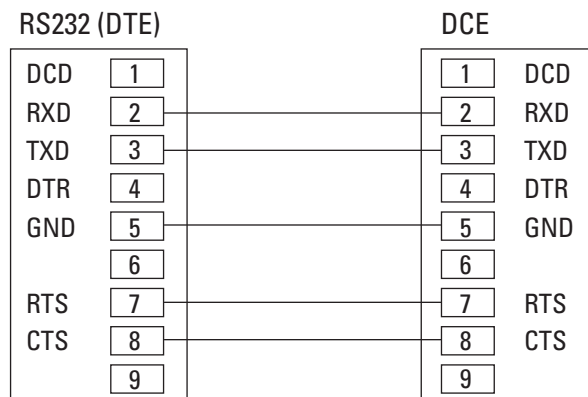
44697

RS232 DTE to RS232 DCE with Handshaking

DCE (Data Communication Equipment) needs different signal wires, but generally, DCE must be connected with the handshaking signal wire.

TIP Most DCE use half-duplex communication. When using these equipment, select half-duplex.

This figure shows a representative connection mode between RS232 port and DCE with handshaking signal.



44698

Wiring for RS485 Serial Communications

RS485 Port

The following table shows the serial and protocol communication parameters supported by the RS485 serial port. These parameters are set from the DS Setting software utility for the 1758-RTU controller or the DS FloConfig software utility for the 1758-FLO controller. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

Serial and protocol communication parameters

Parameter	Engineering value
Baud rate (bps)	2400, 4800, 9600, 19200, 38400, 57600
Communication duplex mode	Half Duplex
Parity	Odd, None or Even
Data bits	7 or 8 bits
Stop bits	1 or 2 bits
Communication protocol	Modbus RTU, Modbus ASCII, DNP3
Protocol mode	Master, Slave (DNP3 supports only Slave mode.)

The RS485 port of the DataSite controller receives and sends voltage, measured in microvolts, to other pieces of RS485 equipment. A piece of RS485 equipment can connect with up to 32 pieces of equipment. The recommended maximum transmission distance is 1200 m and the two ends should have terminal resistance.

Signal grounds of the RS485 equipment are not connected together but set according to the electrical grounding of each piece of equipment. There should be a difference of a few volts between the grounding voltage of each piece of RS485 equipment. The RS485 port runs in the two-wire mode.

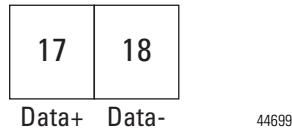
IMPORTANT

When you use the shielded cable, single-end grounding by the shielding layer is adopted.

RS485 Two-wire Connection Mode

When the RS485 port uses a 2-bit fixed connecting terminal to connect with the RS485 network, it runs primarily in the two-wire mode.

RS485 Termination



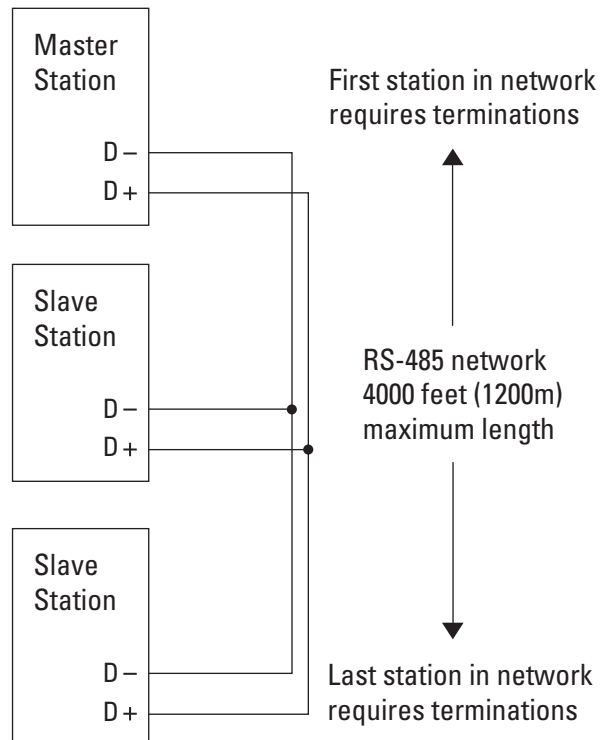
The following table describes each termination signal of the RS485 port.

Pin Assignments for RS485 Connector

Pin	Function	Description
17	Data+	The terminal is the differential input/output positive terminal.
18	Data-	The terminal is the differential input/output negative terminal.

When the two-wire connection is made, a pair of wires is used for sending and receiving data.

RS485 Field Wiring—Two-wire Mode



Termination Resistors

120-ohm termination resistors are required on each of the two physical ends of one network segment. It also means that the two communication ports which are on the physical end position of one network segment must be connected with termination resistors. Other communication ports of this network segment should not be connected with termination resistors.

See [RS485 Field Wiring—Two-wire Mode on page 40](#).

