

# FB1200 Flow Computer Instruction Manual



## Application & Device Safety Considerations

### ▪ **Reading these Instructions**

Before operating a device or application, read these instructions carefully and understand their safety implications. In some situations, improper use may result in damage or injury. Keep this manual in a convenient location for future reference. Note that these instructions may not cover all details or variations in equipment or cover every possible situation regarding installation, operation, or maintenance. Should problems arise that are not covered sufficiently in the text, immediately contact Energy and Transportation Solutions (ETS) Customer Support for further information.

### ▪ **Protecting Operating Processes**

The failure of a device or application – for whatever reason – may leave an operating process without appropriate protection and could result in possible damage to property or injury to persons. To protect against this, review the need for additional backup equipment or provide alternate means of protection (such as alarm devices, output limiting, fail-safe valves, relief valves, emergency shutoffs, emergency switches, etc.). Contact ETS for additional information.

### ▪ **Using Qualified Personnel**

Installation, configuration, and any subsequent modifications to a device or application should only be performed by qualified, suitably trained personnel information.

### ▪ **System Training**

A well-trained workforce is critical to the success of your operation. Knowing how to correctly install, configure, program, calibrate, and troubleshoot your Emerson equipment provides your engineers and technicians with the skills and confidence to optimize your investment. ETS offers a variety of ways for your personnel to acquire essential system expertise. Our full-time professional instructors can conduct classroom training at several of our corporate offices, at your site, or even at your regional Emerson office. You can also receive the same quality training via our live, interactive Emerson Virtual Classroom and save on travel costs. For our complete schedule and further information, contact the ETS Training Department at 800-338-8158 or email us at [education@emerson.com](mailto:education@emerson.com).

### ▪ **Grounding Equipment**

Ground metal enclosures and exposed metal parts of electrical instruments in accordance with relevant safety standards. For the USA, refer to OSHA rules and regulations as specified in *Design Safety Standards for Electrical Systems*, 29 CFR, Part 1910, Subpart S, dated: May 16, 1981 (OSHA rulings are in agreement with the National Electrical Code). For international locations, refer to IEC 60364-4-41: PROTECTION AGAINST ELECTRIC SHOCK. You must also ground mechanical or pneumatic instruments that include electrically operated devices such as lights, switches, relays, alarms, or chart drives. The chassis (or earth ground) lug provides a safe connection point to a customer-designated ground location for ESD and transient voltage suppression. Do not use the chassis ground lug for signal, common, or return connections. **Do not connect the chassis ground lug directly to a lightning arrester/lightning rod.** Do not run signal wiring in conduit or open trays with power wiring or near heavy electrical equipment. If shielded wiring is used, ground the shield of the signal wiring at any one point of the signal loop.

**Important:** Complying with the codes and regulations of authorities having jurisdiction is essential to ensuring personnel safety. The guidelines and recommendations in this manual are intended to meet or exceed applicable codes and regulations. If differences occur between this manual and the codes and regulations of authorities having jurisdiction, those codes and regulations must take precedence.

### ▪ **Protecting from Electrostatic Discharge (ESD)**

Any device contains sensitive electronic components which can be damaged by exposure to an ESD voltage. Depending on the magnitude and duration of the ESD, it can result in erratic operation or complete failure of the equipment. Ensure that you correctly care for and handle ESD-sensitive components.

### ▪ **Ethernet Connectivity**

This automation device is intended to be used in an Ethernet network which **does not** have public access. The inclusion of this device in a publicly accessible Ethernet-based network is **not recommended**.

### ▪ **Returning Equipment**

If you need to return any equipment to ETS, it is your responsibility to ensure that the equipment has been cleaned to safe levels, as defined and/or determined by applicable federal, state and/or local law regulations or codes. You also agree to indemnify ETS and hold ETS harmless from any liability or damage which ETS may incur or suffer due to your failure to ensure device cleanliness.



**Important**

This controlled document includes **Underwriters Laboratories (UL)** safety instructions for use/installation of the Emerson FB1200 Flow Computer in hazardous locations.

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# Special Instructions for Class I Division 2 Locations

1. The Emerson FB1200 Flow Computer is listed by Underwriters Laboratories (UL) as non-incendive and is suitable for use in Class I, Division 2, Groups A, B, C and D hazardous locations or nonhazardous locations. Read this document carefully before installing a non-incendive Emerson FB1200 Flow Computer. Refer to the *Emerson FB1200 Flow Computer Instruction Manual (D301782X012)* for general information. In the event of a conflict between D301782X012 and this document, always follow the instructions in this document.
2. The Emerson FB1200 Flow Computer includes both non-incendive and unrated field circuits. Unless a circuit is specifically identified in this document as non-incendive, the circuit is unrated. Unrated circuits must be wired using wiring methods as specified in *Article 501-4(b)* of the *National Electrical Code (NEC), NFPA 70* for installations in the United States, or as specified in *Section 18-152* of the *Canadian Electrical Code* for installation in Canada.
3. All communication ports terminate on the terminal plate within the enclosure. Wiring to the connectors is unrated. No connections may be made to communication ports unless the user ensures that the area is known to be nonhazardous. Connections to the "Local Port" are temporary and must be short in duration to ensure that flammable concentrations do not accumulate while it is in use.
4. An RTD may be supplied with the Emerson FB1200 Flow Computer. Connection to the RTD is approved as a non-incendive circuit so that Division 2 wiring methods are not required.
5. I/O connections are unrated and must be wired using Division 2 wiring methods.

## DANGER

EXPLOSION HAZARD: Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

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## DANGER

EXPLOSION HAZARD: Substitution of any components may impair suitability for Class I, Division 1 or Class I, Division 2.

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## DANGER


EXPLOSION HAZARD: Do not replace batteries unless power has been switched off or the area is known to be non-hazardous. Batteries must only be changed in an area known to be non-hazardous.

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Data Plate (No Battery) – Class I  
Division 2 Non-incendive (UL)

P/N 399411-01-0



**Flow Computer**  
Remote Automation Solutions

FB1200  
RATINGS, INPUT VOLTAGE: 5.7-30VDC  
RATINGS, POWER: 10 WATTS MAX  
AMBIENT TEMP RANGE: -40°C TO 80°C  
CL I, DIV 2 GROUPS A, B, C, D.  
TEMPERATURE CODE: T4

S/N

MODEL CONFIG.

DATE MFD.:


Fromex S.A. de C.V.  
Nuevo Laredo, Tamaulipas, Mexico

**WARNING:**  
WARNING: DO NOT CONNECT OR DISCONNECT  
WHEN THE AREA IS KNOWN TO BE HAZARDOUS


AVERTISSEMENT Ne pas connecter ou  
déconnecter lorsque la zone est connu pour être  
dangereux.

COMPLIES WITH FCC CLASS A LIMITS.  
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC  
RULES.

BATTERY: NONE




REFER TO THE USER MANUAL FOR  
ADDITIONAL INSTALLATION  
INSTRUCTIONS





Data Plate (Lead Acid Battery) – Class I Division 2  
Non-incendive (UL)

P/N 399417-01-0



**Flow Computer**  
Remote Automation Solutions

FB1200  
RATINGS, INPUT VOLTAGE: 5.7-30VDC  
RATINGS, POWER: 10 WATTS MAX  
AMBIENT TEMP RANGE: -40°C TO 80°C  
CL I, DIV 2 GROUPS A, B, C, D.  
TEMPERATURE CODE: T4

S/N

MODEL CONFIG.

DATE MFD.:

Fromex S.A. de C.V.  
Nuevo Laredo, Tamaulipas, Mexico

**WARNING:**  
EXPLOSION HAZARD-BATTERIES MUST ONLY BE  
CHANGED IN AN AREA KNOWN TO BE  
NON-HAZARDOUS .


**WARNING: DO NOT CONNECT OR DISCONNECT  
WHEN THE AREA IS KNOWN TO BE HAZARDOUS**

AVERTISSEMENT: EXPLOSION BATTERIES DE  
DANGER ne doit être changè dans une région  
connue comme non dangereux.


AVERTISSEMENT Ne pas connecter ou  
déconnecter lorsque la zone est connu pour être  
dangereux.

COMPLIES WITH FCC CLASS A LIMITS.  
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC  
RULES.

BATTERY - LEAD ACID PACK: 6.0 VDC 4.5 Ah  
P/N 399457-00-0



REFER TO THE USER MANUAL FOR  
ADDITIONAL INSTALLATION  
INSTRUCTIONS



# Special Instructions for Class I Division 1 Locations

1. The Emerson FB1200 Flow Computer is listed by Underwriters Laboratories (UL) as explosion proof and is suitable for use in Class I, Division 1, Groups C and D hazardous locations or nonhazardous locations. Read this document carefully before installing an Emerson FB1200 Flow Computer. Refer to the *Emerson FB1200 Flow Computer Instruction Manual (D301782X012)* for general information. In the event of a conflict between D301782X012 and this document, always follow the instructions in this document.
2. The Emerson FB1200 Flow Computer includes both non-incendive and unrated field circuits. Unless a circuit is specifically identified in this document as non-incendive, the circuit is unrated. Unrated circuits must be wired using wiring methods as specified in *Article 501-4(b) of the National Electrical Code (NEC), NFPA 70* for installations in the United States, or as specified in *Section 18-152 of the Canadian Electrical Code* for installation in Canada.

## DANGER

Though the Emerson FB1200 Flow Computer has a local port for local interrogation, it should not be accessed with the cover removed in a Class I Division 1 area unless it has first been verified that no flammable concentrations exist in that area. The local port may be wired through a conduit, using seals, to an unclassified or Division 2 area.

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3. All communication ports terminate on the terminal plate within the enclosure. Wiring to the connectors is unrated. No connections may be made to communication ports unless the user ensures that the area is known to be nonhazardous. Connections to the "Local Port" are temporary and must be short in duration to ensure that flammable concentrations do not accumulate while it is in use.
4. An RTD may be supplied with the Emerson FB1200 Flow Computer. Connection to the RTD is approved as a non-incendive circuit.

### Note

A bendable RTD (with a plastic bushing, as utilized in Division 2 installations) may not be used in a Division 1 area as it renders the area non-explosion proof. Use an RTD connection head and explosion-proof conduit for Division 1 installations.

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5. I/O connections are unrated and must be wired using wiring methods as specified in *Article 501-4(b) of the National Electrical Code (NEC), NFPA 70* for installations in the United States, or as specified in *Section 18-152 of the Canadian Electrical Code* for installation in Canada.

** DANGER**

EXPLOSION HAZARD: Do not connect or disconnect equipment unless power has been removed or the area is known to be non-hazardous.

---

** DANGER**

EXPLOSION HAZARD: Substitution of any components may impair suitability for Class I, Division 1 or Class I, Division 2.

---

** DANGER**

EXPLOSION HAZARD: Do not replace batteries unless power has been switched off or the area is known to be non-hazardous. Batteries must only be changed in an area known to be non-hazardous.

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** DANGER**

The area must be known to be non-hazardous before servicing the unit and before installing or removing I/O wiring.

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Data Plate (No Battery) – Class I Division 1  
Explosion Proof (UL)

P/N 399410-01-0



**Flow Computer**  
Remote Automation Solutions

FB1200  
RATINGS, INPUT VOLTAGE: 5.7-30 VDC  
RATINGS, POWER: 3.0 WATTS MAX  
AMBIENT TEMP RANGE: -40°C TO 80°C  
CLASS I, DIV 1 GROUPS C,D  
TEMPERATURE CODE: T6



S/N

MODEL CONFIG.


DATE MFD.

Fromex S.A. de C.V.  
Nuevo Laredo.  
Tamaulipas, Mexico


**CAUTION:**  
TO REDUCE THE RISK OF IGNITION OF  
HAZARDOUS ATMOSPHERES, DISCONNECT  
THE EQUIPMENT FROM THE SUPPLY CIRCUIT  
BEFORE OPENING ENCLOSURE.  
KEEP TIGHTLY CLOSED WHEN IN OPERATION.

**WARNING: TO REDUCE THE RISK OF IGNITION OF  
HAZARDOUS ATMOSPHERES, CONDUIT RUNS MUST  
HAVE A SEALING FITTING CONNECTED WITHIN 18 IN  
OF THE ENCLOSURE.**

BATTERY: NONE




REFER TO USER MANUAL FOR ADDITIONAL  
INSTALLATION INSTRUCTIONS.





Data Plate (Lead Acid Battery) – Class I  
Division 1 Explosion Proof (UL)

P/N 399416-01-0



**Flow Computer**  
Remote Automation Solutions

FB1200  
RATINGS, INPUT VOLTAGE: 5.7-30 VDC  
RATINGS, POWER: 3.0 WATTS MAX  
AMBIENT TEMP RANGE: -40°C TO 80°C  
CLASS I, DIV 1 GROUPS C,D  
TEMPERATURE CODE: T6



S/N

MODEL CONFIG.

DATE MFD.


Fromex S.A. de C.V.  
Nuevo Laredo.  
Tamaulipas, Mexico

**CAUTION:**  
TO REDUCE THE RISK OF IGNITION OF  
HAZARDOUS ATMOSPHERES, DISCONNECT  
THE EQUIPMENT FROM THE SUPPLY CIRCUIT  
BEFORE OPENING ENCLOSURE.  
KEEP TIGHTLY CLOSED WHEN IN  
OPERATION.


**WARNING: TO REDUCE THE RISK OF IGNITION OF  
HAZARDOUS ATMOSPHERES, CONDUIT RUNS  
MUST HAVE A SEALING FITTING CONNECTED  
WITHIN 18 IN OF THE ENCLOSURE.**

**WARNING: BATTERY MUST ONLY BE CHANGED IN  
AN AREA KNOWN TO BE NON-HAZARDOUS.**

BATTERY - LEAD ACID PACK: 6.0 VDC 4.5 Ah  
SEALED P/N 399457-00-0

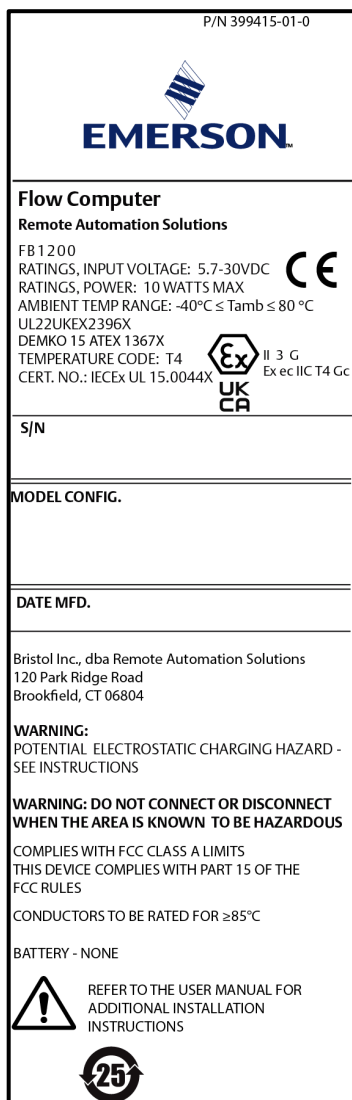


REFER TO USER MANUAL FOR ADDITIONAL  
INSTALLATION INSTRUCTIONS.



# ATEX/UKEx Increased Safety Zone 2 Certifications

## Data Plate – ATEX ec/UKEx Increased Safety



This confirms compliance with the European ATEX Directive 2014/34/EU as well as the United Kingdom UKEx regulation UKSI 2016/1107 (as amended by UKSI 2019:696).

This document includes notes on ATEX/UKEx certifications. For full details, please refer to the *Emerson FB1200 Flow Computer Safe Use Instructions* (D301769X012).

### Special Conditions of Use:

- Make provisions to ensure, in the event of transient disturbances, that the rated voltage does not exceed 140% of the peak rated voltage.
- Impact tests on the display were conducted based on Group II values for the low risk of mechanical danger, in accordance with *Table 15* of both *EN IEC 60079-0:2018* and *IEC 60079-0 7<sup>th</sup> Edition*. Install flow computers with displays in areas where the risk of impact is low.
- Lead Acid Battery, and Solar Panel options are not for use in ATEX/IECEx /UKEx applications.
- For Zone 2 installation, take care to install and use the flow computer in such a way that excludes the danger of electrostatic charge.
- Refer to field replacement guides for replacement of the following parts:

| Replacement Part                     | Kit Number  | Field Replacement Guide document number |
|--------------------------------------|---|---|
| End Caps                             | 399122-01-0 and 399123016-KIT                           | D301814X012                             |
| HMI Module Display Assembly          | 399379-01-0, 621627011-KIT, 399380-01-0, 621627020-KIT  | D301816X012                             |
| CPU Board                            | 399134018-KIT   | D301802X012                             |
| Termination Board and Terminal Block | 399185-01-1, 400216010-KIT, 395791014-KIT 395803000-KIT | D301820X012                             |
| 6-Channel I/O Expansion Board        | 400215-01-0   | D301819X012                             |
| Sensor Assembly                      | Variable Kit Number                                     | D301842X012                             |
| Coin Cell Battery                    | 395620-03-1   | D301854X012                             |

This device was evaluated according to the following standards:

- IEC 60079-0 7th Edition*
- IEC 60079-7, Edition 5.1*

- *EN IEC 60079-0 :2018*
- *EN IEC 60079-7:2015 + A1:2018*

Enclosure Rating: IP66

Terminal blocks for the FB1200 Flow Computer have the following characteristics:

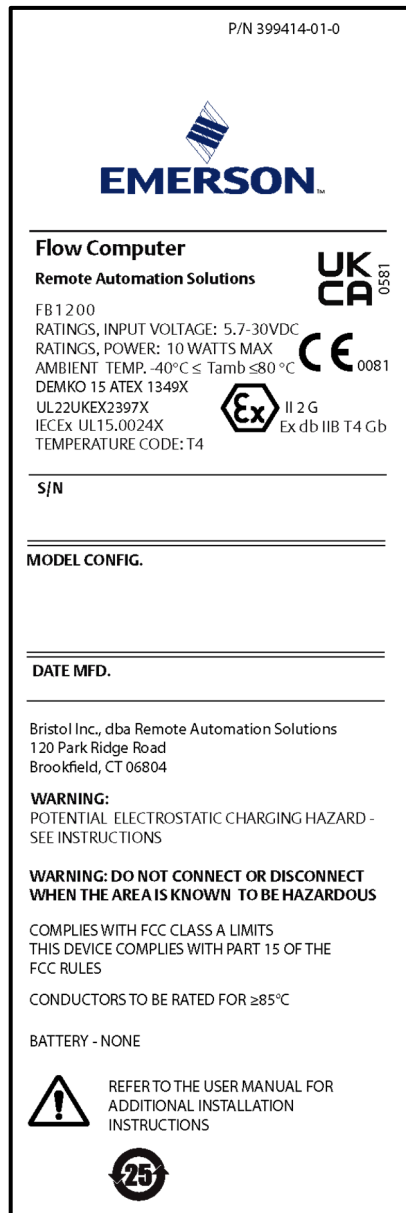
- Terminal blocks can accommodate two conductors per channel.
- Stranded or solid wire allowed.
- Torque values: NM 0.5-0.6
- Wire size: 28-12 AWG (0.08 – 3.3 mm<sup>2</sup>); (0.32 – 2.05 mm)

Bristol Inc.  
120 Park Ridge Road  
Brookfield, CT 06804 U.S.A.

# ATEX/UKEx Flame-Proof Zone 1 Certifications

Data Plate – ATEX Ex db/UKEx Flame-proof

The data plate and certain conditions of use are shown. For full details refer to the *Emerson FB1200 Flow Computer Safe Use Instructions (D301769X012)*.



## Special Conditions of Use / Schedule of Limitations:

- Contact your authorized sales and service representative for any maintenance or repair beyond the routine maintenance of the FB1200 Flow Computer. Do not alter or disassemble any of the fireproof joints of the FB1200 Flow Computer.
- The Model 4088 and Model 215 Scalable Pressure Transmitters provided with the FB1200 Flow Computer contain a thin-wall diaphragm. Installation, maintenance, and use must take into account the environmental conditions to which the diaphragm is subjected. Follow the manufacturer’s instructions for installation and maintenance to ensure safety during the device’s lifetime.
- Refer to field replacement guides for replacement of the following parts:

| Replacement Part                     | Kit Number   | Field Replacement Guide document number: |
|--------------------------------------|--|--|
| End Caps                             | 399122-01-0 and<br>399123016-KIT                                 | D301814X012                              |
| HMI Module Display Assembly          | 399379-01-0,<br>621627011-KIT,<br>399380-01-0,<br>621627020-KIT  | D301816X012                              |
| CPU Board                            | 399134018-KIT  | D301802X012                              |
| Termination Board and Terminal Block | 399185-01-1,<br>400216010-KIT,<br>395791014-KIT<br>395803000-KIT | D301820X012                              |
| 6-Channel I/O Expansion Board        | 400215-01-0  | D301819X012                              |
| Sensor Assembly                      | Variable Kit Number  | D301842X012                              |
| Coin Cell Battery                    | 395620-03-1  | D301854X012                              |

This confirms compliance with the European ATEX Directive 2014/34/EU as well as the United Kingdom UKEx regulation UKSI 2016/1107 (as amended by UKSI 2019:696).





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# Chapter 1: Introduction

This chapter covers the following topics:

- Safety Labels
- Features
- FB1200 Flow Computer Models
- Central Processing Unit (CPU)
- Explosion-proof Enclosure
- Physical Security
- I/O
- Power Options
- Communications
- Human-Machine Interface (HMI) Module
- FBxWifi™ Communications
- Software Tools
- RoHS2 Compliance
- Secure Gateway

The Emerson FB1200 Flow Computer supports measurement for one or two meter runs. This manual describes how to install and configure the Emerson FB1200 Flow Computer hardware.

For information on using the FBxConnect™ configuration software, see the online help that accompanies FBxConnect.

Figure 1-1. FB1200 Flow Computer



- 1 HMI module
- 2 Front end cap (cover)
- 3 Data plate
- 4 Rear end cap (cover)
- 5 Conduit fittings
- 6 Enclosure
- 7 Sensor module

## 1.1. Safety Labels



This product may display safety label(s) to identify potential hazards. The same types of notices appear within the documentation. Whenever you see an exclamation point (!) enclosed within a triangle (shown to the left), consult the documentation for additional safety information about the hazard and how to avoid it. The labels used are :

### DANGER

MAY CAUSE DEATH

Observe all precautionary signs posted on the equipment.

Failure to do so may result in death or serious injury to personnel.

---

### WARNING

DANGER TO PERSONNEL AND EQUIPMENT

Observe all precautionary signs posted on the equipment.

Failure to do so may result in injury to personnel or cause damage to the equipment.

---

### CAUTION

MAY CAUSE INJURY TO PERSONNEL OR DAMAGE EQUIPMENT

Observe all precautionary signs posted on the equipment.

Failure to do so may result in injury to personnel or cause damage to the equipment.

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### SAFETY FIRST

General instructions and safety reminders.