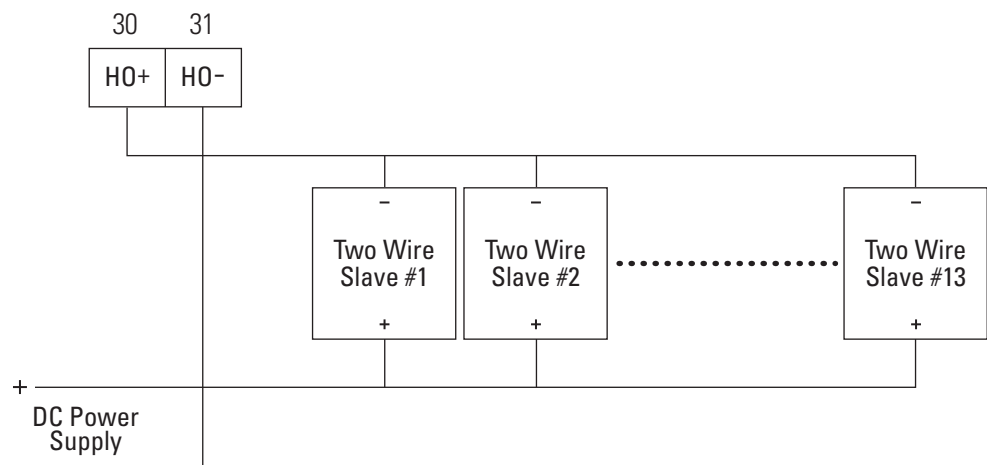
These termination resistors are installed to make sure the data received will be accurate even if the following conditions on the RX line occur:

- Open inputs
- Terminated inputs
- Sudden inputs (shorted circuit)

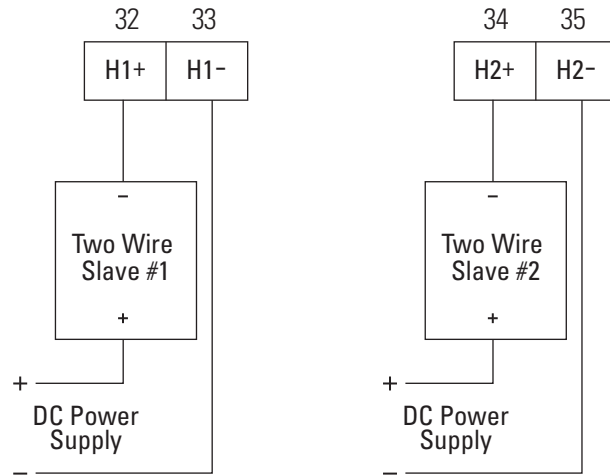
Wiring for HART Communication

The controller comes with three HART protocol communications ports, including one that is multi-point, and can connect to 13 HART protocol meters. The other two are point-to-point ports, and can also collect 4...20 mA signals.

HART multi-point port wiring



44701

HART1 or HART2 point-to-point wiring

44703

Wiring for Ethernet Communication

When using an Ethernet connection, connect the Ethernet interface of the PC and the Ethernet interface of the controller with a 10BASE-T unshielded twisted pair of a 8-pin RJ-45 connector.

It is recommended that the connecting cable of the Ethernet interface belongs to category 5E cable. The protocols and communication parameters and indices of the Ethernet interface have been shown in the table as follows. These parameters are set from the DS Setting software utility for the 1758-RTU controller or the DS FloConfig software utility for the 1758-FLO controller. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

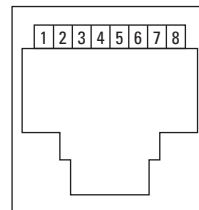
Parameter descriptions for Ethernet port

Parameter	Engineering Value
IP address setup	Set it up according to the requirements. The default IP address is 192.168.100.75.
Port number	Set it up according to the requirements. The default port number is 502.
Physical address	XX:XX:XX:XX:XX:XX 6 hexadecimal integers, each ranging from 0...FF. For example, 00:11:25:48:29:E8
Protocol	Modbus TCP Modbus via TCP Modbus via UDP DNP3 via TCP DNP3 via UDP
Connecting device	Slave device
Network mask	Default value: no setup

Ethernet RJ-45 connector

The receptacle (P8) of the RJ-45 module is the connection terminal of Ethernet. The receptacle of the RJ-45 module matches its 8-pin connector and adopts a 10BASE-T Unshielded Twisted Pair. Pins 1 and 2 are used for transmitting data, pins 3 and 6 are used for receiving data, and pins 4, 5, 7 and 8 are spare pins.

Ethernet RJ-45 connector



44627

The RJ-45 port definition of Ethernet is as follows:

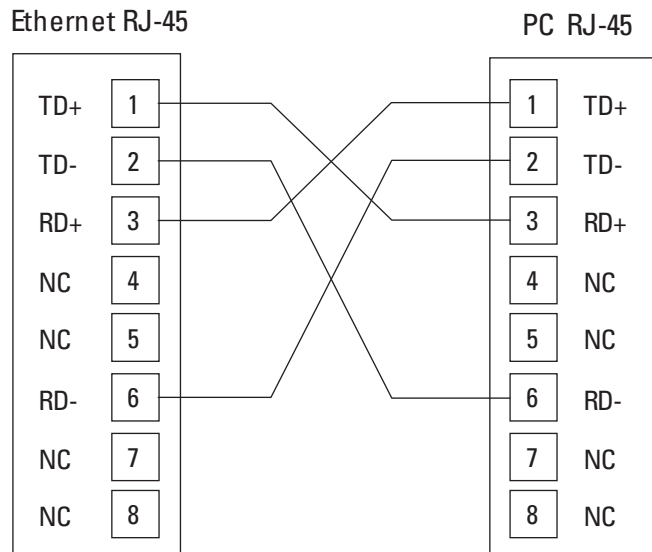
Pin assignments of Ethernet connector

Pin	Function
1	Transmit data TD+
2	Transmit data TD-
3	Receive data RD+
4	NC
5	NC
6	Receive data RD-
7	NC
8	NC

Ethernet cable

The Ethernet cable connecting the RJ-45 connector of the DataSite controller to the PC is a 10BASE-T standard non-shielded twisted pair. The following figure shows the array mode of the Ethernet cable.

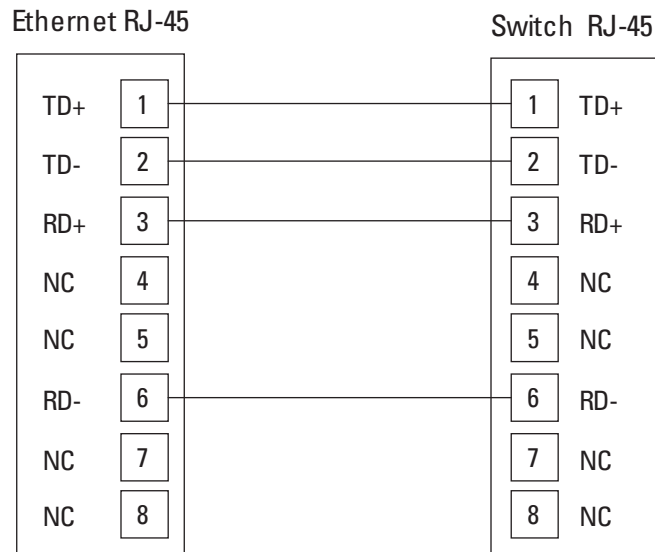
Ethernet to PC



44628

The Ethernet cable connecting the RJ-45 connector of the DataSite controller to the Ethernet Switch is a 10BASE-T standard non-shielded twisted pair. The following figure shows the array mode of the Ethernet cable.

Ethernet to Switch



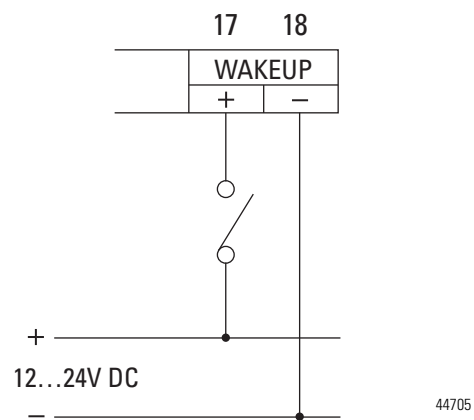
44629

Wiring for Wake Up mode

IMPORTANT

Wake Up mode is applicable to only 1758-RTU controllers.

To reduce power consumption in unattended or solar-powered applications, the controller can be configured to enable Sleep mode by programming the PW_SHDN function block. To exit Sleep mode and wake up the controller, input a high voltage level to the WAKEUP terminal.



Notes:

Operating the Controller

This chapter describes the modes of operation for the DataSite controller.

Operating Modes

You may start up the DataSite controller in the Run or the Service mode. Starting the controller in the Run mode automatically executes DataSite Workbench programs in the controller memory. Starting the controller in the Service mode allows the controller to be initialized.

Run Mode

Run mode is the normal or default operating mode of the DataSite controller. No action is required to select Run mode. When the DataSite controller starts in Run mode, the following happens.

- The user defined serial communication parameters for all COM ports are used.
- If a DataSite program is loaded in the RAM, it is executed.

Service Mode

Service mode is used during application programming and maintenance work. Use the DS Settings or DS FloConfig tool to go into Service mode. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

When the DataSite controller starts in Service mode, the following functions are available.

- Clear DataSite program
- Initialize controller communication parameters
- Initialize file system
- Initialize registers
- Test communication

Sleep Mode

Sleep mode is available on 1758-RTU controllers only. 1758-FLO controllers do not provide Sleep mode due to requirements for periodic execution of the AGA gas flow calculations.

DataSite controllers are capable of extremely low power operation when in Sleep mode. In Sleep mode, the following will occur:

- All programs stop executing.
- The power supply of 3.3V for circuit is shut off.
- The real-time clock and timer continue to function.
- 12V DC power is not affected.

DataSite controllers can switch to Sleep mode under control of the application program. If one of the following conditions occurs, the controller will be switched out of Sleep mode to return to normal operation.

- A real-time clock alarm, as defined by an application program, is triggered.
- A high voltage level signal is applied to the WakeUp input.