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## 1.2. Features

The FB1200 Flow Computer includes the following key features:

- Enclosure suitable for use in Class I Division 1 explosion proof and Ex db Zone 1 flame- proof environments
- Enclosure suitable for use in Class I Division 2 non-incendive and Ex ec Zone 2 non-sparking environments

- Integral multi-variable sensor for measurement of Pressure (P) and Differential Pressure (DP)
- Connections for customer-supplied resistance temperature detector (RTD) for measurement of temperature (T)
- Support for a second meter run through communication with a separate external transmitter
- Base I/O consists of two on-board channels you can individually configure as either digital input (DI), digital output (DO) or pulse input (PI) and two on-board I/O channels you can individually configure as either analog input (AI) or analog output (AO). Optional 6-channel expansion I/O board available
- Power from a DC power supply, or an optional lead acid battery/solar panel combination
- Serial communication options for RS-232, RS-485 (2-wire), and RS-485 (4-wire).
- Ethernet
- HMI module with optional display and back light for local operator interaction
- Optional Wi-Fi® transceiver (802.11 b/g) for field technician to access the flow computer from a laptop without physical cable connection.
- Application software supports AGA3, AGA8, ISO 5167, ISO 6976, and API 21.1 calculations in U.S., metric, or other natural gas standard units.
- Application software optionally supports API Chapter 11.1, API Chapter 12.2, API 20.1, and API 21.2 calculations in U.S., metric, or other hydrocarbon liquid standard units.

## **1.3. FB1200 Flow Computer Models**

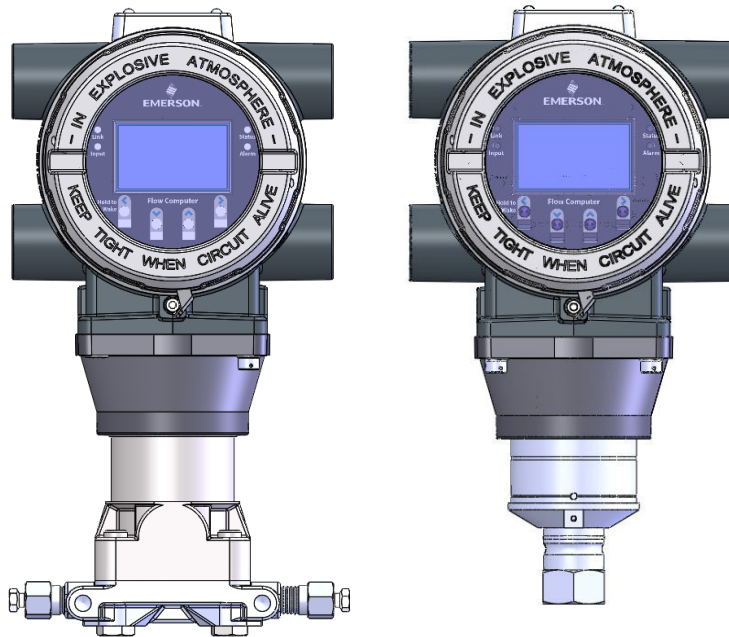
You can purchase the FB1200 Flow Computer with or without integrated sensors.

### **1.3.1 FB1200 Flow Computer (with Multi-variable or Static Pressure Sensor)**

The flow computer with sensors has either a multi-variable sensor module or a static pressure sensor:



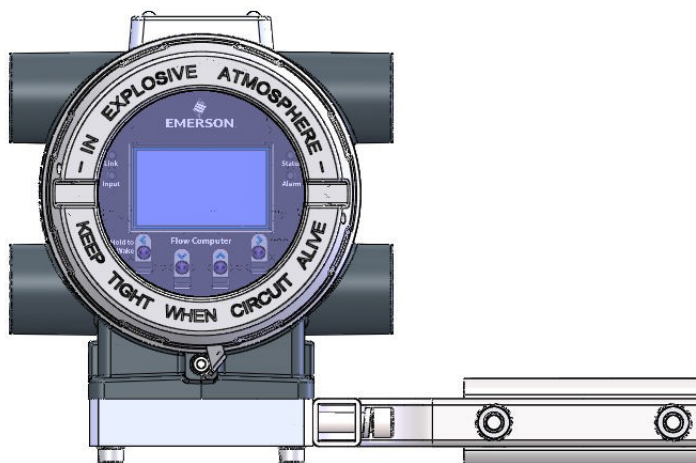
**Figure 1-2. FB1200 Flow Computer – Multivariable (Left); Static Pressure (Right)**



### 1.3.2. FB1200 Flow Computer (without Integral Sensor)

The no integral sensor version includes no sensor module. In this case the process variable data used in flow computer calculations comes from external devices and enters the device through the serial ports or I/O channels.

**Figure 1-3. FB1200 Flow Computer (No Integral Sensor Version)**



## 1.4. Central Processing Unit (CPU)

The flow computer’s CPU is a NXP® Kinetis® K61 series CPU with an ARM® Cortex® M4 processor that operates at 4 MHz to 60 MHz depending on the power mode. The CPU runs the Micrium operating system.

### 1.4.1. Memory

The flow computer includes both static and flash memory.

**Table 1-1. Memory**

| Memory       | Usage  |
|--------------|--|
| 8 MB SRAM    | Holds in-use configuration, current state of all variables   |
| 128 MB Flash | Holds firmware image, historical logs, configuration backup (if saved to flash), and the executing program |

## 1.5. Explosion-proof Enclosure

The FB1200 Flow Computer includes an explosion-proof enclosure made of either aluminum or stainless steel. The enclosure consists of the main housing, two threaded covers, and four conduit entry points.

The four conduit entry points are ¾ in NPT pipe threaded holes that permit entry of field conduit for I/O and communication wiring. ATEX installations use a ¾ in NPT to M20 thread reducer. Unused apertures shall be closed with suitable blanking elements.

The FB1200 Flow Computer can operate in an unprotected outdoor environment. Wiring for I/O, communications, and power enters the enclosure through the four conduit fittings with appropriate protective seals and connects to the terminal plate.

The front end cap (cover) provides a viewing window for the HMI module. You can access the terminal plate by removing the rear end cap (cover).

The FB1200 Flow Computer has North American certification for Class I Division 1 Groups C and D (explosion proof) and Class I Division 2 Groups A, B, C and D (non-incendive) hazardous locations or non-hazardous locations.

The FB1200 Flow Computer has European certification for Ex db Zone 1 (flame proof) and Ex ec Zone 2 (non-sparking) hazardous locations or non-hazardous locations.

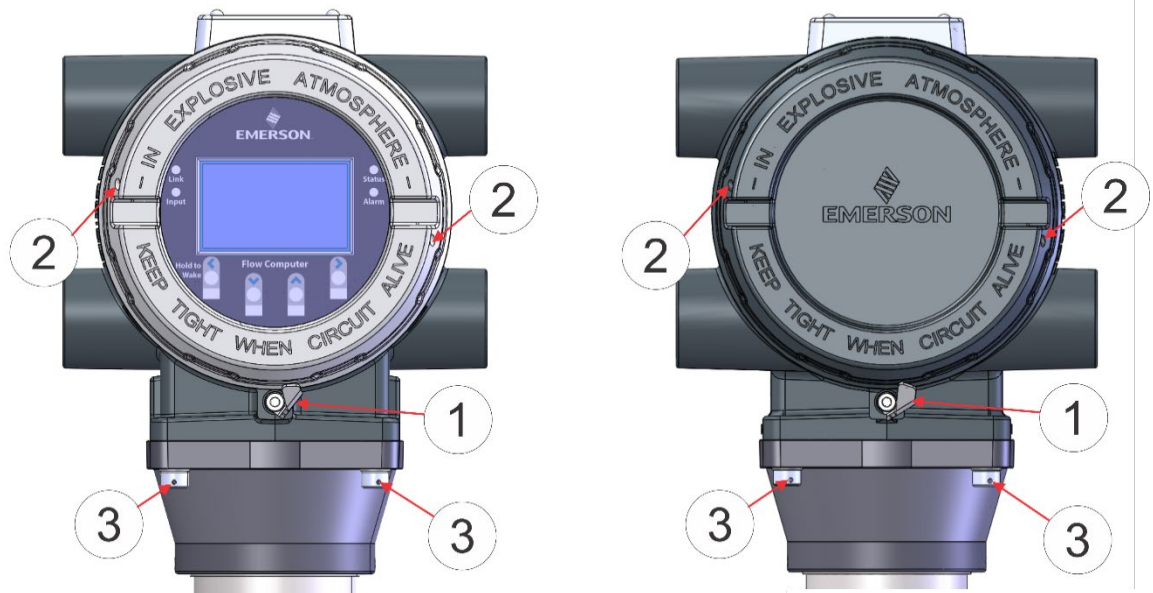
See *CD9435 - UL Safety Instructions for FB1200 Flow Computers* for more information on certifications.

See the data plate screwed to the top of the enclosure to see which certifications apply to your flow computer.

## 1.5.1 Physical Security

The flow computer end caps include retaining clamps for ATEX/IEC applications. In addition, if local regulations require it, you can wire a tamper-resistant seal using the tie holes located in the front and rear end caps, and in the coupling screws.

**Figure 1-4. Retaining Clamps and Tie Holes for Tamper-resistant Seals**



- 1 Retaining clamp (For ATEX & IEC approved products only)
- 2 Tie holes in end caps
- 3 Tie holes in coupling screws

## 1.6. I/O

The flow computer comes with base I/O from both the CPU and the built-in multi-variable (MV) sensor. Base I/O consists of:

- Pressure (P) input from the MV sensor, differential pressure (DP) input from the MV sensor, connections for temperature (T) input from a customer-supplied RTD **or** a single static pressure sensor.
- Two on-board I/O channels that you can individually configure as digital input (DI), digital output (DO), or pulse input (PI)
- Two on-board I/O channels that you can individually configure as either analog input (AI) or analog output (AO)

An optional 6-channel expansion I/O board includes:

- Four I/O channels that you can individually configure as digital inputs (DI), digital outputs (DO), or pulse inputs (PI)
- Two I/O channels that you can individually configure as either analog inputs (AI), or analog outputs (AO)

**Table 1-2. FB1200 Flow Computer I/O Configurations**

| <b>FB1200 Flow Computer without optional I/O</b> | <b>FB1200 Flow Computer with optional I/O</b>                                |
|--|--|
| MV (P, DP, T) or Static Pressure Sensor          | MV (P, DP, T) or Static Pressure Sensor                                      |
| 2 DI/DO/PI channels                              | 6 DI/DO/PI channels (4 of these reside on the 6-channel expansion I/O board) |
| 2 AI/AO channels                                 | 4 AI/AO channels (these reside on the 6-channel expansion I/O board)         |
| FB1200 Flow Computer without optional I/O        | FB1200 Flow Computer with optional I/O                                       |

## 1.7. Power Options

You can power the flow computer using an external DC input, an internal battery, or an internal rechargeable battery connected to a solar panel.



### **Important**

Use **only** batteries supplied with the flow computer or sold by Emerson Energy and Transportation Solutions as spare parts for this flow computer. If you substitute a battery you obtain elsewhere **you void your certification unless it is the identical part from the same manufacturer** as that supplied with the flow computer from Emerson.

**Table 1-3. Power Options**

| <b>Option</b>            | <b>Usage</b>  |
|--------------------------|---|
| External DC Power Supply | 5.7 Vdc to 30 Vdc external supply (Max power at 10 watts)   |
| Lead Acid Battery Pack   | <ul style="list-style-type: none"> <li>▪ 6.0 Vdc</li> <li>▪ 4.5Ah</li> <li>▪ Not suitable with ATEX or IECEx applications</li> <li>▪ Can be optionally charged by a 6-watt solar panel</li> </ul> |

## 1.8. Communications

The flow computer includes three serial communication ports and one Ethernet port. The serial ports allow communication using DNP3, Modbus, BSAP, and ROC protocols. The

Ethernet port is an RJ-45 connector. The Ethernet port supports a maximum of six concurrent TCP connections (sockets).

**Table 1-4. Serial Ports**

| Port | Type  | Use  |
|------|---|--|
| COM1 | <ul style="list-style-type: none"> <li>▪ Serial communications</li> <li>▪ Software-selectable for RS-232, RS-485 (2-wire), RS-485/422 (4-wire) operation</li> <li>▪ 4-wire</li> </ul> | RS-232, RS-485 (2-wire), RS-485 (4-wire) communication to host or other devices. 4-wire used with external radio.<br><br><b>Note:</b> Under older standards RS-485 (4-wire) is identified as RS-422. |
| COM2 | <ul style="list-style-type: none"> <li>▪ Serial communications</li> <li>▪ Software-selectable for RS-232, or RS-485 (2-wire) operation</li> <li>▪ 2-wire</li> </ul>                   | RS-232 or RS-485 (2-wire) communication to host or other devices.  |
| COM3 | <ul style="list-style-type: none"> <li>▪ Serial communications</li> <li>▪ Software-selectable for RS-232, or RS-485 (2-wire) operation</li> <li>▪ 2-wire</li> </ul>                   | RS-232 or RS-485 (2-wire) communication to host or other devices.  |

## 1.9. Human-Machine Interface (HMI) Module

The flow computer includes an HMI module with an optional liquid crystal display (LCD) for local operator access to the device. The LCD, if present, shows a series of menus that sequentially display the current values of particular process variables. A configuration parameter in FBxConnect determines whether you must log in first to view the menus. If required, you log in by selecting alphanumeric characters by scrolling through a list until you select the correct character.

The HMI module includes four LEDs to provide status information. Units with the display include four infrared (IR) buttons for operator interaction.

To conserve power, the HMI module enters sleep mode after a period of inactivity. Sleep mode disables FBxWifi communication. In FBxConnect, you can configure the number of minutes of inactivity triggering sleep mode through the LCD Sleep Time parameter. Setting this parameter to 0 disables sleep mode which keeps the HMI module on but uses significantly more power.

Figure 1-5. HMI Module with LCD



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Figure 1-6. HMI Module without LCD



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**Note**

If your flow computer does not include the LCD option, you still have the status LEDs and a single IR button for waking up the device (shown in *Figure 1-6*).

---

## 1.10. FBxWifi™ Communications

The flow computer has an optional Wi-Fi® transceiver (FBxWifi) that enables you to connect via a laptop or tablet from some small distance away.

This capability allows an operator to potentially remain outside the hazardous location and still communicate with the flow computer. The operator's laptop must have Wi-Fi capability, line-of-sight access to the HMI module, and must be loaded with FBxConnect configuration software. Once connected, the operator can view process values, edit configuration parameters, and collect logs.

---

**Note**

The FBxWifi electronics reside inside the HMI module. The HMI module must be awake to use FBxWifi communications. You can wake it up manually by holding a finger against the

front cover glass over the Hold to Wake button (the left-most button) for typically from five to ten seconds.

### 1.10.1. FBxWifi Antennas

FBxWifi supports two antenna options:

- Option J1 uses the internal antenna located inside the HMI module. This option has a line-of-sight range of approximated 100 ft (30 m) from the front of the flow computer or 60 ft (18 m) from the back and sides of the flow computer.
- Option J2 uses a factory-installed external antenna. This option has a line-of-sight range of approximately 300 ft (90 m) from the flow computer in all directions. This option is available with either Class 1 Div 2  $cUL_{us}$ , IEC Ex ec, or ATEX Ex ec hazardous area approvals.

**Figure 1-7. External FBxWifi Antenna**



## 1.11. Software Tools

The FBxConnect configuration software provides a series of wizards that allow you to perform configuration activities for the flow computer. You connect a PC running the FBxConnect configuration software to the flow computer using one of the communication ports or through a wireless connection. You can then:

- Set parameters within your application
- Configure I/O channels
- Specify the serial communication method for a port (RS-232 to RS-485) as needed
- View or collect audit trail information such as alarm, event, or historical logs
- Update system firmware

## 1.12. RoHS2 Compliance

### **Device without Integral MVS or SP Sensor:**

RoHS (2) EU Directive 2011/65/EU

### **Device with Integral MVS or SP Sensor:**

RoHS (2) EU Directive 2011/65/EU: This product may be considered out-of-scope when used for the intended design purpose in a Large Scale Fixed Installation (LSFI).

Consult <https://www.emerson.com/compliance> for up-to-date product information.

## 1.13. Secure Gateway

For enhanced data security when using an IP/Ethernet connection or a serial connection into an IP terminal server, Emerson Energy and Transportation Solutions recommends adding an industrial router with VPN and firewall security. Recommended solutions include the MOXA EDR-810, the Hirschman Eagle One, or the Phoenix mGuard rs4000 (or equivalents). An example of how to install one of these devices to the RTU can be found in the Emerson Energy and Transportation Solutions *MOXA® Industrial Secure Router Installation Guide* (part number D301766X012). For further information, contact your Emerson Impact Partner or the individual vendor's website.



# Chapter 2: Installation

This chapter covers the following topics:

- Hazardous Locations
- Environmental Specifications
- Required Tools
- Site Considerations
- General Wiring Guidelines
- Front or Rear End caps
- Mounting the Enclosure
- Grounding the Device
- Terminal Plate
- Power Modes
- Connecting Power
- Installing the Optional Solar Panel
- Connecting Communication Ports

The flow computer ships from the factory fully assembled, except for the optional solar panel assembly.

## 2.1 Hazardous Locations

The housing for the FB1200 Flow Computer is an explosion-proof case designed to operate in hazardous locations.

For North America the FB1200 Flow Computer has certifications for Class I, Division 1 (Groups C & D) explosion-proof, Class I Division 2 (Groups A, B, C & D) non-incendive, and non-hazardous locations only.

For Europe the FB1200 Flow Computer has certifications for Ex db Zone 1 flame-proof and for Ex ec Zone 2 non-sparking installations and non-hazardous locations only.

See *CD9435 - UL Safety Instructions for FB1200 Flow Computers* for more information on certifications.

See the data plate screwed to the top of the enclosure to see which certifications apply to your flow computer.

## 2.2 Environmental Specifications

This section summarizes the environmental specifications for the device. For full details, refer to the product data sheet *FB1200 Flow Computer (D301790X012)*.

**Table 2-1. Environmental Specifications**

| Specification                          | Range  |
|--|--|
| Ambient Temperature                    | -40°C to +80 °C (-40 °F to +176 °F) - no battery, C1D1/C1D2<br>-40°C to +80 °C (-40°F to +176 °F) – lead acid battery, C1D1/C1D2<br>-40°C to +80 °C (-40 °F to +176 °F) – no battery, ATEX/IEC Ex db<br>-40°C to +80 °C (-40 °F to +176 °F) – no battery, ATEX/IEC Ex ec |
| Maximum Process Connection Temperature | 120 °C (248 °F)  |
| Humidity                               | 5% to 95% non-condensing   |
| Vibration                              | 2g over 10 to 150 Hz; 1g over 150 to 200 Hz  |

## 2.3 Required Tools

Certain tools and equipment are required for installing and servicing the flow computer.

**Table 2-2. Required Tools**

| Tool                           | Use  |
|--------------------------------|--|
| Torque wrench                  | For bolting/mounting the flow computer                                 |
| 2.5 mm hexagonal wrench        | For manipulating rotation set screw                                    |
| 3 mm hexagonal wrench          | For screw for M4 x 0.7 end cap retaining clamp (ATEX required)         |
| 9/16 in hexagonal wrench       | For installing/removing ¾ in NPT conduit plugs                         |
| 1 1/16 in combination wrench   | For installing/removing ¾ in NPT to M20 thread reducer (ATEX required) |
| #1 Phillips-head screwdriver   | For screws on HMI module   |
| #2 Phillips-head screwdriver   | For screws on other modules and boards                                 |
| 1/8 inch flat-head screwdriver | For 5.08 mm pitch terminal block connections                           |

| Tool   | Use  |
|--|--|
| 3/32-inch flat head screwdriver                                      | For 3.81 mm pitch terminal block connections |
| Laptop PC running Field Tools with FBxConnect configuration software | For software configuration                   |

## 2.4 Site Considerations

The flow computer must reside in an accessible location for configuration and service. Refer to the dimensional drawings for information on the space required.

- Ensure the installation location provides easy access to the HMI module.
- If your unit includes the optional solar panel, ensure the installation location provides sufficient space to mount the solar panel and adequate sunlight to charge the battery.
- If your unit includes the optional FBxWifi, ensure the installation location provides line-of-sight access to the transceiver.

**Figure 2-1. FB1200 Flow Computer Dimensions – Multivariable Sensor Version (Option F1)**



Figure 2-2. FB1200 Flow Computer Dimensions - No Integral Sensor Version (Option F0)

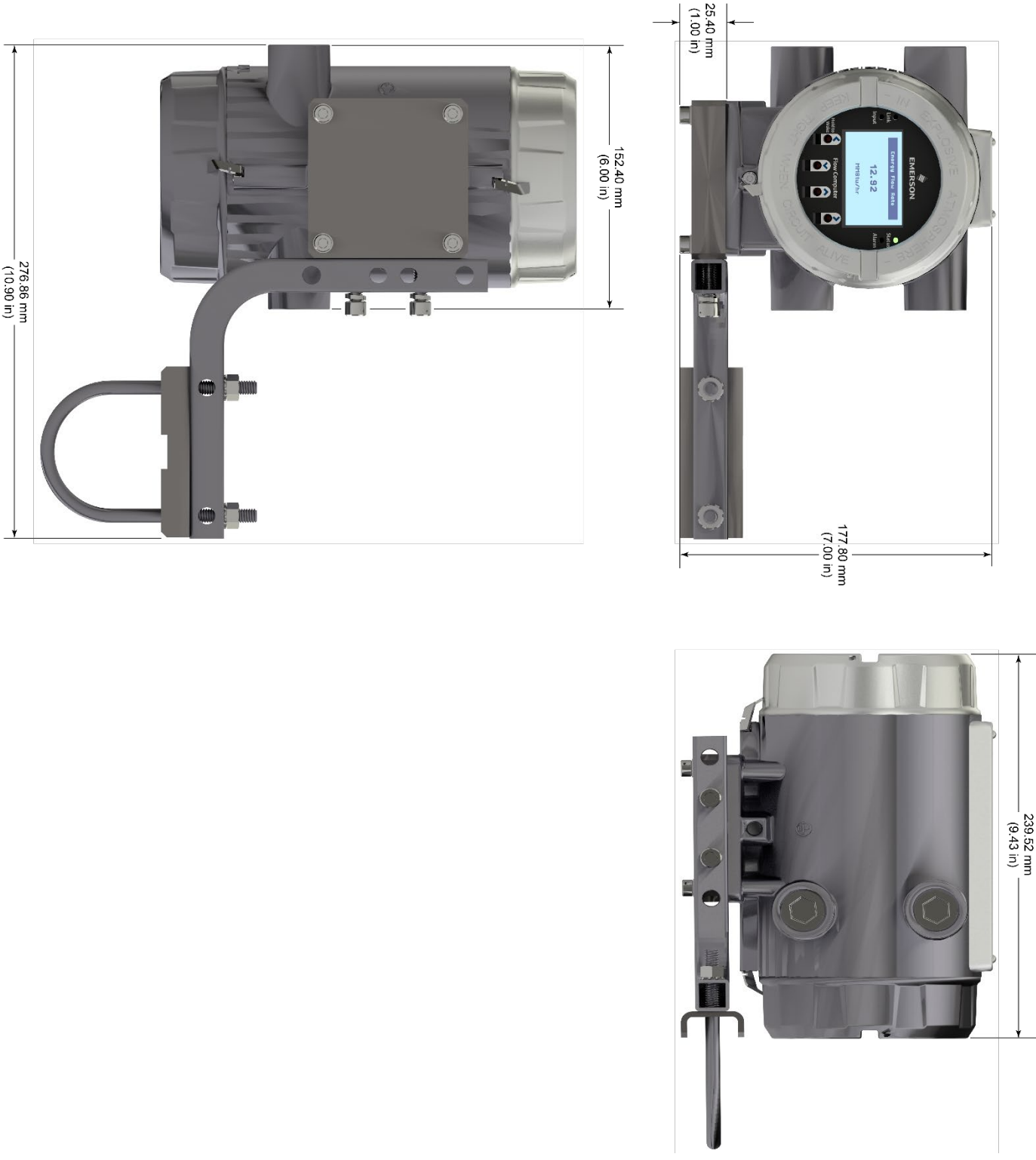


Figure 2-3. FB1200 Flow Computer Dimensions – Static Pressure Sensor (Option F2)



## 2.5 General Wiring Guidelines

The flow computer's pluggable terminal blocks use compression-type terminals.

The 5.08 mm pitch terminal blocks accommodate wire between 28 and 12 AWG; the 3.81 mm pitch terminal blocks accommodate wire between 28 and 14 AWG.

- When making a connection, insert the bare end of the wire (approx. 1/4" max) into the clamp adjacent to the screw and secure the screw.
- To prevent shorts, ensure that no bare wire is exposed.
- Allow some slack in the wire while making terminal connections. Slack makes the wires more manageable and helps minimize mechanical strain on the terminal blocks.
- Use twisted pair, shielded and insulated cable for communication and I/O wiring to minimize signal errors caused by electromagnetic interference (EMI), radio frequency interference (RFI) and transients. When using shielded cable, ground all shields at only one point in the appropriate system. This prevents circulating ground current loops that can cause signal errors.

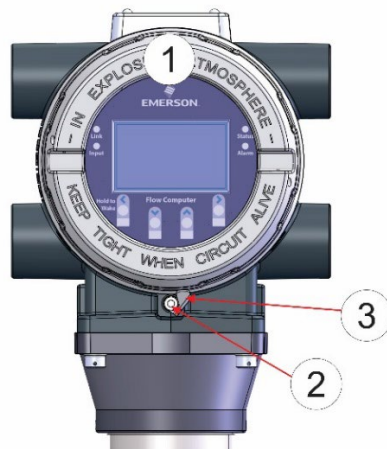
## 2.6 Front or Rear End Caps

The flow computer includes two threaded covers (end caps). The front end cap includes a window for viewing the HMI module; the rear end cap provides access to the terminal plate for power and I/O wiring.

### 2.6.1 Removing/Replacing Retaining Clamp on End Caps

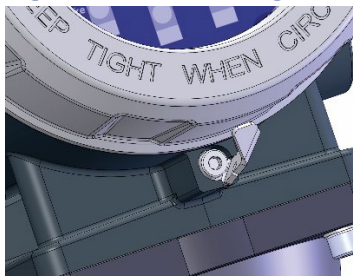
For flameproof ATEX/IEC applications, each end cap includes a retaining clamp which screws down to prevent the end cap from being unscrewed.

**Figure 2-4. Front End Cap with Retaining Clamp Fitted**



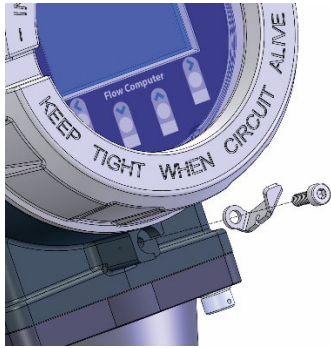
- 1 End Cap
- 2 Screw
- 3 Retaining Clamp

**Figure 2-5. Retaining Clamp in Place**



To loosen or tighten the screw, use a 3mm hexagonal wrench. When tightening, torque to 12 in-lbs (1.4 N m).

**Figure 2-6.** Retaining Clamp and Screw



## 2.6.2 Removing the Front or Rear End Caps

### **⚠ DANGER**

**EXPLOSION HAZARD:** Never remove end cap(s) in a hazardous location. Removing end cap(s) in a hazardous location could result in an explosion.

#### **Note**

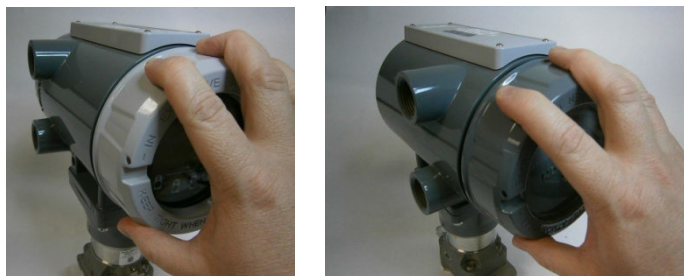
If you need more leverage place a long screwdriver or other appropriate tool across the two notches in the end cap to act as a pry bar (see *Figure 2-7*).

**Figure 2-7.** Removing or Tightening the End Cap with Long Screwdriver



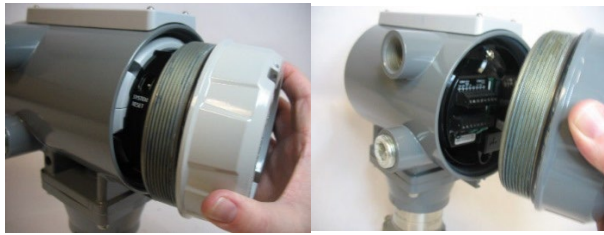
1. Remove the retaining clamp (if present). (See *Section 2.6.1*)
2. Grasp the end cap (front or rear).

**Figure 2-8.** Front (left) and Rear (right) End caps



3. Unscrew the end cap turning it counter-clockwise until it comes off. Set it aside in a safe location.



**Figure 2-9. Front (left) and Rear (right) End Caps Removal**

## 2.6.3 Replacing the Front or Rear End Caps

### **⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

1. Grasp the end cap (front or rear).
2. Carefully align the end cap threads with the threads of the enclosure.



### **Important**

When replacing the rear end cap, ensure wires connecting to the terminal plate do not get crimped or caught between the end cap threads and the enclosure.

3. Screw the end cap clockwise (eight full turns) until it is tightly sealed to the enclosure.
4. Replace the retaining clamp (if required). (See [Section 2.6.1](#))

### **Note**

If you need more leverage place a long screwdriver or other appropriate tool across the two notches in the end cap to act as a pry bar (see [Figure 2-7](#)).

## 2.7 Mounting the Enclosure

You can mount the flow computer either directly to a manifold on the pipeline or indirectly on a two-inch pipe or pole.

Direct mount installations use either a traditional mounting kit or a coplanar mounting kit. Indirect mount installations use an inline mounting kit.

### 2.7.1 Bolting Considerations

If the flow computer installation requires assembly of a process flange, manifold, or flange adapters, follow these assembly guidelines to ensure a tight seal for optimal performance characteristics of the flow computer.

Only use bolts supplied with the flow computer or sold by Emerson Energy and Transportation Solutions as spare parts. Refer to the figure for common flow computer assemblies with the bolt length required for proper flow computer installation.

**⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

**Note**

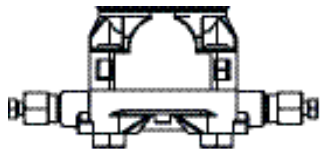
For all other manifolds, contact your local Emerson Sales office or Emerson Impact Partner.

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Bolts are typically carbon steel or stainless steel. Confirm the material by viewing the markings on the head of the bolt and referencing the figure. If bolt material is not shown in the figure, contact your local Emerson Energy and Transportation Solutions representative for more information.

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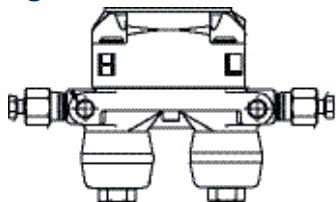
**Figure 2-10. Transmitter with Coplanar Flange**



4 x 1.75 in (44 mm)

---

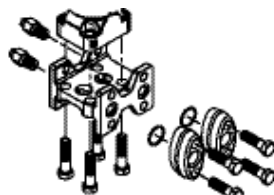
**Figure 2-11. Transmitter with Coplanar Flange and Optional Flange Adapters**



4 X 2.88 in (73 mm)

---

**Figure 2-12. Transmitter with Traditional Flange and Optional Flange Adapters**








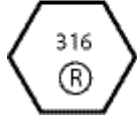


4 x 1.75 in (44 mm)      4 x 1.50 in (38 mm)

---

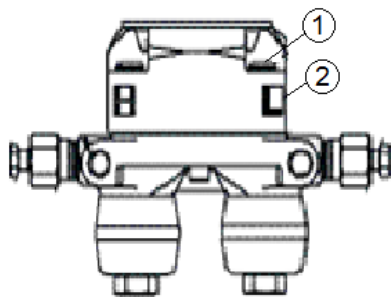
Use the following bolt installation procedure:

1. Carbon steel bolts do not require lubrication. Stainless steel bolts are factory-coated with a lubricant to ease installation. Do not apply any additional lubricant when installing either type of bolt.
2. Finger-tighten the bolts.
3. Torque the bolts to the initial torque value using a crossing pattern. See [Table 2-3](#) for initial torque value.
4. Torque the bolts to the final torque value using the same crossing pattern. See [Table 2-3](#) for final torque value.
5. Verify that the flange bolts protrude through the sensor module before applying pressure.

**Table 2-3. Torque Values for the Flange and Flange Adapter Bolts**

| Bolt Material         | Head markings   | Initial Torque              | Final Torque                |
|-----------------------|---|-----------------------------|-----------------------------|
| Carbon Steel (CS)     |     | 300 in. -lbs.<br>(33.9 N m) | 650 in. -lbs.<br>(73.4 N m) |
| Stainless Steel (SST) |    | 150 in. -lbs.<br>(16.9 N m) | 300 in. -lbs.<br>(33.9 N m) |
|                       |    |                             |                             |

**Figure 2-13. Proper Bolt Installation**



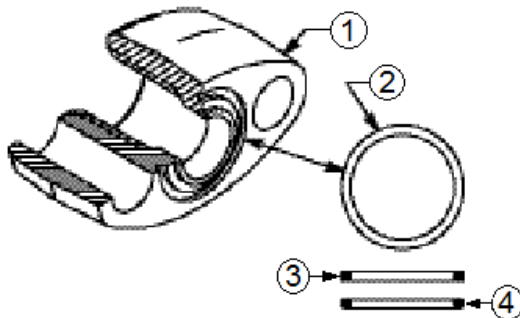
- 1 Bolt
- 2 Sensor module

## 2.7.2 O-rings with Flange Adapters

### **⚠ DANGER**

Failure to install proper flange adapter O-rings may cause process leaks, which can result in death or serious injury. Only use the O-ring that is designed for its specific flange adapter.

**Figure 2-14. O-rings with Flange Adapters**



- 1 Flange
- 2 O-ring
- 3 Square PTFE-based profile
- 4 Round Elastomer profile

1. Whenever the flange or adapters are removed, visually inspect the O-rings.
2. Replace the O-rings if there are any signs of damage, such as nicks or cuts.
3. If the O-rings are replaced, re-torque the flange bolts and alignment screws after installation to compensate for seating of the O-rings.

## 2.7.3 Direct Mount

Direct mount installations use either a traditional mounting kit or a coplanar mounting kit. Mount the flow computer directly to the pipeline only if the pipeline includes a process manifold.

### **⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

1. Place taps in the top or side of the line.
2. Mount the flow computer beside or above the taps.

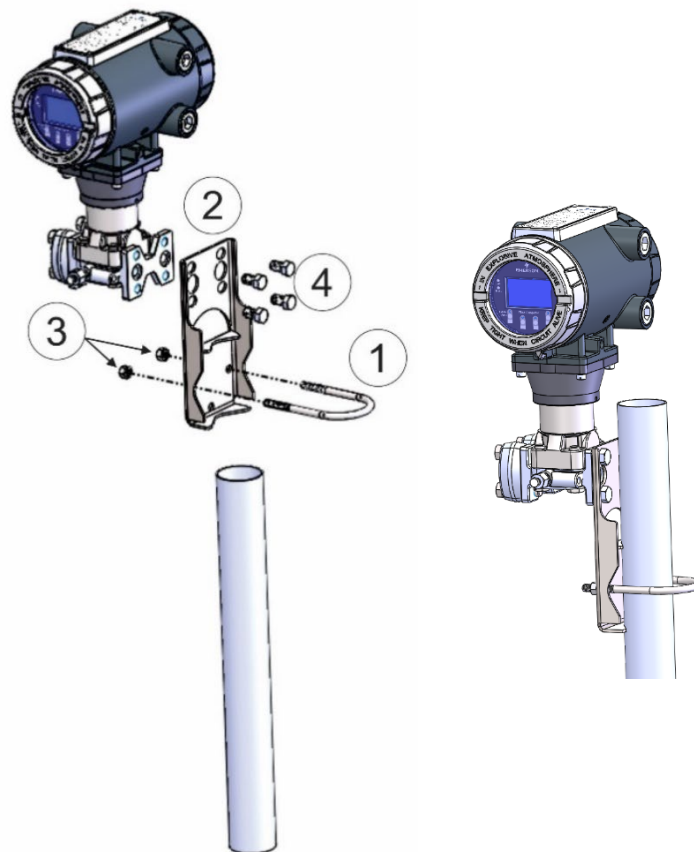
## 2.7.4 Indirect Mount

You can mount the flow computer to a two-inch pipe or pole. Indirect mount can use the inline, coplanar, or traditional flange mounting kits.

### **⚠ DANGER**

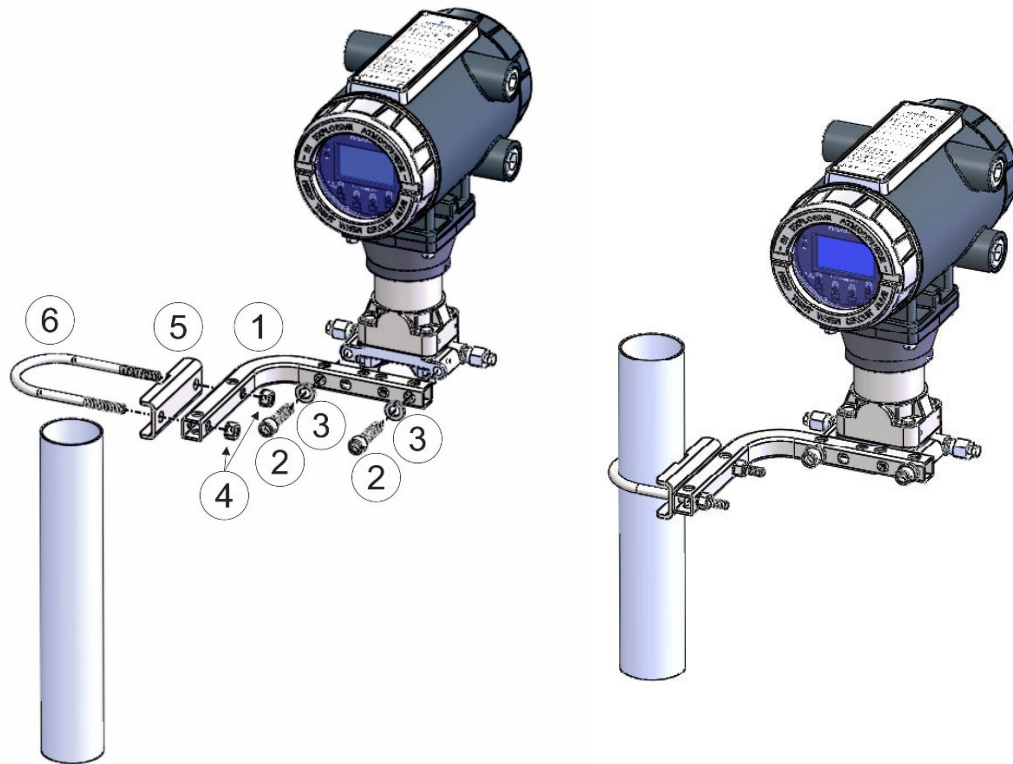
**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

**Figure 2-15. Traditional Flange Mounting Kit**



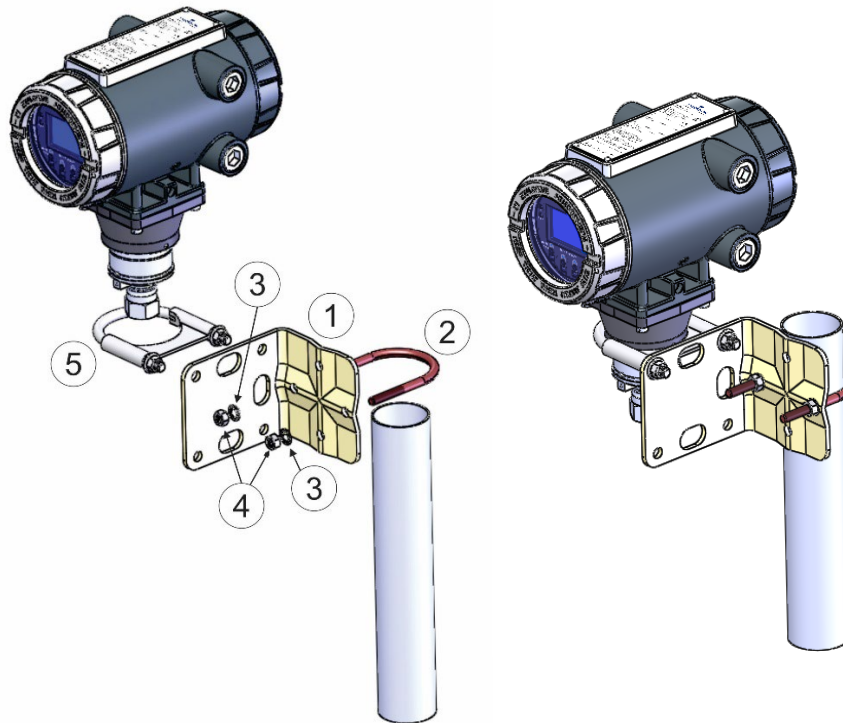
- 1 2.0 in. pipe diam. U-bolt assembly (5/16-18 x 4.0 LG) with (2) nuts (item 3)
- 2 Mounting bracket
- 3 Apply Loctite® 222™ Low Strength Purple Threadlocker to nuts. Torque nuts to 30 in-lbs (3.4 N m)
- 4 7/16-20 x .625 cs/zinc cobalt screws (4). Torque to 30 in-lbs (3.4 N m)

Figure 2-16. Coplanar Mounting Kit



- 1 Tubular L-shaped bracket
  - 2 3/8-16 x 1 ½ in socket head wire lockable screw (2) – Apply Killark® LUBG-6 Thread Lubricant to threads. Torque screws to 30 in-lbs (3.4 N m)
  - 3 Split 3/8 lock washer (2)
  - 4 5/16-18 keps nut (2). Apply Loctite 222 Low Strength Purple Threadlocker to nuts. Torque nuts to 30 in-lbs (3.4 N m)
  - 5 U-bolt bracket
  - 6 2-inch diameter pipe U-bolt
-

Figure 2-17. Inline Mounting Kit



- 1 Pipe mounting bracket
- 2 U-bolt 2 ½ inch diam. pipe (5/16-18 x 3.75 long)
- 3 5/16 flat lock washer (2)
- 4 5/16-18 300 series hex nut (2) - Apply Loctite 222 Low Strength Purple Threadlocker to threads. Torque nuts to 30 in-lbs (3.4 N m)
- 5 U-bolt clamp assembly - Apply Loctite 222 threadlocker to threads. Torque nuts to 30 in-lbs (3.4 N m)

## 2.7.5 Rotating the Housing

To improve accessibility to the HMI module or to ease wiring, you can optionally rotate the housing.



### Important

**Never** rotate the housing **more than 180 degrees** from its original (as-shipped) position. Over-rotation can break electronics within the unit.

Figure 2-18. Figure 2-18: Housing Rotation Set Screw (1 each side)



- 1 Set Screw (one each side)

**⚠ DANGER**

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

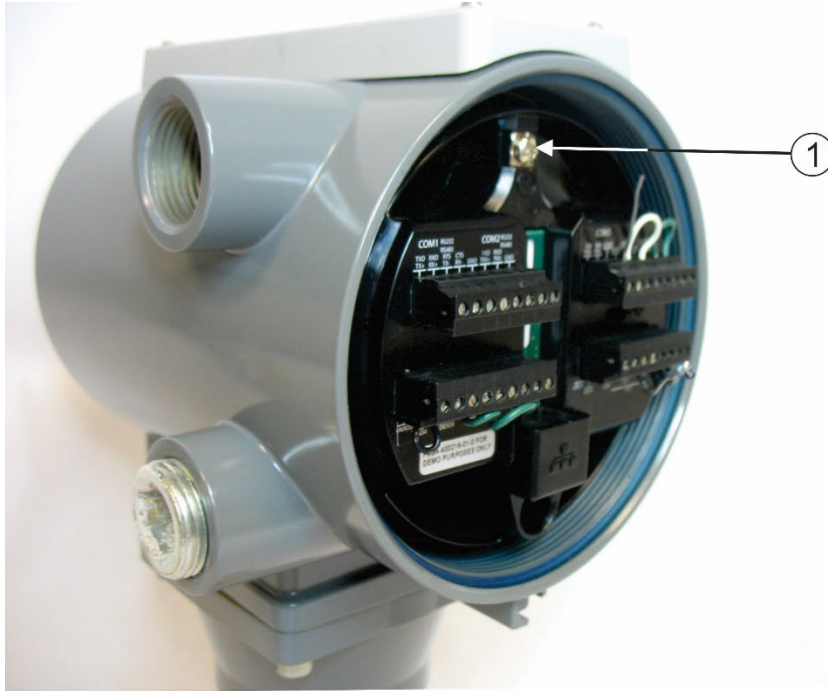
1. Loosen the two housing rotation set screws.
2. Rotate the housing **no more than** 180 degrees from its original (as-shipped) position.
3. Re-tighten the two housing rotation set screws. Torque to 6 in-lbs. (0.7 N m).



## 2.8 Grounding the Device

The flow computer includes a grounding lug on the terminal plate.