LED Indicators

PWR STAT D00 D02 D10 D12 D14 D16 PI0 PI2 TX0 TX1 TX2 10V100M
 RUN ERR D01 D03 D11 D13 D15 D17 PI1 LINK RX0 RX1 RX2 FH

Indicator	State	Description
PWR	Green	Power is applied. This indicator is not affected by LED power control settings.
RUN	Green	Normal operation. This indicator is not affected by LED power control settings.
STAT	Flasing red	DataSite application running
ERR	Yellow	Error detected
D10...D17	Green	Corresponding digital input is on
D00...D03	Green	Corresponding digital output is on
PI0...PI2	Green	Corresponding pulse input voltage is more than 8V
TX0	Flashing red	Transmitting data through HART port
RX0	Flashing green	Receiving data through HART port
TX1	Flashing red	Transmitting data through serial port 1
RX1	Flashing green	Receiving data through serial port 1
TX2	Flashing red	Transmitting data through serial port 2

Indicator	State	Description
RX2	Flashing green	Receiving data through serial port 2
LINK	Flashing yellow	Transmitting or receiving data through Ethernet port
10\100M	Red	speed for ethernet connection, 10Mbps or 100Mbps
FH	Green	Ethernet mode, half duplex or full duplex

Power Control

LED Power Control

Lighting the LEDs on the DataSite controller board consumes power. To conserve power, you can turn off these LEDs through the controller. This feature is particularly useful when the DataSite controller is used in a solar powered system or at unattended work stations.

The enable/disable status of the LED power is set by the DS Settings or DS FloConfig configuration tool. Application programming can change the enable/disable status. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

The LED power provides power for LEDs if enabled.

PWR and RUN are not controlled by the LED power enable/disable status.

COM1 Power Control

The insulating power of COM1 port on the DataSite controller board consumes power. If the controller does not connect with a serial equipment, the controller can shut the COM1 port to conserve power. This feature is particularly useful when the DataSite controller is using solar power.

The enable/disable status of COM1 power is set by the DS Settings or DS FloConfig configuration tool. The application programming may change the enable/disable status. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

The COM1 power provides power for COM1 if enabled.

COM2 is not controlled by the COM1 power enable/disable status.

Ethernet Power Control

The Ethernet port on the DataSite controller board consumes power. If the controller does not connect with an equipment through Ethernet port, controller can shut the Ethernet port to conserve power. This feature is particularly useful when the DataSite controller is using solar power.

The enable/disable status of Ethernet port power is set by the DS Settings or DS FloConfig configuration tool. The application programming may change the enable/disable status. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

The Ethernet port power provides power for Ethernet port if enabled.

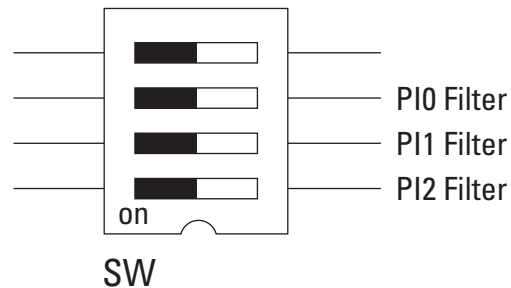
Counter Input Filters

Each of the three counter inputs on the DataSite controller can be filtered. Filtering limits the maximum digital input or counter frequency to approximately 30 Hz. Pulse inputs use filters to resolve the problems of contact bounce in low speed counting applications.

The FILTER 1, FILTER2, and FILTER3 switches control the input filter functions:

- Remove the module cover and set the configuration switches. For the location of the switch, see [Upper Board on page 24](#).
- To disable a filter, slide the switch to the right.
- To enable a filter, slide the switch to the left.

The default setting of these filters is Disabled.



44630

Real-Time Clock

The real-time clock of the DataSite controller provides the time and date independently for the operating system. The time and date remain correct during power off. The calendar automatically manages leap years.

Real time clock can be saved into register by reading through the DataSite function block, [CLOCK_GET]. The values for the data and time date are stored in single registers as two-digit values.

For example the date and time, 17:32:23, 2004-07-13, would be stored as:

Hour	Minute	Second	Year	Month	Day
17	32	23	04	7	13

For example the date and time, 00:00:01, 2000-01-01, would be stored as:

Hour	Minute	Second	Year	Month	Day
00	00	01	00	01	01

Application programs that use the date and time data must ensure that the rollover from year 99 to year 00 is accounted for in the program.

Modbus Register Assignment

There are four internal registers in the DataSite controller:

- Coil_Register,
- State_Register,
- Input_Register,
- Hold_Register.

Coil_Register and State_Register are bit registers, every register address of which is accorded with a binary bit.

Input_Register and Hold_Register are 16-bit registers.

The following table shows the Modbus address range of the controller.

Register name	Modbus address	Features
Coil_Register	00001-04096	1-bit
State_Register	10001-14096	1-bit
Input_Register	30001-31024	16-bit
Hold_Register	40001-49999	16-bit

Assigned Modbus Register Addresses of I/O Signals

The I/O points of the controller are:

6AI-3HART-8DI-4DO-2AO-3PI-1RS232-1RS232/1RS485-1Ethernet-12VDC

When we read or write those signals, we only need to read or write the registers as shown in the following table.

Signal	Registers	Value range	Meaning
6AI	30001...30006	10000...50000	Unsigned short data, standard value, readable only.
2HART (2AI)	30007...30008	10000...50000	Unsigned short data, standard value, readable only.
8DI	10001...10008	1, 0	BOOL data, readable only
3DI (PI)	10009...10011	1, 0	BOOL data, readable only (when you use PI as DI)
4DO	00001...00004	1, 0	BOOL data, readable or writable
2AO	40001...40002	10000...50000	Unsigned short data, standard value, readable or writable
3PI	30011...30016	32-bit int	Unsigned integer data, readable only

Analog Scaling

For 8AI (4...20 mA)

Current	Standard value
4.00 mA	10000
8.00 mA	20000
12.00 mA	30000
16.00 mA	40000
20.00 mA	50000

For 6AI (0...10V):

Voltage	Standard value
0.000V	10000
2.500V	20000
5.000V	30000
7.500V	40000
10.000V	50000

For 2AO (4...20 mA):

Standard value	Current
10000	4.00 mA
20000	8.00 mA
30000	12.00 mA
40000	16.00 mA
50000	20.00 mA

Scan Settings of Equipment Connected with COMs

There are 1RS232/1RS485-1RS232 serial communications on the DataSite controller. The CPU of the controller needs to be configured in order to read and write data from equipment connected with the two COMs.