**Figure 2-19. Ground Lug**



**1** Ground Lug

### **⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

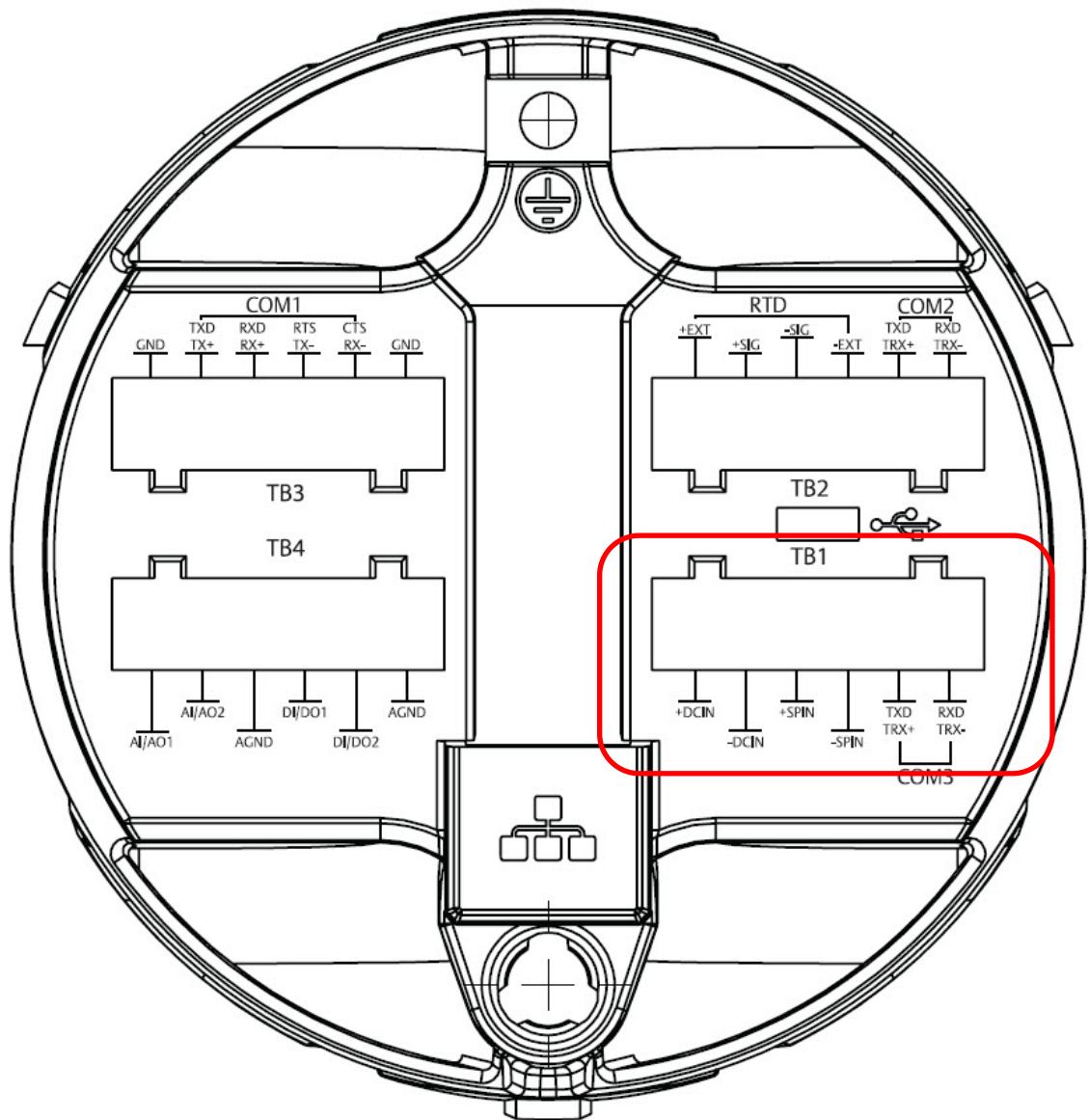
- Once you have installed the unit, run a ground wire between the ground lug and a known good earth ground. You route the ground wire through one of the conduit fittings.
- Use stranded copper wire to earth ground and keep the length as short as possible.
- Clamp or braise the ground wire to the ground bed conductor (typically a stranded copper AWG 0000 cable installed vertically or horizontally).
- Run the ground wire so that any routing bend in the cable has a minimum radius of 30.5 cm (12 inches) below ground and 20.4 cm (8 inches) above ground.
- For more information on grounding or if your installation uses cathodic protection, refer to *Site Considerations for Equipment Installation, Grounding, and Wiring* (D301452X012).

## 2.9 Terminal Plate

The terminal plate includes the various terminal blocks (TB) for power and I/O connections.

The terminal plate's appearance varies depending upon whether you have the optional 6-channel expansion I/O module installed with 3.81 pitch connections; when it is installed there are eight or nine connections per terminal blocks instead of six 5.08 pitch connections. Compare your device to the pictures to see which terminal plate you have.

**Figure 2-20. Terminal Plate** (without Optional I/O with 6 5.08 mm Pitch Connectors)



## 2.10 Power Modes

To keep power consumption to a minimum, especially for remote sites, the flow computer can run in two different power modes: Low Power Mode (4 or 8 MHz CPU clock speed) or Standard Power Mode (60 MHz CPU clock speed).

### 2.10.1 Low Power Mode

The flow computer normally runs in low power mode for typical metering applications. The radio Power Control function (configurable in FBxConnect) switches the flow computer into standard power mode at specified times when serial communications are required, then it reverts to low power mode when the communication period is over. A serial connection to a remote 4088B MVT can occur in low power mode.

The local display (HMI module) with FBxWifi communications and FBxWifi uses additional power. You can configure it in FBxConnect to shut down after a period of inactivity.



#### Important

You must **disable** the Ethernet port (using a jumper) to run in low power mode. See *Section 2.13.3*.

**Table 2-4. Typical Power Usage – Low Power Mode at Room Temperature**

| Description  | Power Usage (mW) at 6.1Vdc |
|--|----------------------------|
| Base flow computer with integral multivariable DP and pressure sensor and temperature measurement for a single meter run.  |                            |
| Historical configuration supports maximum of:  | 47                         |
| <ul style="list-style-type: none"> <li>▪ 4 averages</li> <li>▪ 12 Station 1 history points (Group 4)</li> <li>▪ 10 User Periodic history points (Group 1)</li> </ul> |                            |
| Base flow computer with integral static pressure sensor and temperature measurement and a pulsed input for a single meter run  |                            |
| Historical configuration supports maximum of:  | 45                         |
| <ul style="list-style-type: none"> <li>▪ 4 averages</li> <li>▪ 12 Station 1 history points (Group 4)</li> <li>▪ 10 User Periodic history points (Group 1)</li> </ul> |                            |
| Base flow computer with integral multivariable DP and pressure sensor and temperature measurement,   | 82                         |

| Description  | Power Usage (mW)<br>at 6.1Vdc |
|--|-------------------------------|
| communicating to remote 4088B-dual meter run (4088B externally powered)  |                               |
| Historical configuration supports maximum of:  |                               |
| <ul style="list-style-type: none"> <li>▪ 8 averages</li> <li>▪ 24 Station 1 &amp; Station 2 history points (Group 4 / Group 5)</li> <li>▪ 10 User Periodic history points (Group 1)</li> </ul> |                               |
| <b>Additional Load Options:</b>  |                               |
| Display and backlight active   | 292                           |
| FBxWifi  | 315                           |
| FBxWifi and display active   | 337                           |
| DO active (1 Hz, 50:50 duty cycle, no load)  | 1                             |



**Important**

If you increase the number of history points/averages beyond any of the maximum limits detailed in *Table 2-4*, the flow computer **cannot** operate in low power mode and **automatically** runs in standard power mode.

## 2.10.2 Standard Power Mode

When serial communication is active (other than to a remote 4088B MVT) the flow computer operates in standard power mode. The unit also uses standard power mode when:

- The HMI module display is ON
- FBxWifi is active
- Ethernet port enabled in the flow computer
- Modbus Master communication active
- PIDs, Math/logic Blocks, Action Blocks, Effect blocks enabled
- 6-channel expansion I/O board installed and enabled in the flow computer; if board installed but disabled in FBxConnect, can remain in low power mode
- Power control zone enabled

**Table 2-5. Typical Power Usage – Standard Power Mode at room temperature**

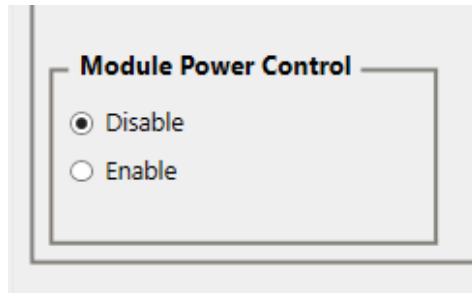
| Description  | Power Usage (mW) at 6Vdc | Power Usage (mW) at 12Vdc | Power Usage (mW) at 24Vdc |
|--|--------------------------|---------------------------|---------------------------|
| Base flow computer with integral multivariable DP and pressure sensor and temperature measurement for a single meter run   | 230                      | 245                       | 287                       |
| Base flow computer with integral static pressure sensor and temperature measurement and a pulsed input for a single meter run  | 244                      | 260                       | 305                       |
| Base flow computer with integral multivariable DP and pressure sensor and temperature measurement, communicating to remote 4088B - dual meter run (4088B externally powered) | 278                      | 306                       | 373                       |
| <b>Additional Load Options:</b>  |                          |                           |                           |
| Display and backlight active   | 162                      | 168                       | 178                       |
| FBxWifi  | 189                      | 185                       | 200                       |
| FBxWifi and display active   | 204                      | 207                       | 221                       |
| DO active (1 Hz, 50:50 duty cycle, no load)  | 1                        | 1                         | 1                         |
| PI active (10 KHz, 50:50 duty square wave)   | 13                       | 14                        | 15                        |
| 6-channel expansion I/O board installed  | 40                       | 49                        | 80                        |
| Ethernet enabled 100 Mbit  | 435                      | 421                       | 462                       |
| Ethernet active 100 Mbit   | 459                      | 443                       | 489                       |

### 2.10.3 Notes on Battery Life

Battery life varies based on numerous factors including temperature, communication usage, and various load options. To achieve the maximum battery life noted in the product data sheet requires that you:

- Limit use of the display, backlight, and FBxWifi options.
- Limit communication activity.

- Disable power to all I/O (except for the MV or static pressure sensor, or RTD). To do this, click **Configure > I/O Setup > I/O Configuration > Properties** and select **Disable** for each I/O module.



See the product data sheet *FB1200 Flow Computer (D301790X012)* for information on the additional power load of various options.

## 2.11 Connecting Power

Power can come from an external DC supply, or a lead acid battery pack with a solar panel. See *Section 2.12.4* for information on solar power connections.

Power connections are made through conduit fittings to the terminal plate. Remove the rear end cap for access to the terminal plate.

### 2.11.1 Connecting DC Power

#### **⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

When power comes from an external DC supply, connect using the +DCIN and -DCIN terminals. Use standard copper wire (#18 AWG minimum). The device supports both 12V and 24V power supplies. It accepts DC voltage from 5.7 to 30V; the amount of power required varies depending upon the options used.

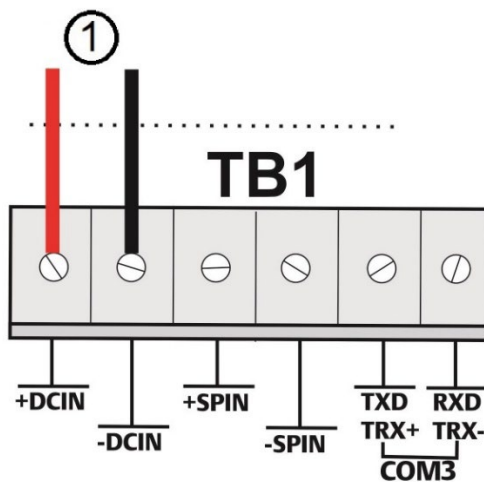
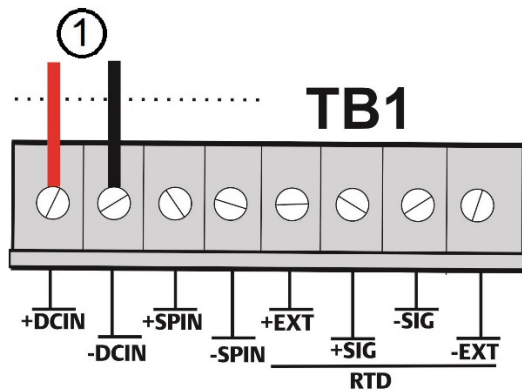
---

#### **Note**

The top portion of *Figure 2-21* shows the unit with optional I/O; the bottom portion shows the unit without optional I/O.

---

Figure 2-21. DC Power Connections



1 To External power supply

**Note**

If your flow computer does not power on, check that the polarity of the DC input voltage wiring connections match *Figure 2-21*. If you accidentally reversed the polarity of the connectors, it triggers a polyfuse (positive coefficient temperature thermistor) to protect the device from damage. Once the polarity is corrected, the polyfuse resets automatically to allow for proper operation.

## 2.11.2 Connecting Battery Power

**⚠ DANGER**

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

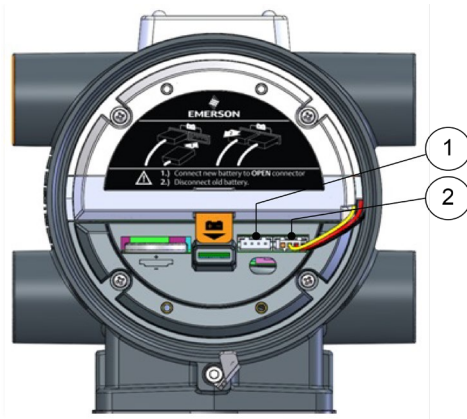


**Important**

If you purchased this device with the rechargeable lead acid battery pack, be aware that the lead acid battery pack must always be stored in a charged state. If you do not intend to install the flow computer immediately, make provisions to “top-off” the lead acid battery at six-month intervals. Failure to do so could sharply reduce battery life or result in a dead battery.

When power comes from an internal battery pack, the battery pack plugs into one of two connectors.

**Figure 2-22. Connecting the Battery Pack**



- 1 Left Battery Connector
- 2 Right Battery Connector

**Restriction**

The solar panel and lead acid battery combination **cannot** be used with ATEX/IECEX applications.

## 2.12 Installing the Optional Solar Panel

If you purchased the lead acid battery/solar panel kit for main power, you need to install the supplied 6W solar panel. If you purchased the lead acid battery with a solar regulator but you are supplying your own solar panel, follow the manufacturer’s instructions for remote mounting.

**⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

Solar panel installation involves:

- Attaching mounting hardware to the solar panel (if not attached prior to shipment).



- Mounting the solar panel in one of two ways:
  - Integral mount (solar panel attaches directly to the flow computer)
  - Remote mount (solar panel mounts to a pole)
- Wiring power to the solar panel.
- Setting the tilt angle of the panel for maximum solar exposure.

## 2.12.1

### Attaching Mounting Hardware to the Solar Panel

#### DANGER

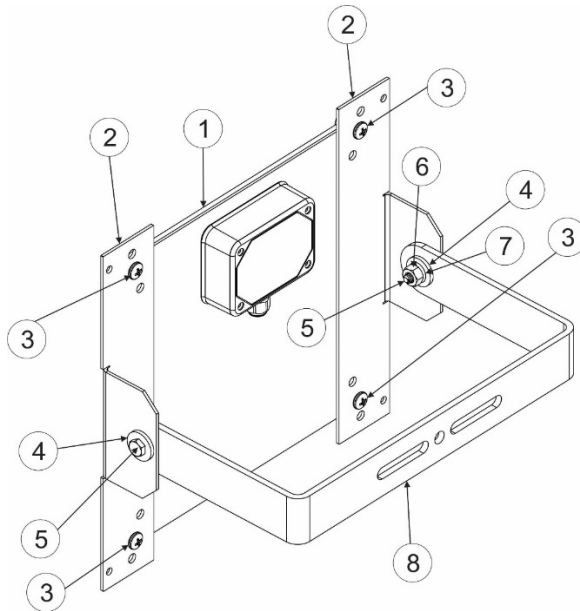
EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

Attach mounting hardware to the solar panel as shown in *Figure 2-23*.

- Attach aluminum tilt brackets (Item 2) to solar panel using the provided pan head screws (Item 3), hex nuts (Item 10 in *Figure 2-24*), and #10 lock washers (Item 9 in *Figure 2-24*).
- Apply Loctite® Threadlocker 222 sparingly to threads of hex nuts (Item 6). Attach mounting bracket to tilt brackets using provided hex nuts (Item 6), hex bolts (Item 5), washers (Item 4), and spring lock washers (Item 7). The spring lock washer goes between the washer and the nut. Torque to 30 in-lbs (3.4 N m).

**Figure 2-23. Attaching Mounting Hardware to the Solar Panel**



- 1** 6V, 6W solar panel
  - 2** aluminum tilt bracket (2)
  - 3** 10-32 x ½ pan head screw (4). Note: Matching hex nuts and washers not visible in this graphic; see Items 9 and 10 in *Figure 2-24*
  - 4** 5/16 flat washer (4); only two visible in this graphic
  - 5** 5/16-18 x .75 LG hex head bolt (2)
  - 6** 5/16-18 hex nut (2); only one visible in this graphic
  - 7** 5/16 flat spring lock washer (2) only one visible; placed on bolt between washer and nut
  - 8** mounting bracket
-

## 2.12.2 Mounting the Solar Panel (Integral Mount)

### DANGER

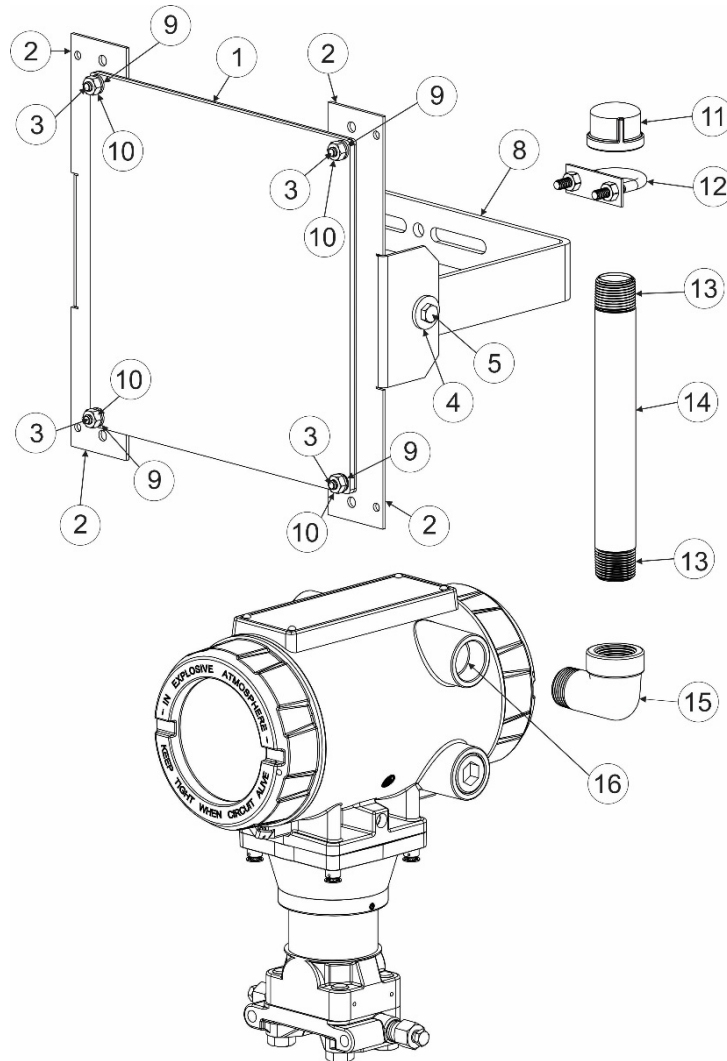
EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

#### Restriction

The solar panel and lead acid battery combination **cannot** be used with ATEX/IECEX applications. The integral mount solar panel **cannot** be used in a Class I Division 1 area; C1D1 solar panels must be remote mounted with the solar panel in a safe area.

1. Apply Loctite® 380™ Black Instant Adhesive to threads of elbow pipe (Item 15 in Figure 2-20). Attach elbow pipe (Item 15) to the flow computer conduit opening (Item 16); torque to 50 in-lbs (5.6 N m).
2. Apply Loctite 380 adhesive sparingly to threads of pipe (Item 14).
3. Attach pipe (Item 14) to elbow pipe (Item 15). Torque to 50 in-lbs (5.6 N m).
4. Attach pipe cap (Item 11) to top of pipe (Item 14). Torque to 50 in-lbs (5.6 N m).
5. Apply Loctite 222 threadlocker sparingly to threads of U-bolt (Item 12).
6. Attach solar panel assembly to pipe (Item 14) using U-bolt (Item 12).
7. Attach a ground wire at the back of the solar panel. For more information on grounding, refer to *Site Considerations for Equipment Installation, Grounding, and Wiring Manual (D301452X012)*.
8. Adjust swivel and tilt angle for maximum solar exposure (see [Section 2.13.5](#)).

**Figure 2-24. Integral Mounted Solar Panel**



- 1** 6V, 6W solar panel
- 2** aluminum tilt bracket (2)
- 3** 10-32 x 1/2 pan head screw (4).
- 4** 5/16 flat washer (4); only two visible in this graphic
- 5** 5/16-18 x .75 LG hex head bolt (2)
- 8** mounting bracket
- 9** #10 lock washer (4)
- 10** #10-32 hex nut (4)
- 11** 3/4 NPT pipe cap
- 12** U-bolt 1 1/8 in. diam. pipe x 1/4 -20 x 2-inch-long
- 13** pipe threads (2)
- 14** 3/4 NPT x 8-inch-long threaded pipe
- 15** 3/4 NPT 90-degree female x male elbow pipe
- 16** Conduit fitting

## 2.12.3 Mounting the Solar Panel (Remote Mount)

### **⚠ DANGER**

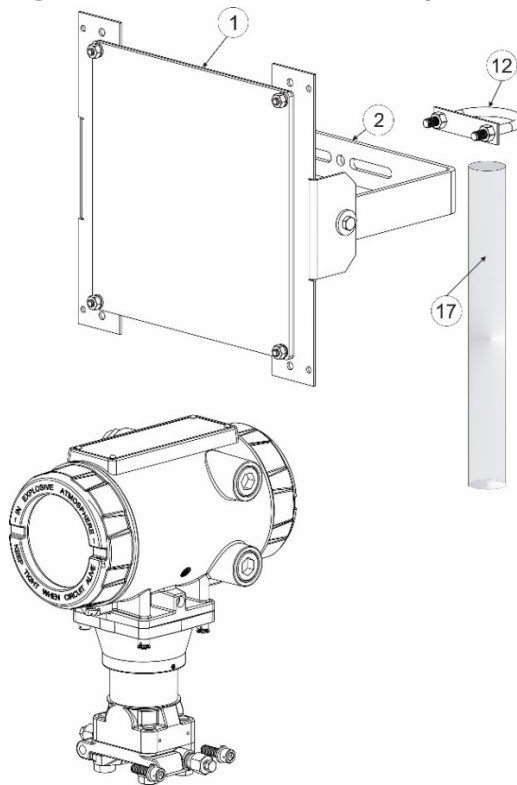
EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

#### **Restriction**

Battery power is **not** allowed in ATEX/IECEX applications.

1. Apply Loctite 222 thread locker sparingly to threads of U-bolt (Item 12).
2. Attach solar panel assembly to pole using U-bolt (Item 12). Torque to 30 in-lbs (3.4 N m).
3. Adjust swivel and tilt angle for maximum solar exposure (see [Section 2.13.5](#)).

**Figure 2-25. Remote Mounted (pole mounted) Solar Panel**



- |           |   |
|-----------|---|
| <b>1</b>  | 6V, 6W solar panel                                  |
| <b>2</b>  | mounting bracket                                    |
| <b>12</b> | U-bolt 1 1/8 in. diam. pipe x 1/4 -20 x 2 inch long |
| <b>17</b> | pole (customer supplied)                            |

## 2.12.4 Connecting Solar Power

### **⚠ DANGER**

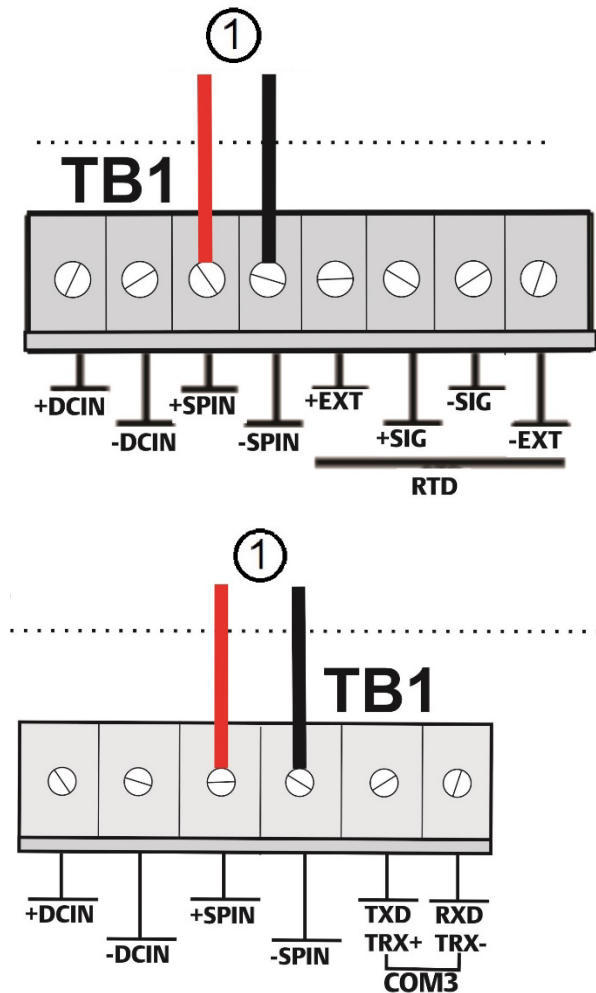
EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

When power comes from a solar panel/lead acid battery combination, connect using the +SPIN and -SPIN terminals and standard copper wire (#18 AWG minimum).

**Note**

The top portion of *Figure 2-26* shows wiring for units with option I/O; the bottom portion shows wiring for units without optional I/O.

**Figure 2-26. Wiring Solar Power**



1 To solar panel

**Restriction**

Battery power is not allowed in ATEX/IECEX applications.

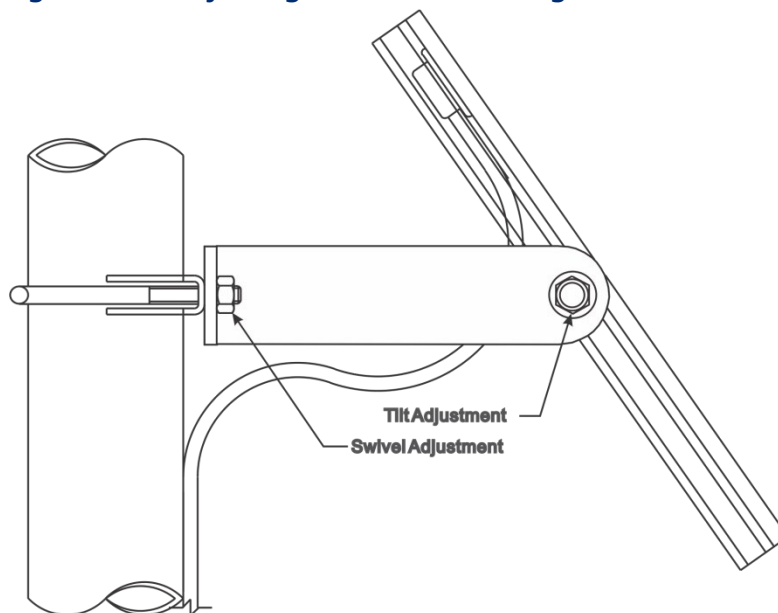
## 2.12.5 Adjusting the Optional Solar Panel Tilt Angle

**⚠ DANGER**

**EXPLOSION HAZARD:** Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

The mounting brackets allow you to adjust the solar panel for maximum solar exposure. You can adjust the swivel of the panel by adjusting the U-bolt.

**Figure 2-27. Adjusting Solar Panel Tilt Angle**



- Point the solar panel surface due *south* (in the northern hemisphere) or due *north* (in the southern hemisphere) at an angle determined by the latitude of the site. [Table 2-6](#) shows the angle (from horizontal) at which you should install the solar panel to maximize annual energy output. At most latitudes, you can improve performance by reducing the angle during the summer and increasing the angle during the winter. If no seasonal adjustments in panel direction are needed then adjust the position for the worst-case December-March angle.
- Solar insolation is the amount of solar energy in hours received each day by an optimally tilted panel during the worst month of the year. An insolation rating of one hour means that the site, on average, would receive one hour of solar energy at the panel's rated power level (1000W/m<sup>2</sup> per day). This rating varies from less than one hour in northern Canada to more than six hours in the Sahara Desert.

**Table 2-6: Solar Panel Tilt Angle**

| Latitude  | Installation Angle              |
|-----------|---------------------------------|
| 0 to 4°   | 10° from horizontal             |
| 5 to 20°  | Add 5° from the local latitude  |
| 21 to 45° | Add 10° from the local latitude |
| 46 to 65° | Add 15° from the local latitude |
| 66 to 75° | 80° from horizontal             |

## 2.13 Connecting Communication Ports

### **⚠ DANGER**

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

The communication ports allow you to connect either to a PC or laptop running FBxConnect software or to other devices. If your application measures two meter runs, you must dedicate a port for communication to the external transmitter for the second meter run.

Access the three serial communication ports and the Ethernet port on the terminal plate under the rear end cap. Route communication cables through the conduit fittings and connect the cables on the terminal plate.

### 2.13.1 Connecting to COM1

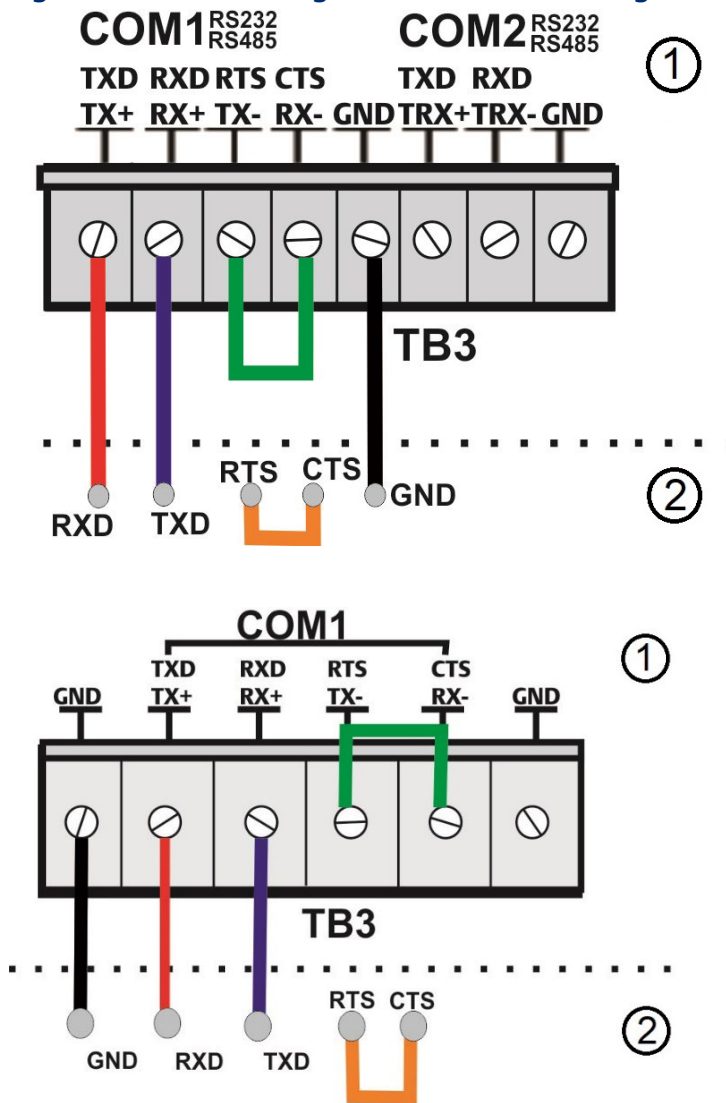
COM1 can be configured for RS-232, RS-485 (2-wire), or RS-485 (4-wire) communications. When connecting COM1 to another device using **RS-232**, use wiring as shown in *Figure 2-28*.

**Note**

The upper portion of *Figure 2-28* shows wiring for units with optional I/O; the lower portion shows wiring for units without optional I/O.



Figure 2-28. Connecting a Device to COM1 Using RS-232



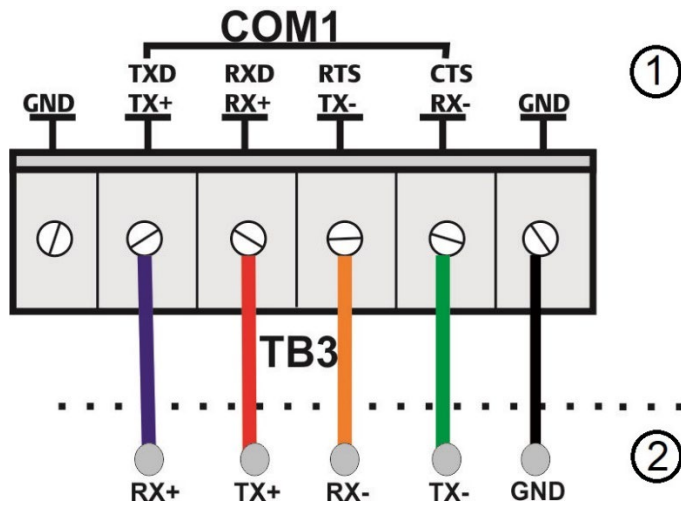
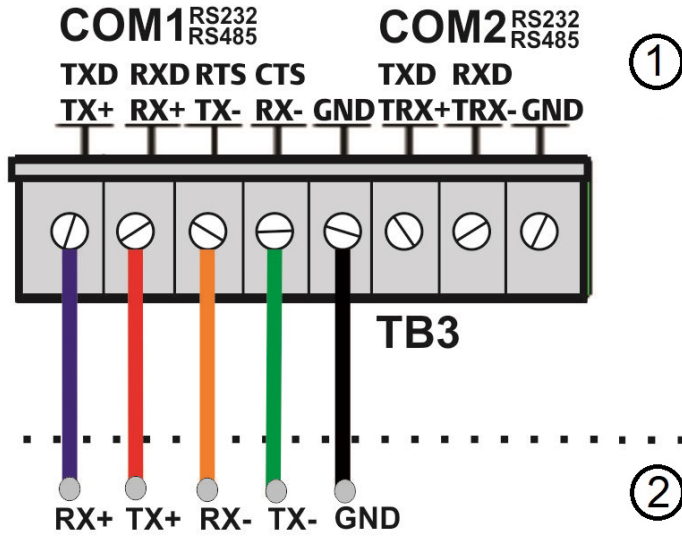
- 1 RS-232 port (COM1) on FB device
- 2 RS-232 port on external device

When connecting COM1 to another device using **RS-485 (4-wire)**, use wiring as shown in *Figure 2-29*.

**Note**

The upper portion of *Figure 2-29* shows wiring for units with optional I/O; the lower portion shows wiring for units without optional I/O.

Figure 2-29. Connecting a Device to COM1 Using RS-485 (4-wire)



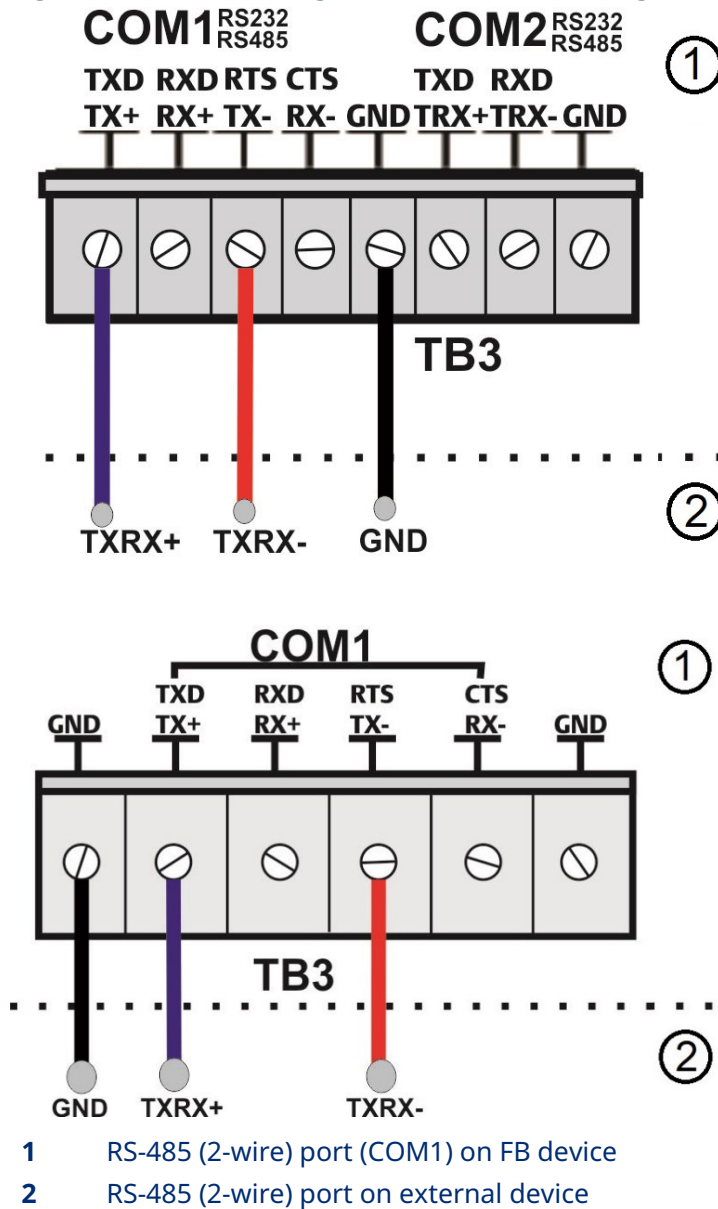
- 1 RS-485 (4-wire) port (COM1) on FB device
- 2 RS-485 (4-wire) port on external device

When connecting COM1 to another device using **RS-485 (2-wire)**, use wiring as shown in *Figure 2-30*.

**Note**

The upper portion of *Figure 2-30* shows wiring for units with optional I/O; the lower portion shows wiring for units without optional I/O.

Figure 2-30. Connecting a Device to COM1 Using RS-485 (2-wire)



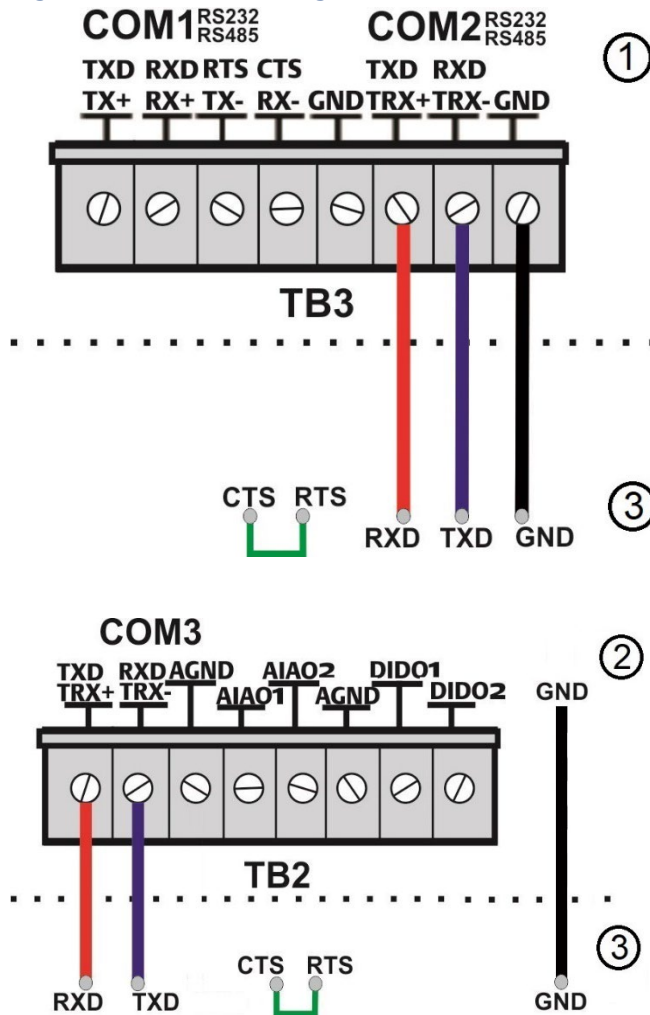
Regardless of the interface standard (RS-232, RS-485 [2-wire or 4-wire]), you must use FBxConnect to configure the port for proper usage.

### 2.13.2 Connecting to COM2 and COM3

COM2 and COM3 operate identically. Each can be configured for either RS-232 or RS-485 (2-wire) communication.

When connecting COM2 or COM3 to an **RS-232** port on another device (a PC or another controller/flow computer) use wiring as shown in *Figure 2-31*:

Figure 2-31. Connecting a Device to COM2 or COM3 Using RS-232 (with Optional I/O)

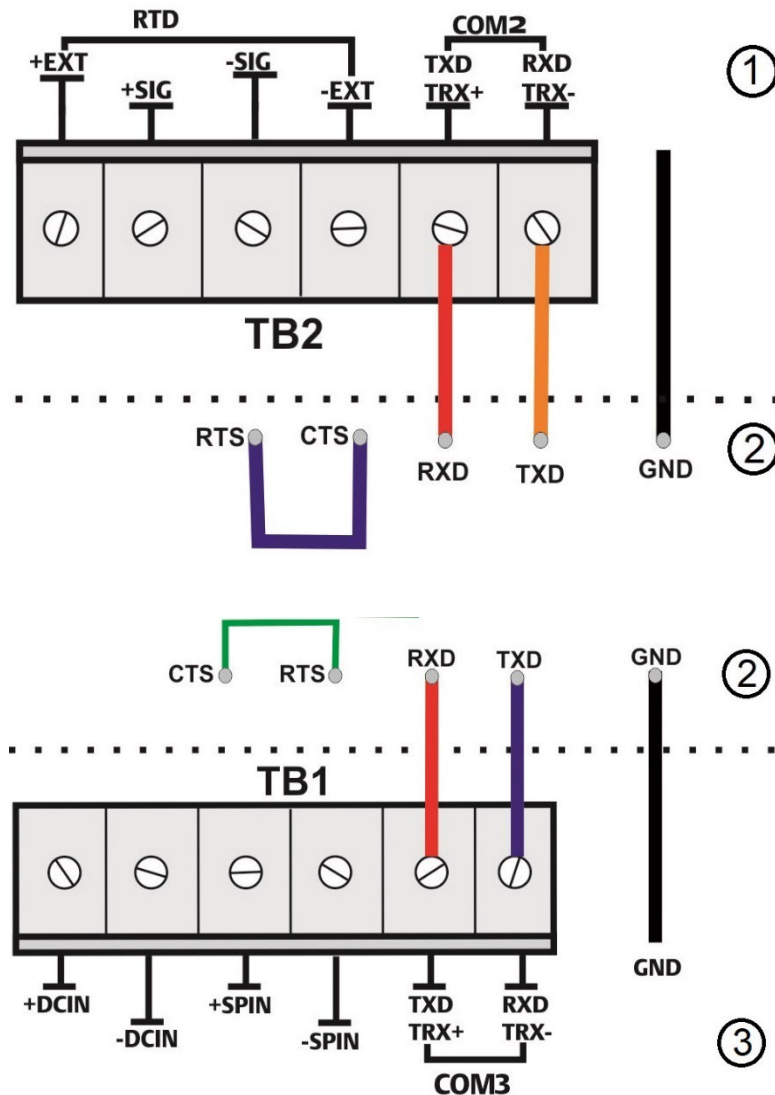


- 1 RS-232 port (COM2) on FB device
- 2 RS-232 port (COM3) on FB device
- 3 RS-232 port on external device

**Note**

COM3 does not have its own GND terminal. Use either GND terminal on the COM1 terminal block.

Figure 2-32. Connecting a Device to COM2 or COM3 Using RS-232 (without optional I/O)

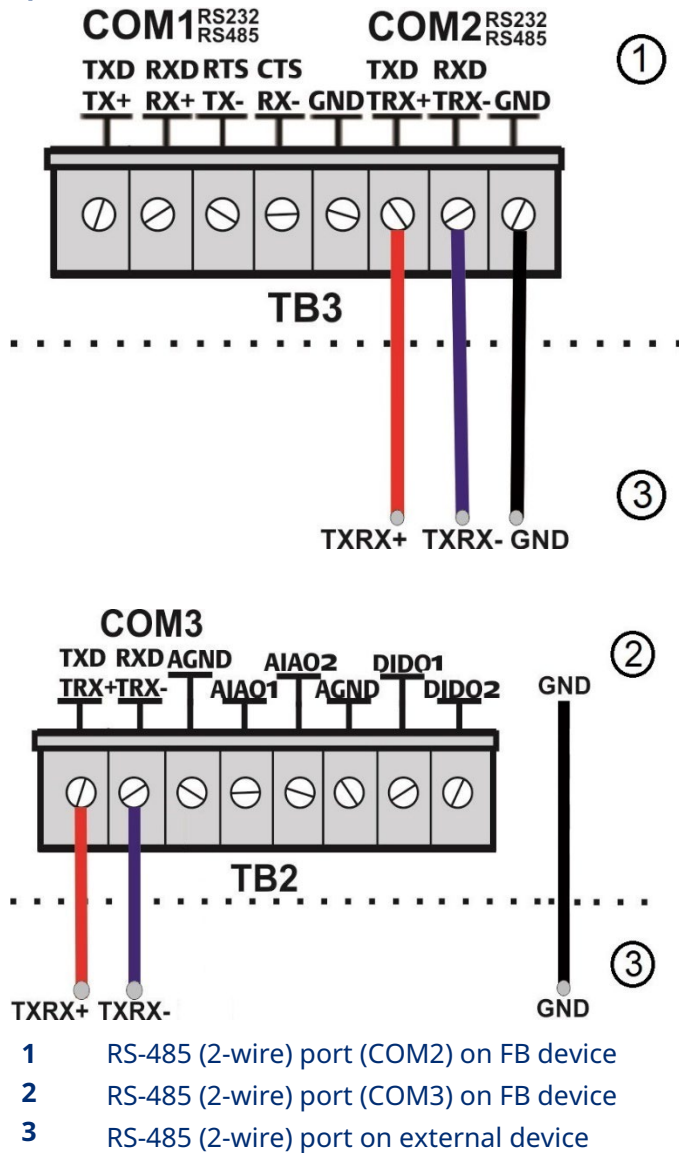


**Note**

COM2 does not have its own GND terminal. Use either GND terminal on the COM1 terminal block.