Read mode:

- Read serial equipment data through configuring scan data block (US1 Block, US2 Block)
- Read serial equipment data through application program

For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

RS485/RS232 Switch Settings

The serial communication port COM1 of the DataSite controller is designed as RS485/RS232. The COM1 function can be modified by changing the configuration, or via an application program. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

IMPORTANT

COM1 is the common communication port for RS485/RS232. Only one function can be used when connecting serial communication equipment. RS485 and RS232 communication equipment cannot be connected at the same time or else there will be communication failure.

Communication Parameters

The parameters of the DataSite controller should be configured according to the application requirements. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

Lithium Battery

The DataSite controller uses a lithium battery that allows the real-time-clock (RTC) to maintain the correct time setting through periods when line power has been removed from the unit. Current drain on the battery during these periods is approximately 1 microamp.

The battery should provide approximately 5 years of operation for the RTC. The battery is also rated to maintain the real-time clock and RAM data for two years continuously without any external power.

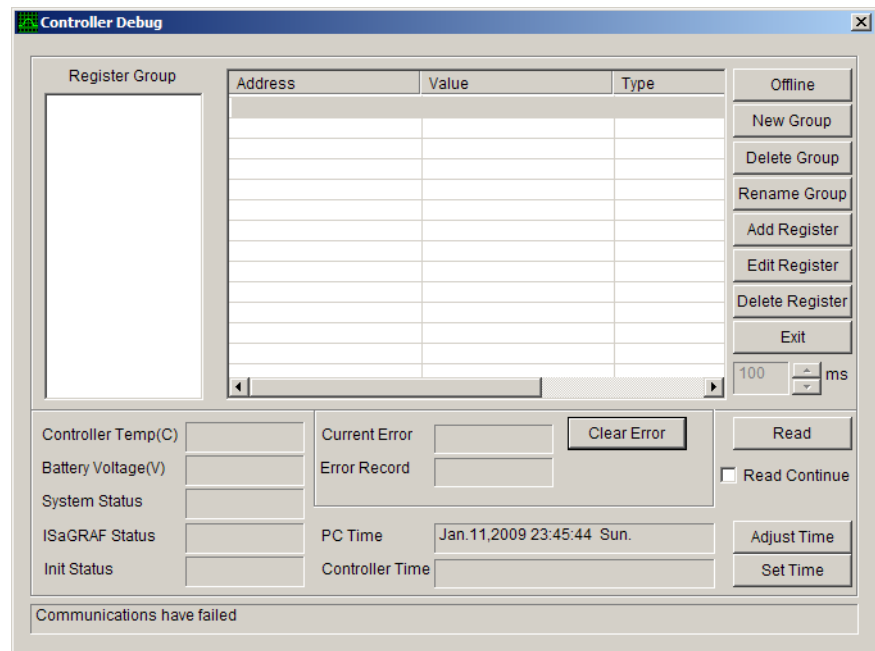
ATTENTION



Accidental shorting or extreme temperatures may damage the battery.

Battery Status Check

The DS Settings utility provides a display of the battery voltage.



If an application program uses the Sleep function of the controller, the battery should be greater than 2.0V. Otherwise, the controller may not recover from the Sleep mode. For details, refer to the DataSite Software User Manual, publication [1758-UM002](#).

If the battery voltage should drop below 2.0 V, contact your Rockwell Automation Support or your local Rockwell Automation representative to arrange for a repair or exchange of the DataSite controller.

Decommission and Recycle the Battery

ATTENTION

The lithium battery is not user replaceable. Follow the instructions in this section to remove the battery from the DataSite unit for recycling when decommissioning the DataSite unit.

IMPORTANT

Refer to the SLC 500 Lithium Battery Installation Instructions, publication [1747-IN515](#), for more information on handling, usage, storage, and disposal of lithium batteries.