When connecting COM2 or COM3 to an **RS-485 (2-wire)** port on another device (such as a transmitter), use wiring as shown in *Figure 2-33*:

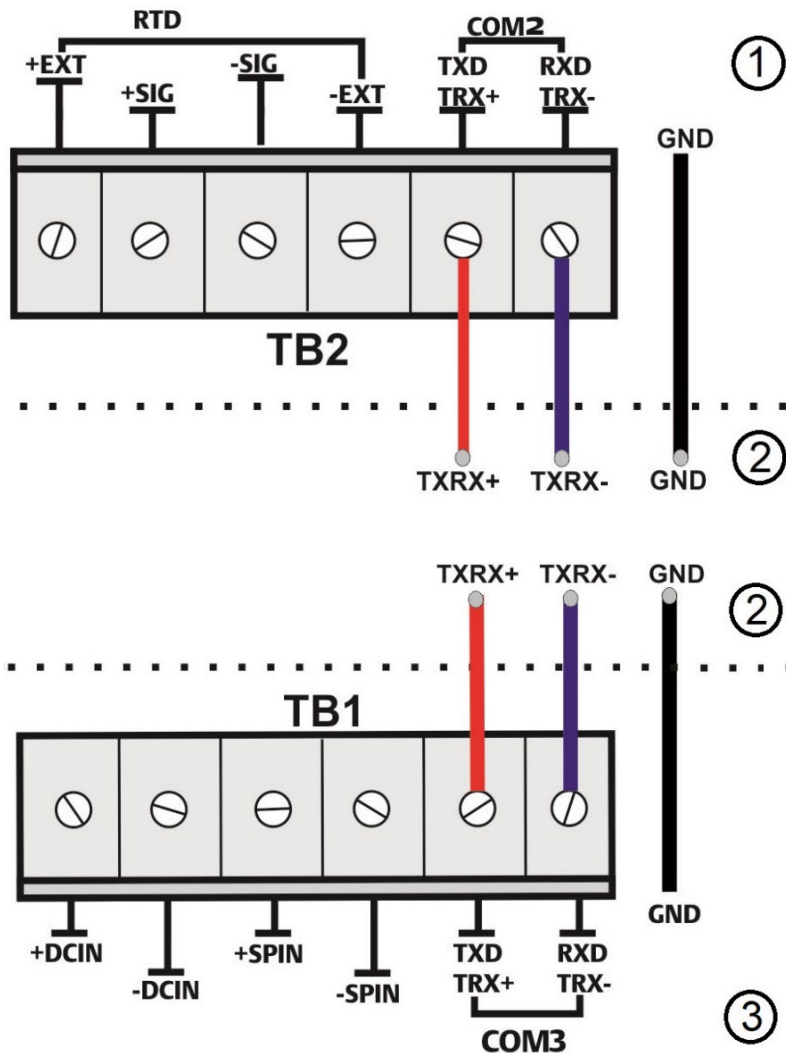
Figure 2-33. Connecting a Device to COM2 or COM3 Using RS-485 (2-wire) (with optional I/O)



**Note**

COM3 does not have its own GND terminal. Use either GND terminal on the COM1 terminal block.

Figure 2-34. Connecting a Device to COM2 or COM3 Using RS-485 (2-wire) (without optional I/O)



- 1 RS-485 (2-wire) port (COM2) on FB device
- 2 RS-485 (2-wire) port on external device
- 3 RS-485 (2-wire) port (COM3) on FB device

**Note**

Neither COM2 nor COM3 have GND terminals. Use either GND terminal on the COM1 terminal block when grounding COM2 or COM3.

Regardless of the interface standard (RS-232 or RS-485 2-wire), you must use FBxConnect to configure the port for proper usage.

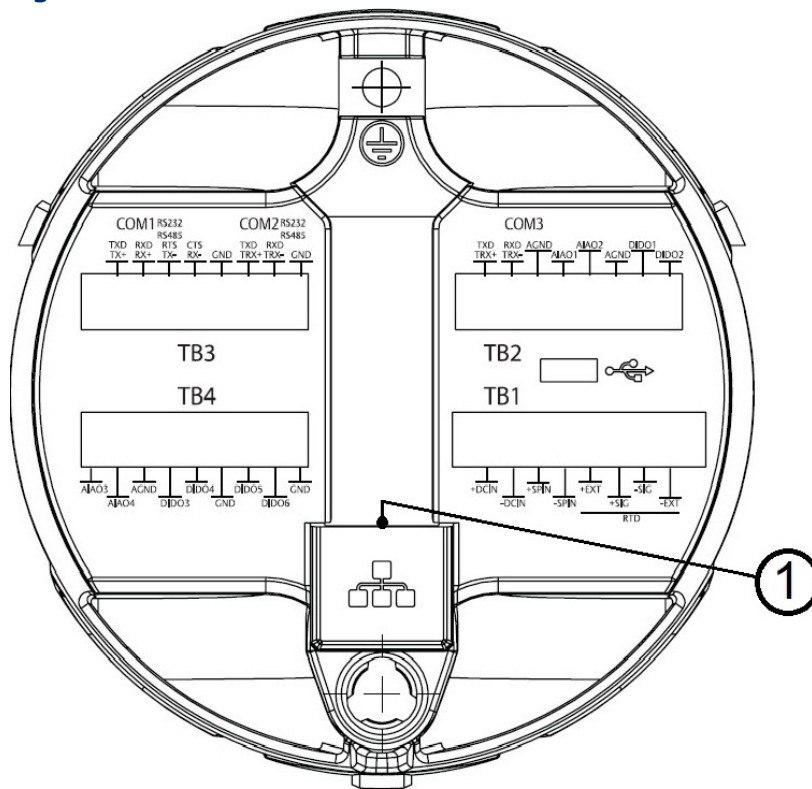
## 2.13.3 Ethernet Port

The Ethernet port is a standard 8-pin 10/100Base-T RJ-45 modular connector located on the terminal plate. Connect to the Ethernet port using the appropriate Category 5 shielded patch cable

### Note

The default IP address for the Ethernet port is **192.168.1.10**; the default port is **20000**.

**Figure 2-35. Location of Ethernet Port**



**1** Ethernet Port



### Note

If you ordered Ethernet, the unit ships with Ethernet enabled. If you need to operate the device in lower power mode, you must **disable** Ethernet. Jumper J10 on the CPU module (see [Figure 2-36](#)) controls whether Ethernet is enabled or disabled (lower power mode). See the [CPU Module Field Replacement Guide](#) (D301802X012) for information on how to open the unit to gain access to the CPU module.



Figure 2-36. Ethernet Port jumper



- J10  1-2 Enable Ethernet
- J10  2-3 Disable Ethernet (low power mode)



## Chapter 3: I/O Configuration and Wiring

This chapter covers the following topics:

- Analog Inputs
- Analog Outputs
- Digital Inputs
- Digital Outputs
- Pulse Inputs
- Connecting the RTD/PRT
- Connecting a Rosemount 4088B Transmitter For Use in a Second Meter Run

I/O in the flow computer comes from the integrated multivariable sensor and RTD connector, the CPU board, as well as from the optional 6-channel expansion I/O board.

---

### Note

When using a digital output to drive an inductive load (such as a relay coil), place a suppression diode across the load. This protects the DO from the reverse Electro-Motive Force (EMF) spike generated when the inductive load is switched off.

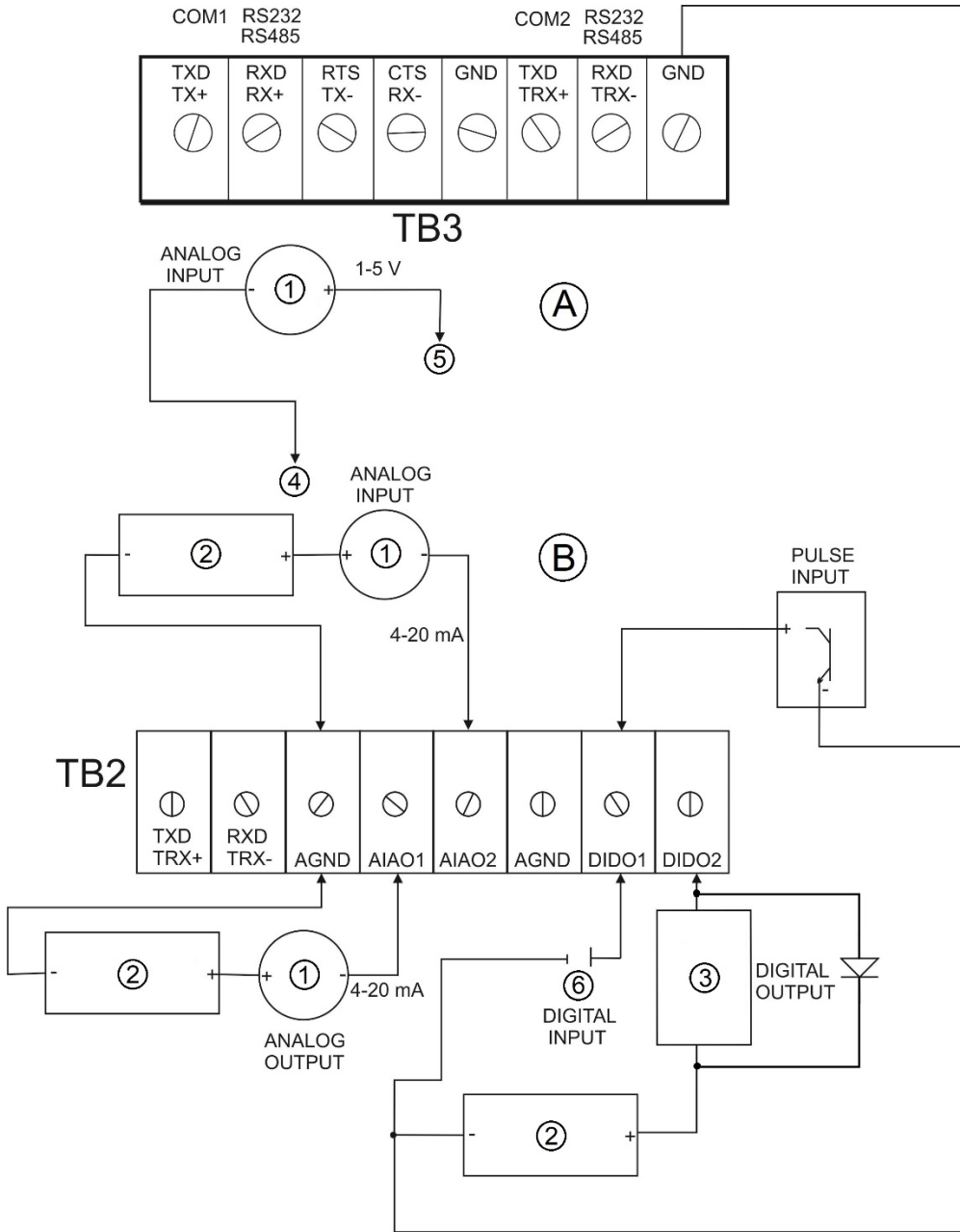
---

### Notes About Power for an External Device Connected to a Flow Computer I/O Point:

If the external device does not include its own integrated power supply, you must provide your own external supply (30Vdc maximum) for that device.

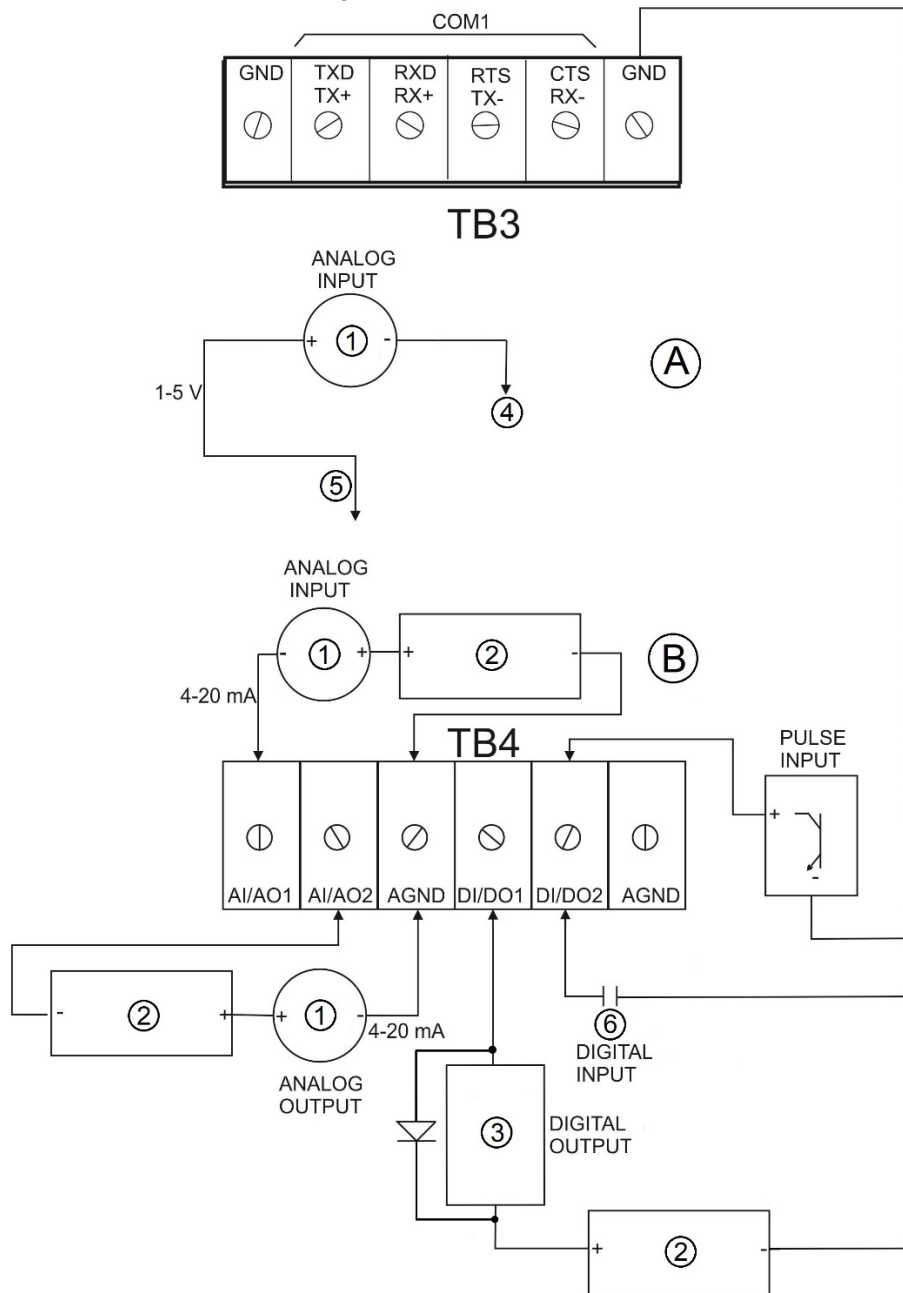
---

Figure 3-1. Base I/O on CPU (with Optional I/O)



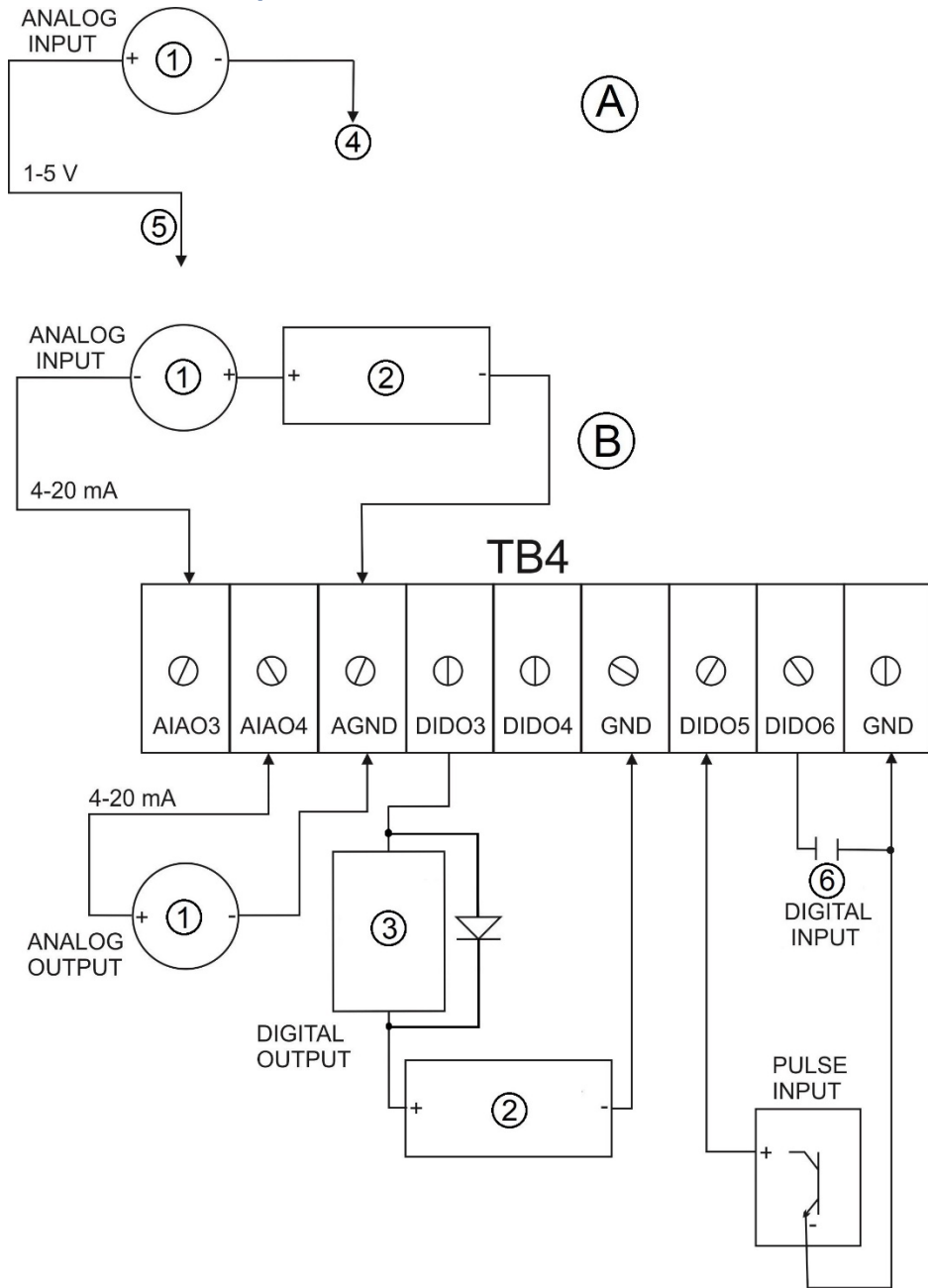
- A** When wiring a 1-5 V Analog Input (AI), use configuration at left
- B** When wiring a 4-20 mA Analog Input (AI), use configuration at left
- 1** Field Device
- 2** Power Supply 30Vdc Max
- 3** 500 mA load max
- 4** To AGND
- 5** To AIAOx
- 6** Dry contact

Figure 3-2. Base I/O On CPU (without Optional I/O)



- A When wiring a 1-5 V Analog Input (AI), use configuration at left
- B When wiring a 4-20 mA Analog Input (AI), use configuration at left
- 1 Field Device
- 2 Power Supply 30Vdc Max
- 3 500 mA load max
- 4 To AGND
- 5 To AIAOx
- 6 Dry contact

Figure 3-3. Optional 6-channel Expansion I/O Module



- A** When wiring a 1-5 V Analog Input (AI), use configuration at left
- B** When wiring a 4-20 mA Analog Input (AI), use configuration at left
- 1** Field Device
- 2** Power Supply 30Vdc Max
- 3** 500 mA load max
- 4** To AGND
- 5** To AIAOx
- 6** Dry contact

## 3.1 Analog Inputs

The flow computer includes two on-board channels you can individually configure as either analog inputs (AI) or analog outputs (AO). In addition, if you purchased the optional 6-channel expansion I/O board, there are two additional channels you can individually configure as either AIs or AOs.

### Note

No external resistor is required for a current (mA) device. You can apply a 250 ohm resistor using analog input configuration selections in FBxConnect.

When configured as analog inputs, the channels have the following characteristics:

**Table 3-1. Analog Input Characteristics**

| Type              | Number Supported  | Characteristics  |
|-------------------|---|--|
| Analog Input (AI) | 0 to 4 as follows: <ul style="list-style-type: none"> <li>▪ 1 or 2 non-isolated channels on CPU board (AIAO1 and AIAO2) always present. You can configure one, both, or neither as AIs.</li> <li>▪ 1 or 2 additional non-isolated channels on optional 6-channel expansion I/O board (AIAO3 and AIAO4). If present you can configure one, both, or neither as AIs.</li> </ul> | <ul style="list-style-type: none"> <li>▪ 4 to 20 mA range (@24Vdc), or 1 to 5Vdc</li> <li>▪ Over range for calibration purposes: 3.2 to 20.8 mA or 0.8 to 5.2 Vdc</li> <li>▪ Externally powered</li> <li>▪ Factory calibrated (re-calibration is unnecessary for at least 3 years)</li> <li>▪ Signal conditioning</li> <li>▪ When you configure a channel as an AI it cannot be used as an AO</li> </ul> |

### 3.1.1 AI Wiring

Wire analog inputs as shown in the following figures.

### Note

*Figures 3-4* and *3-5* show analog input wiring for AIAO2. AIAO1 and AIAO2 share the same GND terminal.

Figure 3-4. 4-20 mA AI Wiring (Base I/O with Optional I/O Module)

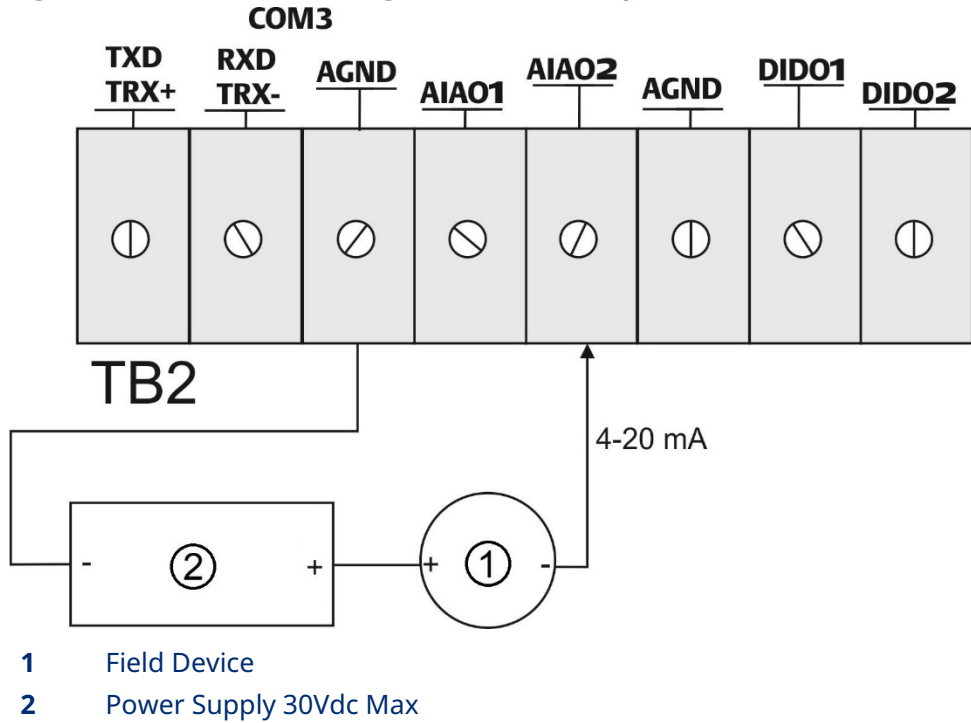
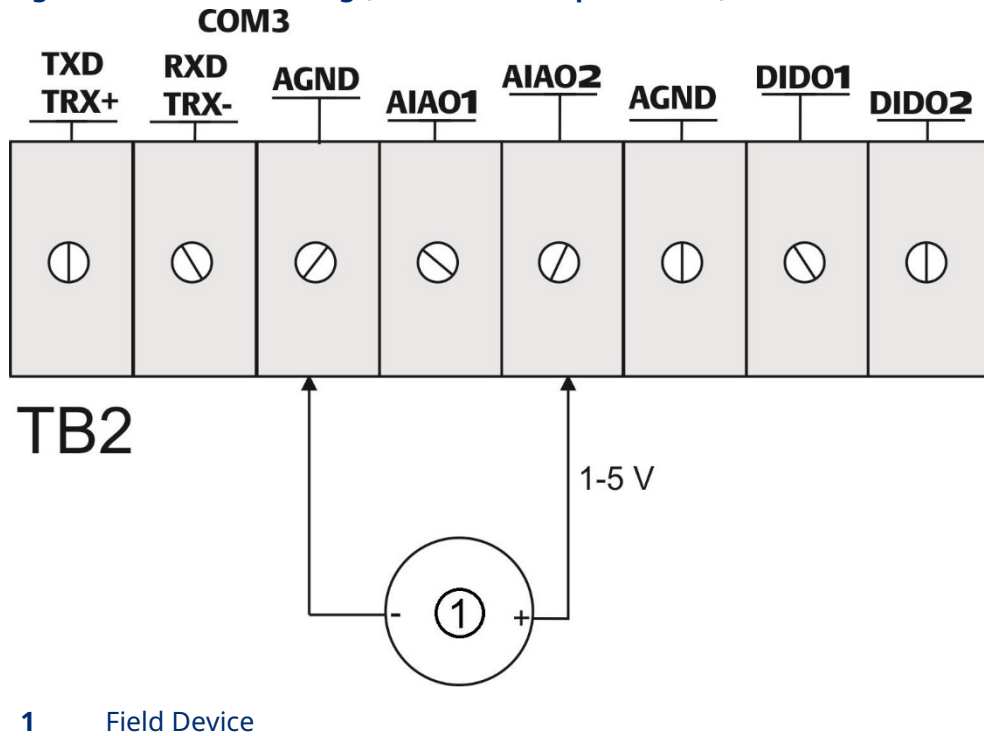
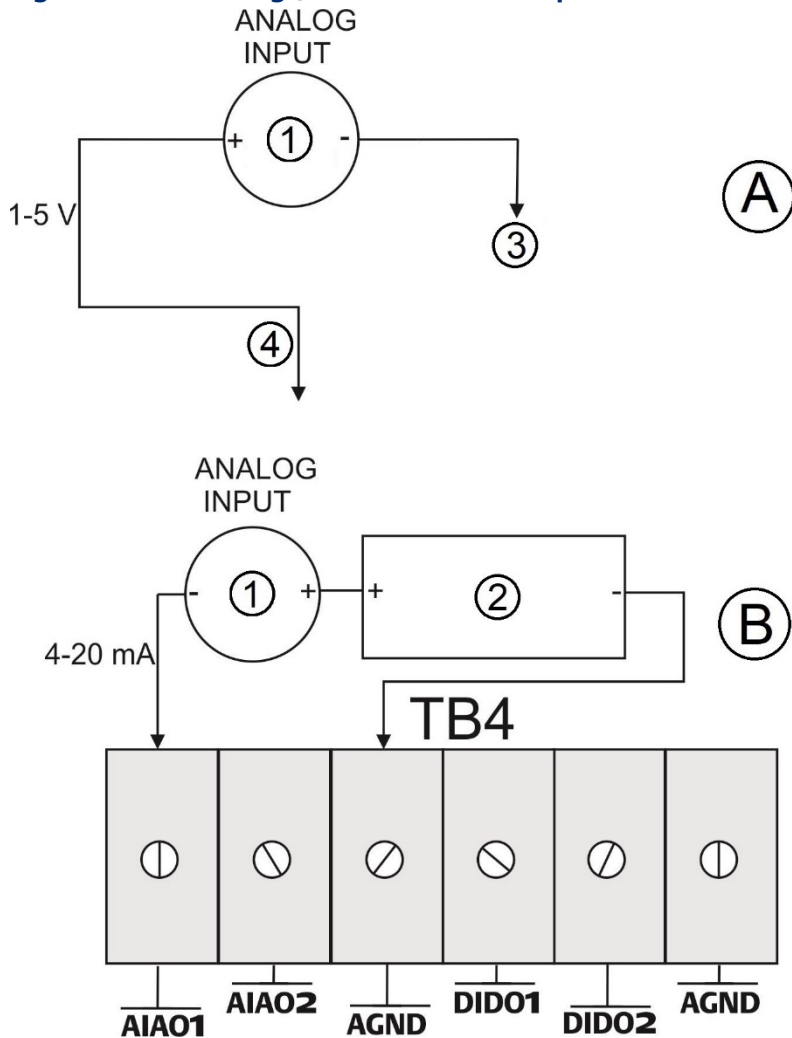


Figure 3-5. 1-5 V AI Wiring (Base I/O with optional I/O)





**Figure 3-6. AI Wiring (Base I/O without Optional I/O Module)**

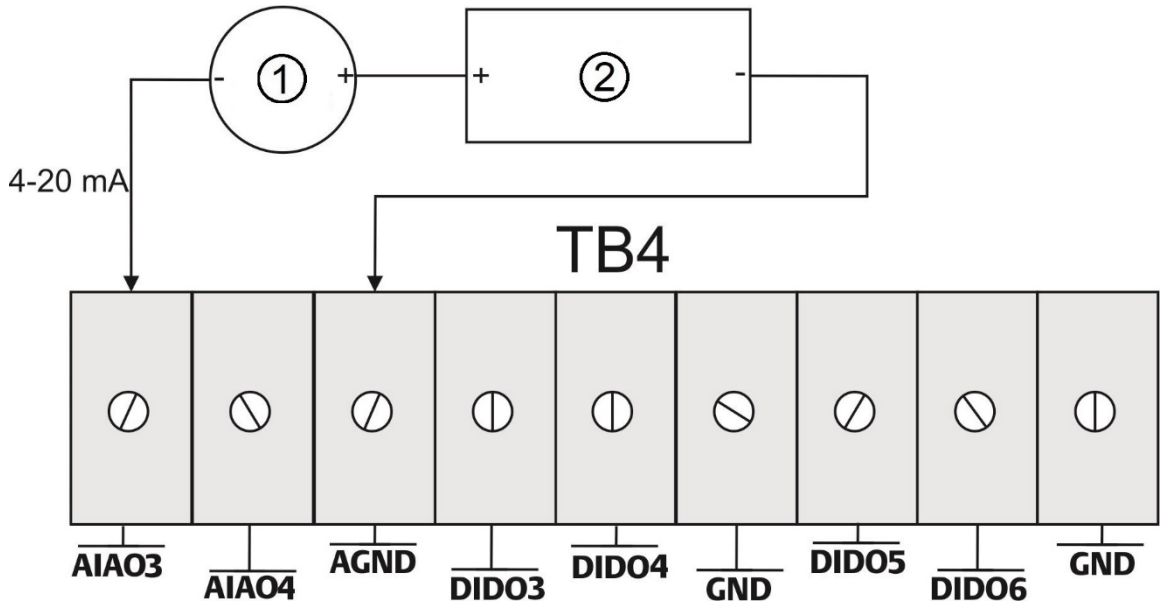


- A** When wiring a 1-5 V Analog Input (AI), use configuration at left
- B** When wiring a 4-20 mA Analog Input (AI), use configuration at left
- 1** Field Device
- 2** Power Supply 30Vdc Max
- 3** To AGND
- 4** To AIAOx

**Note**

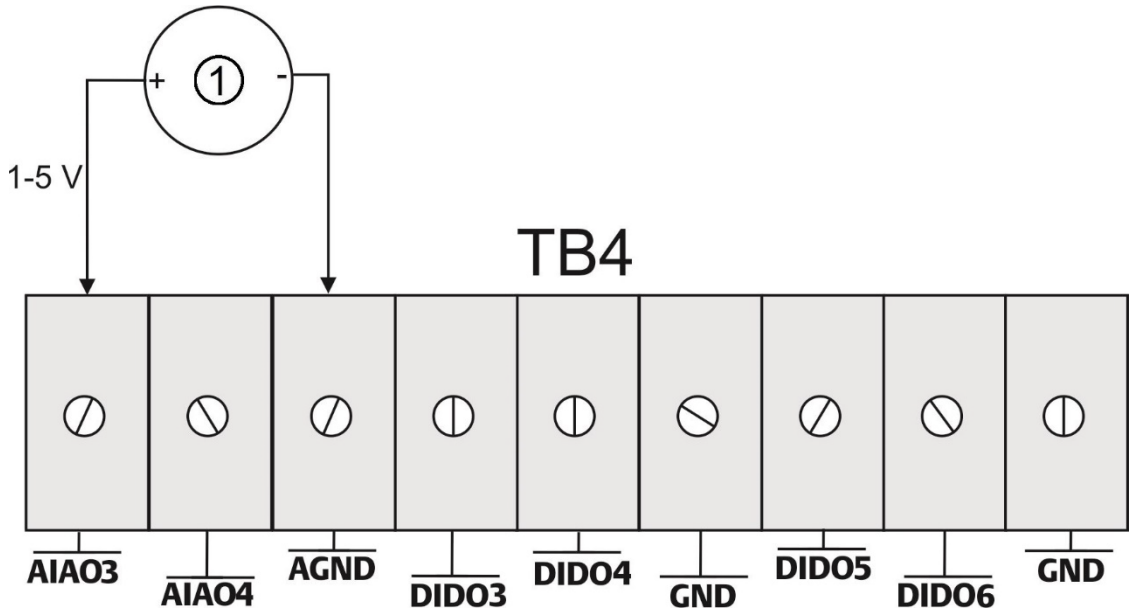
Figures 3-7 and 3-8 show analog input wiring for AIAO3. AIAO3 and AIAO4 share the same GND terminal.

Figure 3-7. 4-20 mA AI Wiring (with Optional 6-channel Expansion I/O Module).



- 1 Field Device
- 2 Power Supply 30Vdc Max

Figure 3-8. 1-5 V Analog Input (AI) Wiring (Optional 6-channel Expansion I/O Module)



- 1 Field Device

## 3.2 Analog Outputs

The flow computer includes two on-board channels you can individually configure as either analog outputs (AO) or analog inputs. In addition, if you purchased the optional 6-channel expansion I/O board, there are two additional channels you can individually configure as either AOs or AIs.

When configured as analog outputs, the channels have the following characteristics:

**Table 3-2: Analog Output Characteristics**

| Type               | Number Supported  | Characteristics   |
|--------------------|---|---|
| Analog Output (AO) | 0 to 4 as follows: <ul style="list-style-type: none"> <li>▪ 1 or 2 non-isolated channels on CPU board (AIAO1 and AIAO2) always present. You can configure one, both, or neither as AOs. <b>Note:</b> If you configure both as AOs we recommend you provide isolation to avoid ground loops which could affect readings.</li> <li>▪ 1 or 2 additional non-isolated channels on optional 6-channel expansion I/O board (AIAO3 and AIAO4). If present you can configure one, both, or neither as AOs.</li> </ul> | <ul style="list-style-type: none"> <li>▪ 4 to 20 mA range (@24Vdc)</li> <li>▪ Externally powered field device (AIAO1/AIAO2)</li> <li>▪ AO provides current to power field device (AIAO3/ AIAO4)</li> <li>▪ AO sinks current to system ground</li> <li>▪ Factory calibrated (re-calibration is unnecessary for at least 3 years)</li> <li>▪ You can configure a fail state so that on power up or if the CPU fails the output drives to 0 <math>\mu</math>A</li> <li>▪ When a channel is configured as an AO it cannot be used as an AI</li> </ul> |

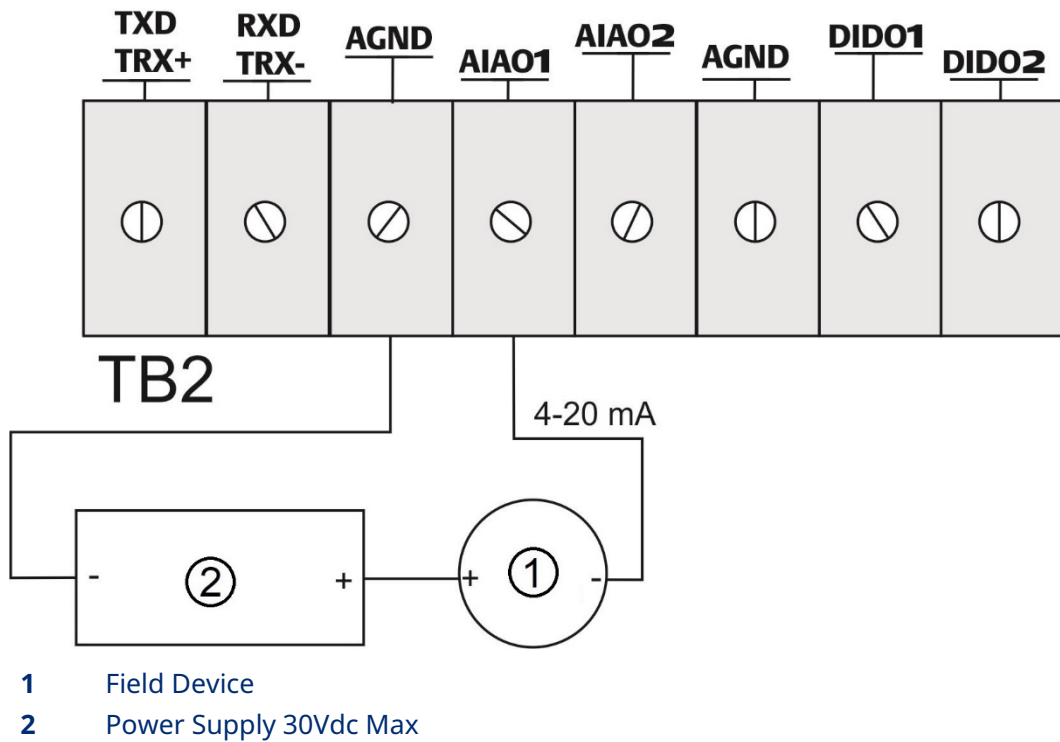
### 3.2.1 AO Wiring

Wire analog outputs as shown in the following figures.

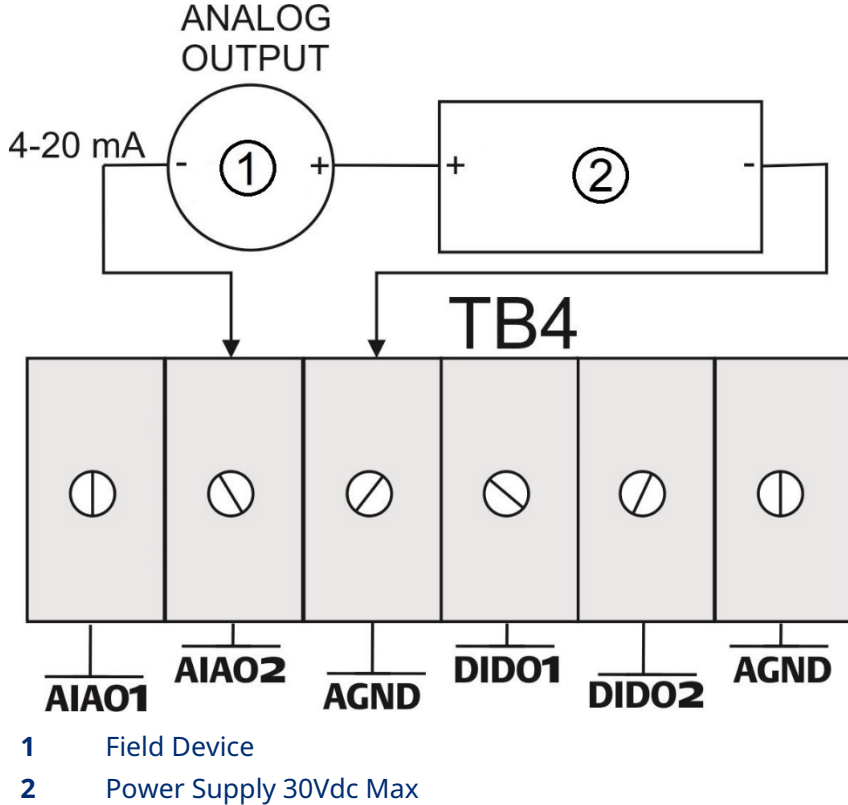
#### Note

*Figure 3-9* shows analog output wiring for AIAO1. AIAO1 and AIAO2 share the same GND terminal.

**Figure 3-9. AO Wiring (Base I/O with Optional I/O)**



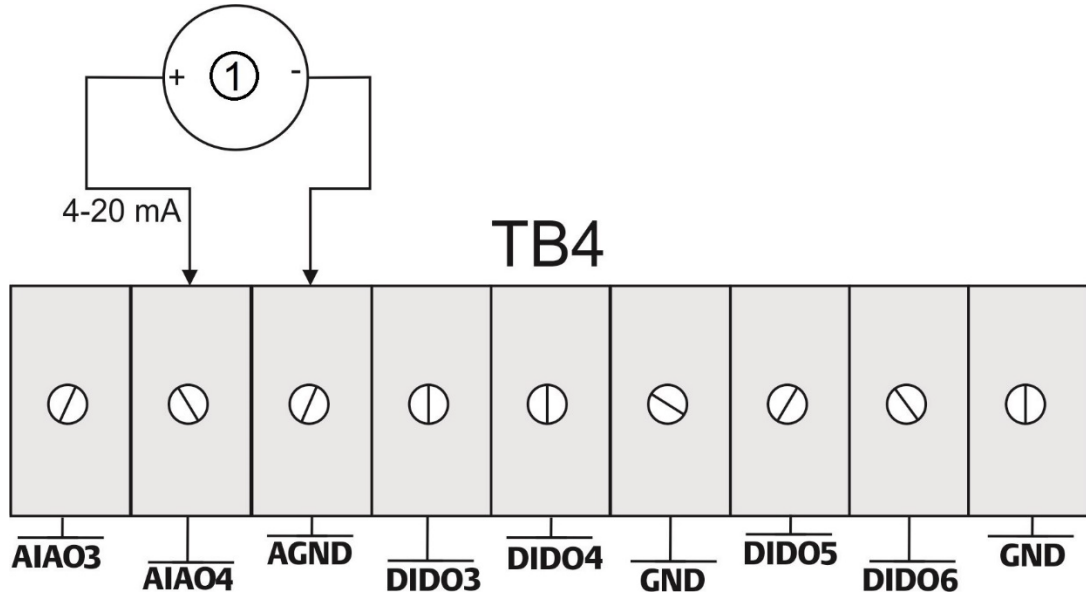
**Figure 3-10. AO Wiring (Base I/O without Optional I/O)**



**Note**

Figure 3-11 shows analog output wiring for AIAO4. AIAO3 and AIAO4 share the same GND terminal.

**Figure 3-11. AO Wiring (with Optional 6-channel Expansion I/O Module)**



1 Field Device

### 3.3 Digital Inputs

Depending upon how you ordered it, the flow computer includes either two or six channels you can individually configure as digital inputs (DI), digital outputs (DO), or pulse inputs (PI).

When configured as digital inputs, the channels have the following characteristics:

**Table 3-3. Digital Input Characteristics**

| Type               | Number Supported   | Characteristics  |
|--------------------|--|--|
| Digital Input (DI) | 0 to 6 as follows: <ul style="list-style-type: none"> <li>▪ 1 or 2 non-isolated channels on CPU board (PI/DI/DO1 and PI/DI/DO2). Two always present; you can configure one, both, or neither as DIs.</li> <li>▪ 1 to 4 additional non-isolated channels on optional 6-channel expansion I/O board (PI/DI/DO3 through PI/DI/DO6). If present you</li> </ul> | <ul style="list-style-type: none"> <li>▪ Circuit protection</li> <li>▪ 30ms input filtering</li> <li>▪ Maximum input frequency of 10 Hz</li> <li>▪ Selectable current source of 66 µA or 2 mA</li> <li>▪ Either externally driven or internally driven and pulled to ground by dry contact closures or open collector devices</li> </ul> |

| Type | Number Supported                                    | Characteristics  |
|------|---|--|
|      | can configure one, two, three, four or none as DIs. | <ul style="list-style-type: none"> <li>When a channel is configured as a DI it cannot be used as a DO or PI channel</li> </ul> |

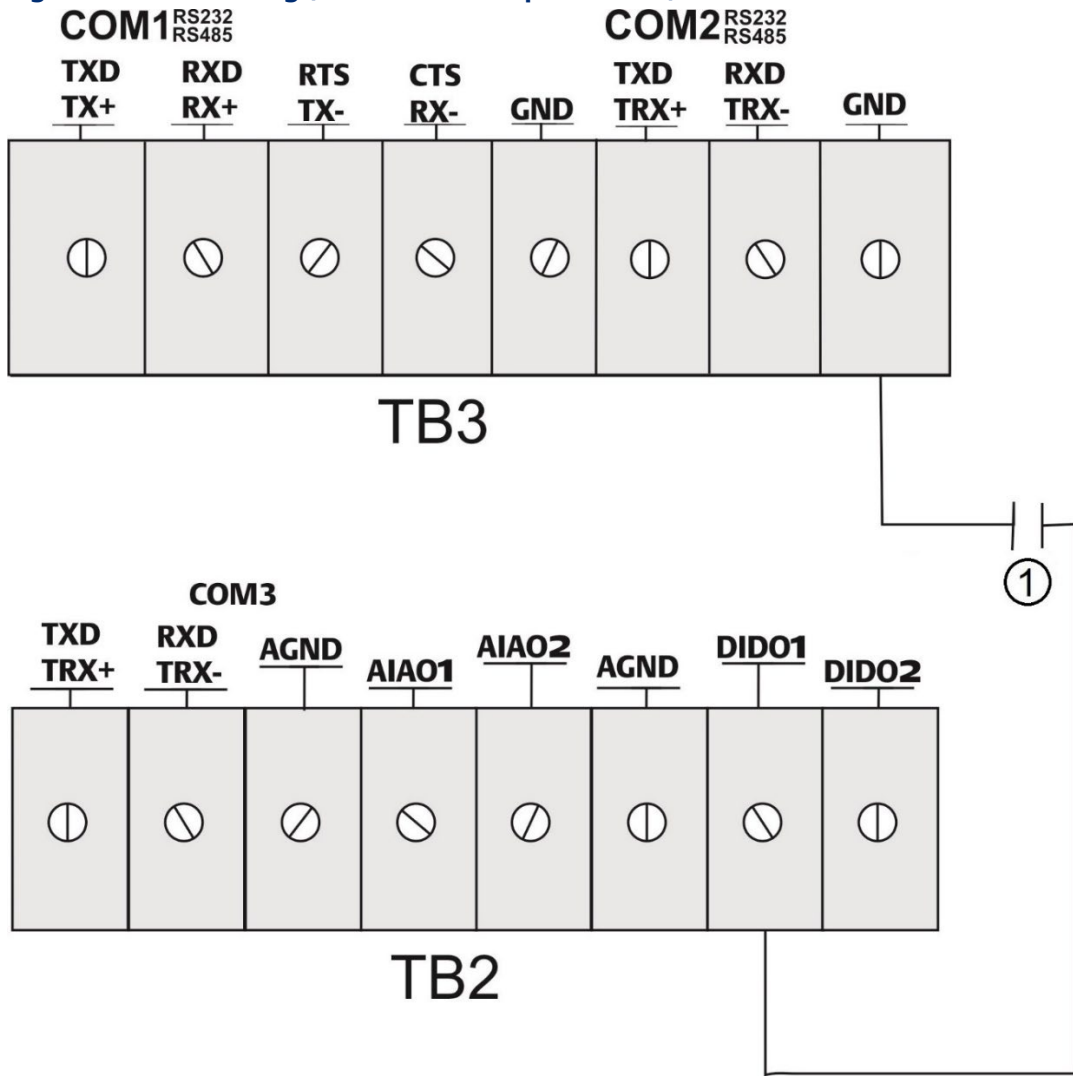
### 3.3.1 DI Wiring

The following figures show how to wire digital inputs.