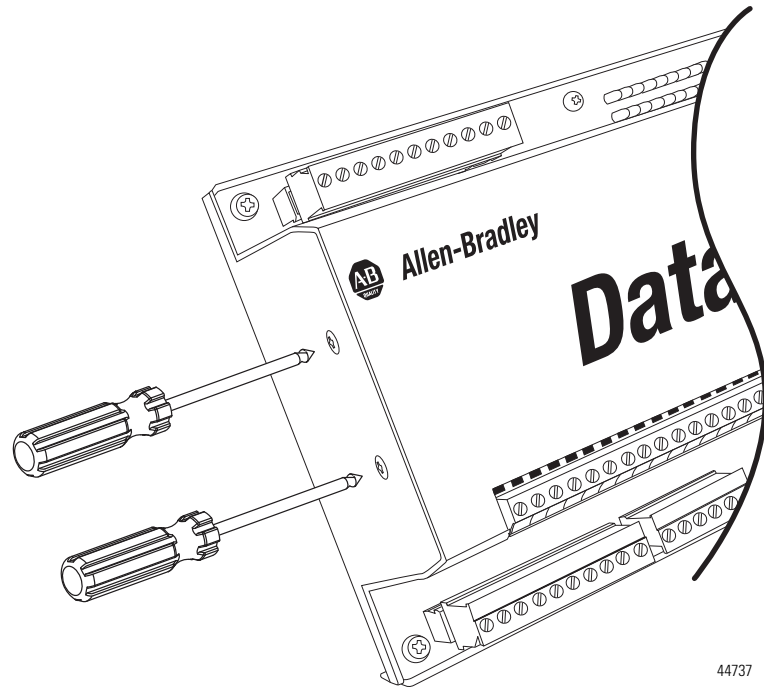
ATTENTION

When you connect or disconnect the battery an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that the area is nonhazardous before proceeding.

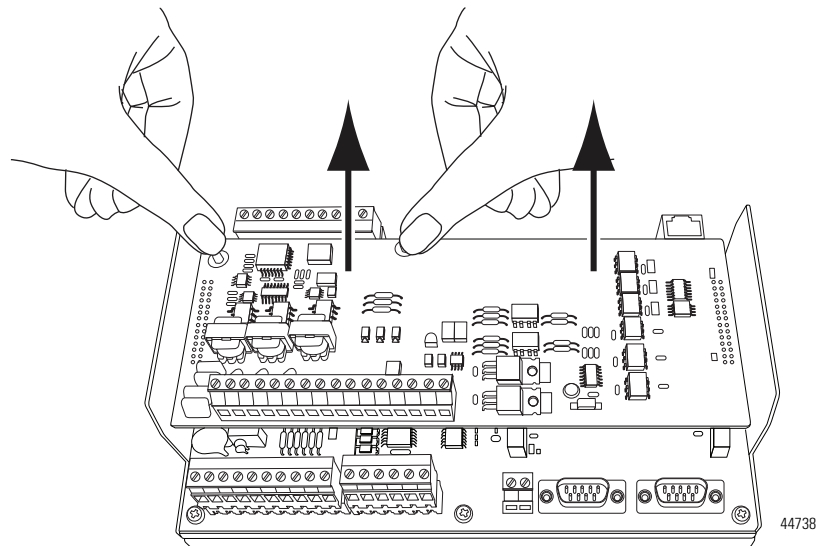
For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication [AG 5-4](#).

Follow these steps to remove the battery.

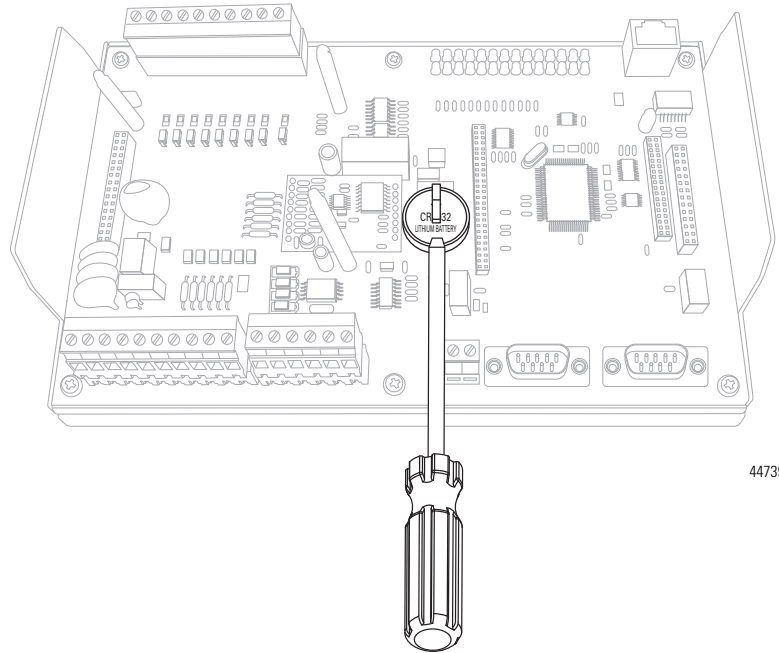
1. Remove the cover by first removing the screws on either side of the controller.



2. Pry the board off from the standoffs.

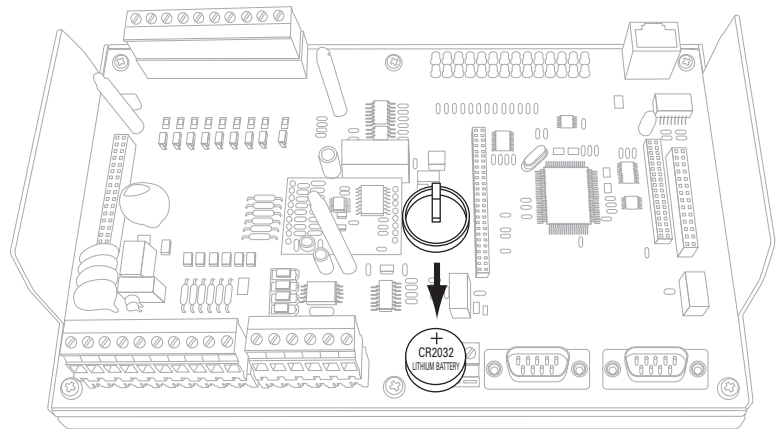


3. Use a flat-blade screwdriver to pry the battery out from under the clamp.



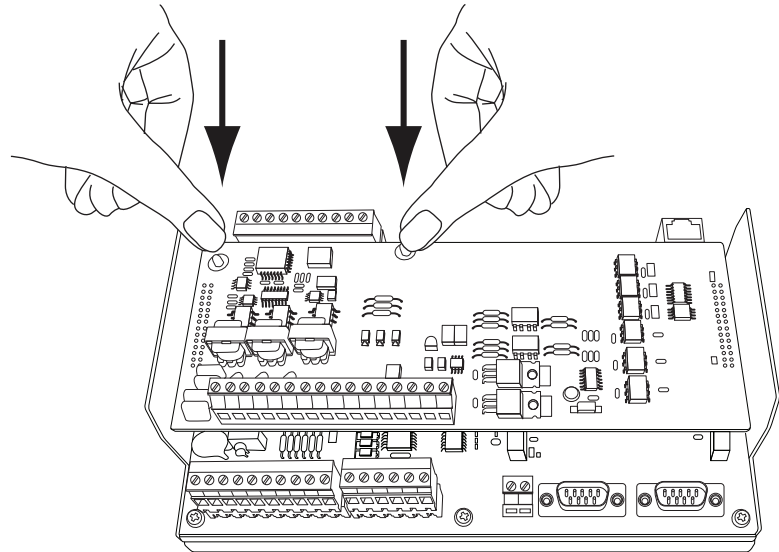
44739

4. Remove the battery.



44740

5. Replace the board onto the standoffs.



44741

6. Replace the cover, and fasten the screws securely.

Specifications

This appendix provides the following information:

- [Controller Specifications](#)
- [Flow Measurement Parameters](#)

Controller Specifications

General

Attribute	Value
Dimensions	213 x 133 x 56 mm 8.375 x 5.25 x 2.20 in.
Number of I/Os	8 digital inputs 4 digital outputs 8 analog inputs 2 analog outputs 3 pulse inputs
Power supply voltage	12V DC, (-15%, +10%)
Power consumption	80...120 mA
Heat dissipation, nom.	< 1.2 W
Input circuit type	Current Sinking
Output circuit type	Current Sourcing (FET)
Terminal screw torque	0.8 mm (7 in-lb)
Wire size	0.34... 2.5 mm ² (22...12 AWG) solid or stranded copper wire rated at 90 °C (194 °F) or greater 1.2 mm (3/64 in.) insulation max

CPU

Attribute	Value
Processor	32-bit ARM processor 30 MHz clock frequency Integrated watchdog timer
Memory	2 M (program Flash) 4 M (data Flash) 1 M (data SRAM) 32 K FRAM
Non-volatile RAM	With no power, the Flash storage with lithium battery retains data for five years.
Clock calendar	±1 minute/month
Integrated function	Watchdog timer Clock Calendar 4 advanced PID loops for 1758-RTU and 1758-FLO

Pulse Input

Attribute	Value
Voltage range	12V...24V DC
Off-state voltage	8V DC
Operating frequency	10 kHz with filters off 30 Hz with filters on
On-state current, min	5 mA
On-state current, nom	6 mA
On-state current, max	13.2 mA
Off-state leakage current	2.5 mA
Nominal impedance	2 k Ω

Digital Input

Attribute	Value
On-state voltage range	8V...24V DC
Off-state voltage range	0V...4V DC
Operating frequency	1 kHz
On-state current, min	3 mA
On-state current, nom	5 mA
On-state current, max	11 mA
Off-state leakage current	2 mA
Nominal impedance	2.4 k Ω

Digital Output

Attribute	Value
Power supply	12V...24V DC
Continuous current per point	200 mA
Operating frequency	100 Hz
On-state current, min	1 mA
On-state current, max	200 mA
Off-state leakage current	1 mA

Analog Input

Attribute	Value
Analog/Digital (A/D) resolution	16-bit
Conversion type	Successive approximation
Type	Single ended (unipolar)
Isolation voltage	500V AC from logic power supply
Transient variety protection	600 W
Voltage Input Range	0...10V DC or 4...20 mA versions
Upload time	10 ms
Response time	10 ms (10% to 90%)
Type of Data	Integer
Input Coding	Hexadecimal
Voltage input impedance	100 k Ω for 10V DC inputs 170 Ω for 20 mA inputs
Input Resolution	16-bit
Non-linearity	$\pm 0.1\%$ of full scale
Overall accuracy	$\pm 0.1\%$ of full scale at 25 °C $\pm 0.3\%$ of full scale over temperature range
Voltage Input Overvoltage Protection	Continuous input must not exceed 160% of the rated range

Analog Output

Attribute	Value
Digital/Analog (D/A) resolution	16-bit
Power supply	Successive approximation
Output signal range	4...20 mA
Maximum load Impedance	1000 Ω with 24V DC loop power 400 Ω with 12V DC loop power
Output type	Single ended regulation on positive side with common negative return
Isolation voltage	70V AC or 100V DC
Absolute accuracy	$\pm 0.2\%$ (25 °C with 250 Ω load) $\pm 0.5\%$ (full temperature range, 0...1000 Ω load)
Response time	100 ms typical (10% to 90%)
Noise and ripple, max	0.04%
Transient protection	600 W

HART

Attribute	Value
Modulation	Frequency Shift Keying (FSK) Logic 1 - 1200 Hz Logic 0 - 2200 Hz
Data rate	1200 bps
Transmit level	500 mVp-p / 250 Ω
Receive sensitivity	120 mVp-p/ on 80 mVp-p/ off
Output impedance	300 Ω transformer isolated
Input impedance	4000 Ω transformer isolated
Load resistor	250 Ω 1 W max

RS232

Attribute	Description
COM port	RS232 serial port (COM1, COM2) Data Terminal Equipment (DTE) DB-9P
Baud rate	2400, 4800, 9600, 19200, 38400, 57600
Parity	None, Odd, or Even
Data bits	7 or 8 bits
Stop bit	1 or 2 bits
Duplex	Half-duplex or full-duplex (with RTS/CTS control)
Cable length, max.	15.2 m
Protocol	Modbus RTU/ASCII, DNP3, DS Workbench (only in COM2), None
Protocol mode	Master, Slave (DNP3 supports only Slave mode.)

RS485

Attribute	Description
COM port	RS485 serial port (COM1) Data Terminal Equipment (DTE)
Baud rate	2400, 4800, 9600, 19200, 38400, 57600
Parity	None, Odd, or Even
Data bits	7 or 8 bits
Stop bit	1 or 2 bits
Duplex	Half-duplex
Cable length, max.	RS485, 1200 m
Protocol	Modbus RTU/ASCII, DNP3, None
Protocol mode	Master, Slave (DNP3 supports only Slave mode.)

Ethernet

Attribute	Description
COM port	RJ45
Communication rate	10 M/100 M bit/s
Cable length, max.	100 m
Communication Mode	Full duplex
Protocol	Modbus TCP Modbus via TCP Modbus via UDP DNP3 via TCP DNP3 via UDP
Protocol mode	Slave

Environmental Specifications

Attribute	Value
Temperature, operating	-40...70 °C (-40...158 °F)
Temperature, nonoperating	-50...80 °C (-58...176 °F)
Relative humidity	5...95% non-condensing
Vibration	IEC 60068-2-6 Constant amplitude 0.15mm: 10...57 Hz Constant acceleration 2g: 57...150 Hz
Shock	IEC 60068-2-27 18 shocks, semi-sinusoidal 15g / 11 ms
Electrical/EMC	EN 61000-6-4 2001; EN 61000-6-2 2005
ESD immunity	IEC 61000-4-2: 4 kV contact discharges 8 kV air discharges
Radiated RF immunity	IEC 61000-4-3: 10 V/m with +900 MHz keyed carrier 80% AM from 80...2000 MHz
EFT/B immunity	2 kV @ 5 kHz 1 kV @ 5 kHz on communications cable
Surge transient immunity	Communications cable: 1 kV galvanic gun I/O: 2 kV common mode, 1 kV differential mode DC power supply: 500 V common mode, 500 V differential mode
Conducted RF immunity	IEC 61000-4-6: 10V rms cable 3 V rms

Certifications

Certification (when product is marked)⁽¹⁾	Value
c-UL-us	UL Listed Industrial Control Equipment UL Listed Industrial Control Equipment for use in Canada UL Listed for Class I, Division 2 Group A,B,C,D Hazardous Locations, certified for U.S. and Canada. See UL File E10314.
CE	Marked for all application directives
C-Tick	Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11; Industrial Emissions

(1) See the Product Certification link at <http://www.ab.com> for Declaration of Conformity, Certificates, and other certification details.

Flow Measurement Parameters

The flow measurement specifications apply to 1758-FLO DataSite controllers only.

Flow Measurement Specifications (for 1758-FLO controllers only)

Attribute	Value
Meter channels	1...8 channels
Meter algorithm	AGA3/AGA7 are optional. The default is AGA3. Compressibility factor calculation using AGA8.
Clock	Accuracy 0.08s/24h, support calibration
Operation	With the software tools, DS FloConfig and DS DNP3.
Security of the system	With special license code for flow computer controller and password for parameters modification.
Data acquisition cycle	Acquisition cycle of AI-channel is 100 ms. For DI and PI channels, it is 10 ms.
Flow calculation cycle	1 s
Base conditions	User can change the base conditions.
Compressibility factor calculation	Three methods of AGA8 optional: Gas analysis, HV-GR-CO2, GR-CO2-N2
Pressure tap location	Support flange upstream and downstream tap pressure
Transient flow calculation	Supports transient volume hour flow rate calculation in base conditions and flowing conditions. Supports mass flow rate calculation. Supports low or zero flow cutoff.
Flow transaction records	Store the hourly and daily historical transaction records during 35 days. If parameters are changed, a new hourly and daily record will be logged.
Event records	700 event records
Alarm records	300 alarm records
Accumulative total	Long integer
Overall accuracy	±0.2% F.S.

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products.

At <http://www.rockwellautomation.com/support/>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration, and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/support/>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, review the information that is contained in this manual. You can contact Customer Support for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html , or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication [RA-DU002](#), available at <http://www.rockwellautomation.com/literature/>.

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