**Note**

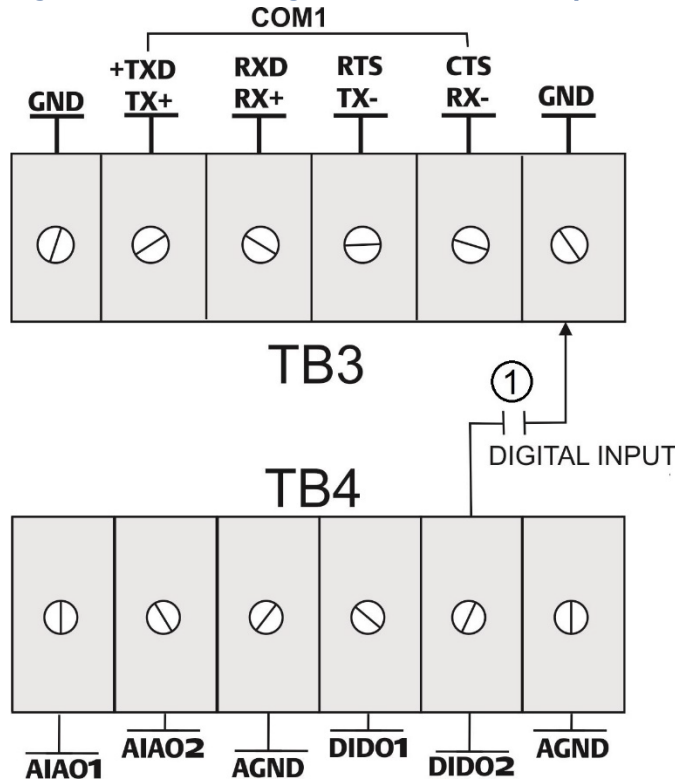
Figure 3-12 shows discrete input wiring for DIDO1. DIDO1 and DIDO2 share the same GND terminal.

**Figure 3-12. DI Wiring (Base I/O with Optional I/O)**



1 Dry contact

Figure 3-13. DI Wiring (Base I/O without Optional I/O)

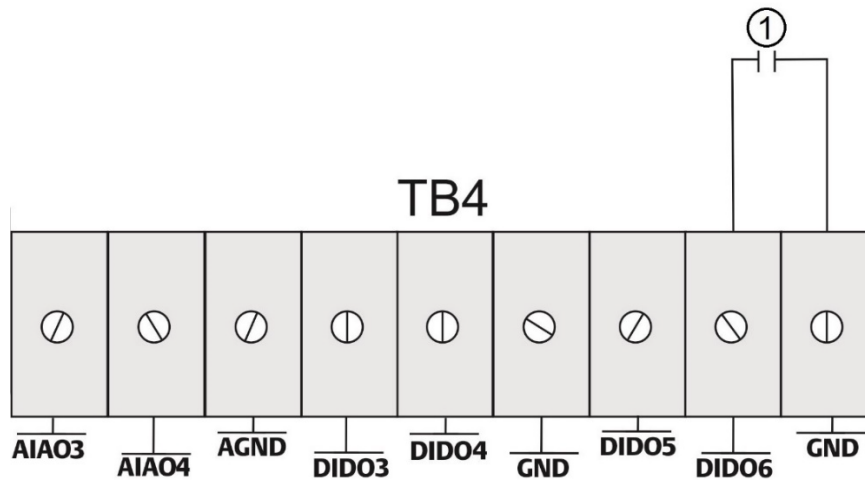


1 Dry contact

**Note**

Figure 3-14 shows discrete input wiring for DIDO5. DIDO5 and DIDO6 share the same GND terminal. DIDO3 and DIDO4 share a different GND terminal.

Figure 3-14. DI Wiring - (with Optional 6-channel Expansion I/O Module)



1 Dry contact

## 3.4 Digital Outputs

Depending upon how you ordered it, the flow computer includes two or six channels you can configure as digital outputs (DO), digital inputs (DI) or pulse inputs (PI).

### Note

When using a digital output to drive an inductive load (such as a relay coil), place a suppression diode across the load. This protects the DO from the reverse Electro-Motive Force (EMF) spike generated when the inductive load is switched off.

When configured as digital outputs, the channels have the following characteristics:

**Table 3-4: Digital Output Characteristics**

| Type                | Number Supported   | Characteristics   |
|---------------------|--|---|
| Digital Output (DO) | 0 to 6 as follows: <ul style="list-style-type: none"> <li>▪ 1 or 2 non-isolated channels on CPU board (PI/DI/DO1 and PI/DI/DO2). Two always present; you can configure one, both, or neither as DOs.</li> <li>▪ 1 to 4 additional non-isolated channels on optional 6-channel expansion I/O board (PI/DI/DO3 through PI/DI/DO6). If present you can configure one, two, three, four or none as DOs.</li> </ul> | <ul style="list-style-type: none"> <li>▪ DO is a low side switch that sinks current to ground</li> <li>▪ Current rating of 500 mA</li> <li>▪ Maximum operating frequency of 50 Hz</li> <li>▪ Pulse off/on time can be configurable with a 31 ms minimum on time and a 31 ms minimum off time</li> <li>▪ Can be configured in software with an output state for initial power-up and in the case of a CPU failure</li> <li>▪ Software configurable failure mode of fail open, fail closed, or hold last state</li> <li>▪ When a channel is configured as a DO it cannot be used as a DI or PI channel</li> </ul> |

### 3.4.1 DO Wiring

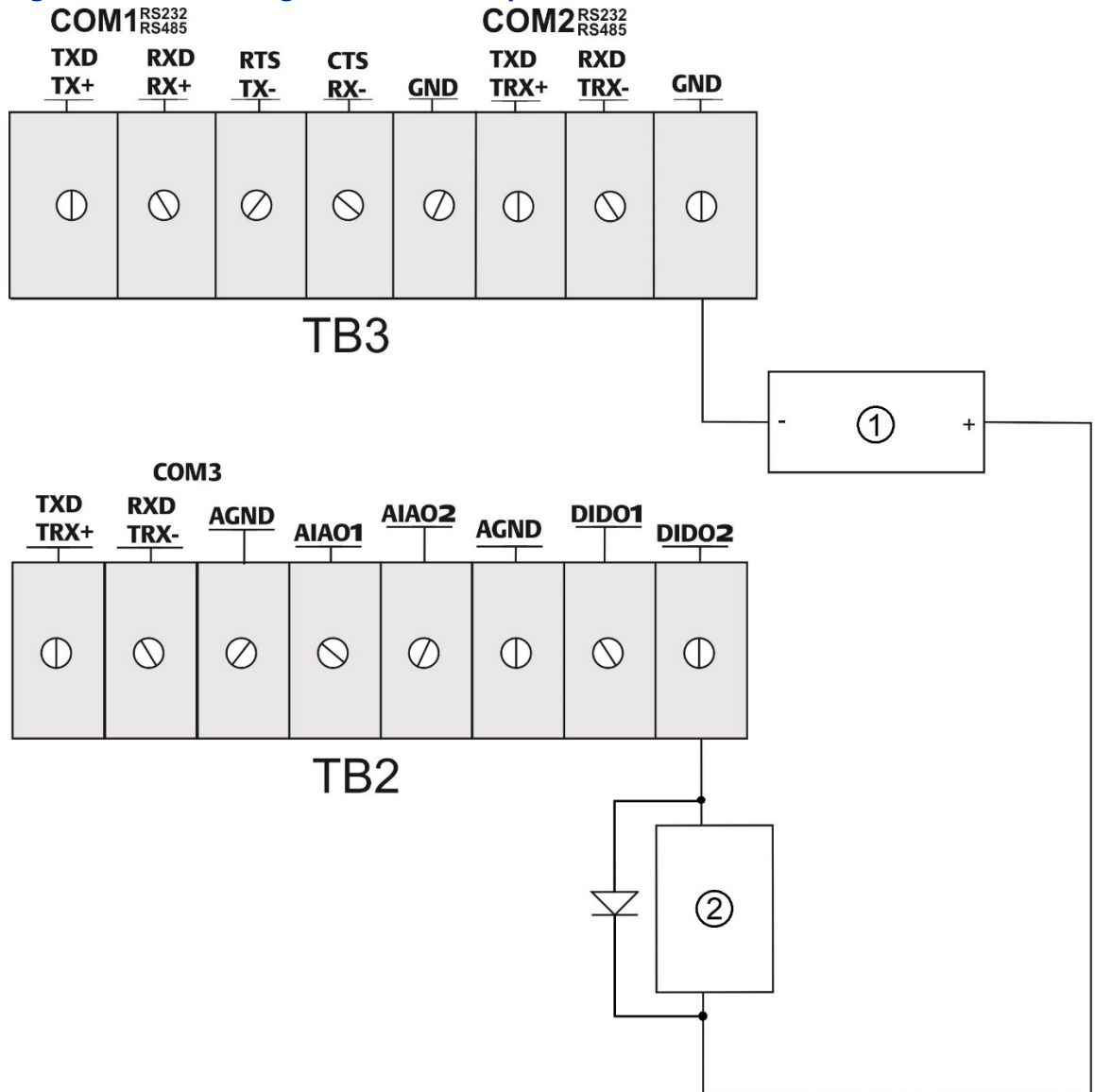
The following diagrams show how to wire digital outputs.



**Note**

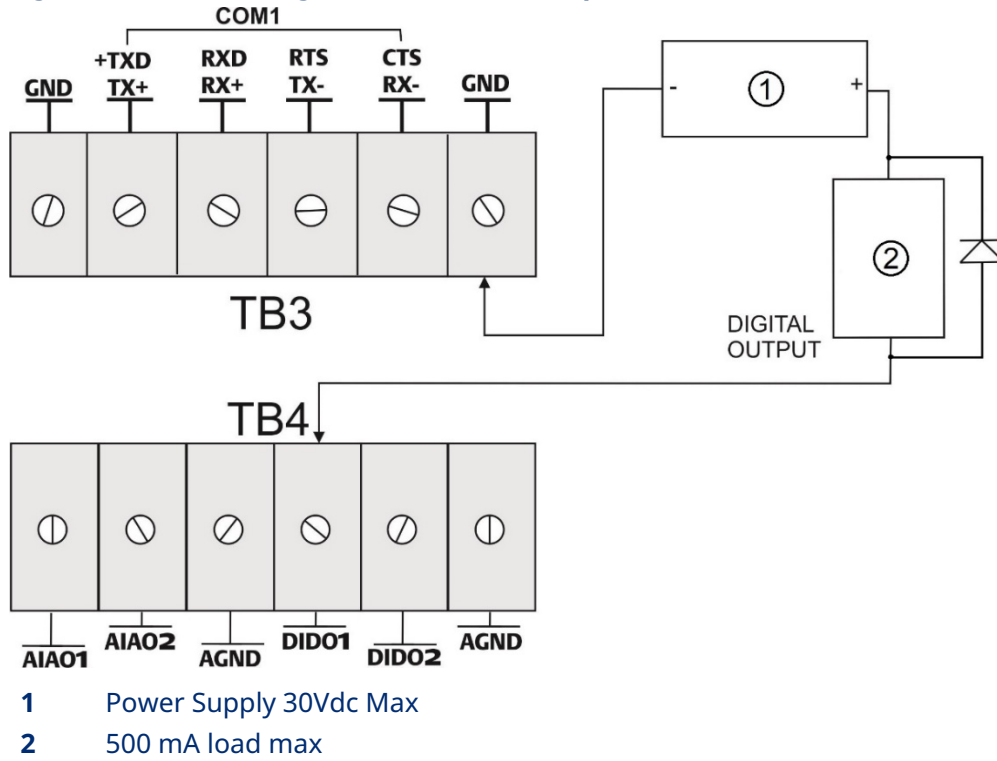
Figure 3-15 shows digital output wiring for DIDO2. DIDO1 and DIDO2 share the same GND terminal. DIDO3 and DIDO4 share a different GND terminal.

**Figure 3-15. DO Wiring (Base I/O with Optional I/O)**



- 1 Power Supply 30VDC max
- 2 500 mA load max

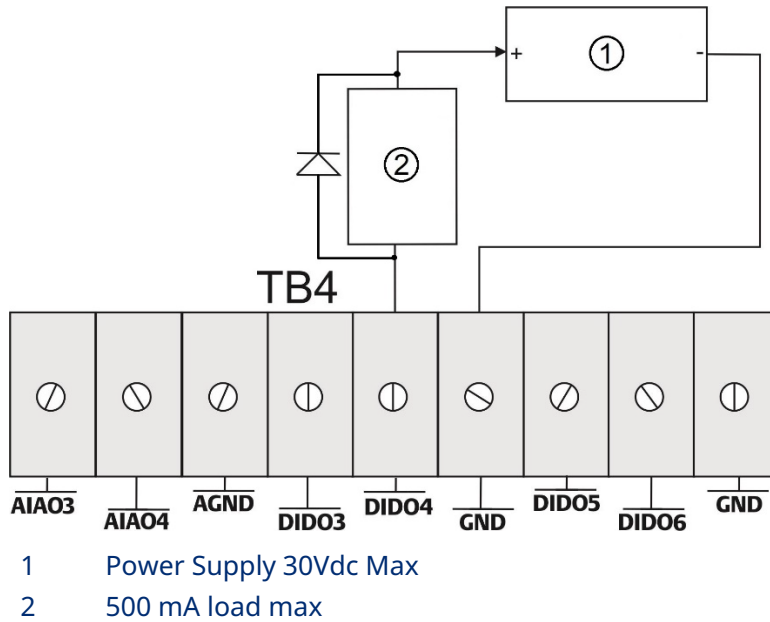
**Figure 3-16. DO Wiring (Base I/O without Optional I/O)**



**Note**

Figure 3-17 shows digital output wiring for DIDO4. DIDO3 and DIDO4 share the same GND terminal. DIDO5 and DIDO6 share a different GND terminal.

**Figure 3-17. DO Wiring (with Optional 6-channel Mixed I/O Module)**



## 3.5 Pulse Inputs

The flow computer includes two channels that can be individually configured as pulse inputs (PI), digital inputs (DI), or digital outputs (DO).

When configured as pulse inputs, the PI channels have the following characteristics:

**Table 3-. Pulse Input Characteristics**

| Type             | Number Supported   | Characteristics  |
|------------------|--|--|
| Pulse Input (PI) | 0 to 6 as follows: <ul style="list-style-type: none"> <li>▪ 1 or 2 non-isolated channels on CPU board (PI/DI/DO1 and PI/DI/DO2). Two always present; you can configure one, both, or neither as PIs.</li> <li>▪ 1 to 4 additional non-isolated channels on optional 6-channel expansion I/O board (PI/DI/DO3 through PI/DI/DO6). If present you can configure one, two, three, four or none as PIs.</li> </ul> | <ul style="list-style-type: none"> <li>▪ Supports dry contacts and open collector outputs connected to ground and voltage inputs</li> <li>▪ Supports single pulse for volume or mass</li> <li>▪ Input filtering selectable at 30 <math>\mu</math>s or 1 ms</li> <li>▪ Frequency range from 0 to 10.5 KHz</li> <li>▪ Maximum input frequency for the 1 ms filter is 300 Hz</li> <li>▪ When a channel is configured as a PI it cannot be used as a DI or DO channel</li> <li>▪ ON when greater than 3.0V; OFF when less than 2.0V</li> </ul> |

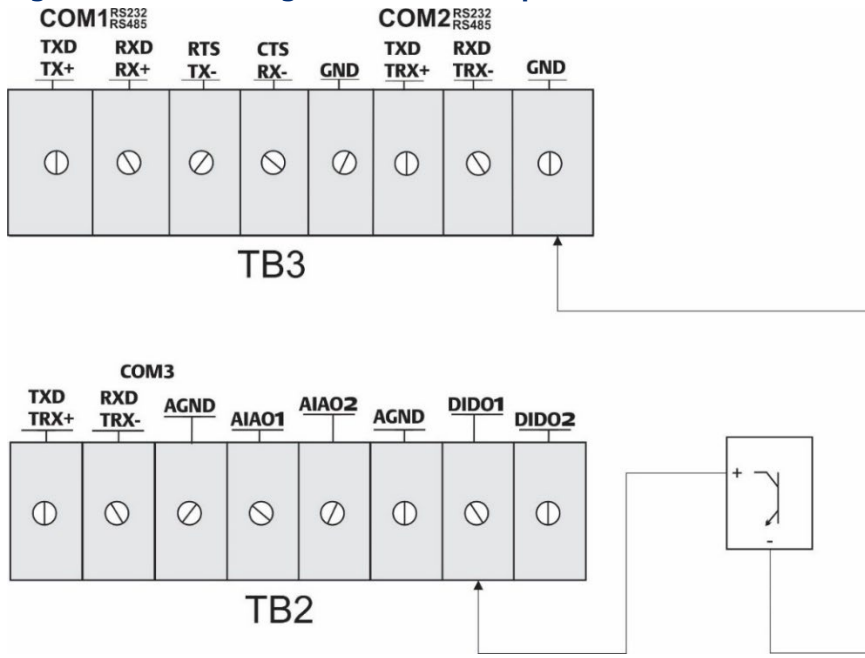
### 3.5.1 PI Wiring

The following diagrams show how to wire the pulse inputs.

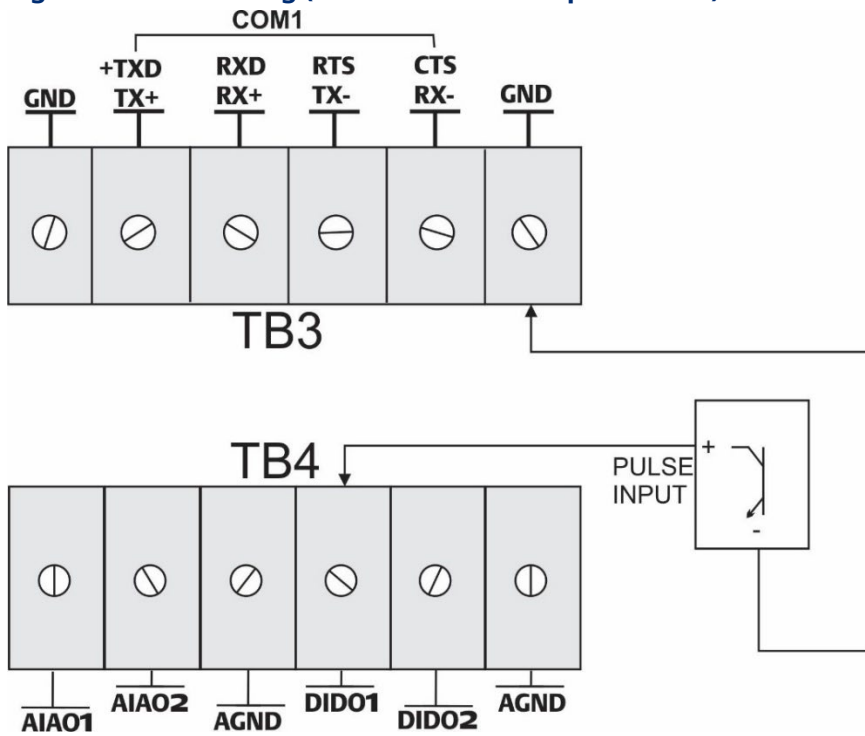
**Note**

Figure 3-18 shows pulse input wiring for PIDIDO1. PIDIDO1 and PIDIDO2 share the same GND terminal.

**Figure 3-18. PI Wiring (Base I/O with Optional I/O)**



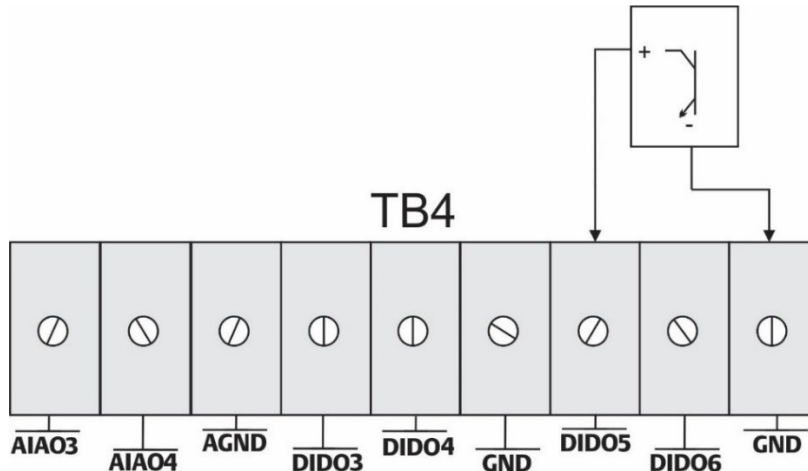
**Figure 3-19. PI Wiring (Base I/O without Optional I/O)**



**Note**

Figure 3-20 shows pulse input wiring for PIDIDO5. PIDIDO5 and PIDIDO6 share the same GND terminal. PIDIDO3 and PIDIDO4 share a different GND terminal.

**Figure 3-20. PI Wiring (with Optional I/O Module)**



## 3.6 Connecting the RTD/PRT

**⚠ DANGER**

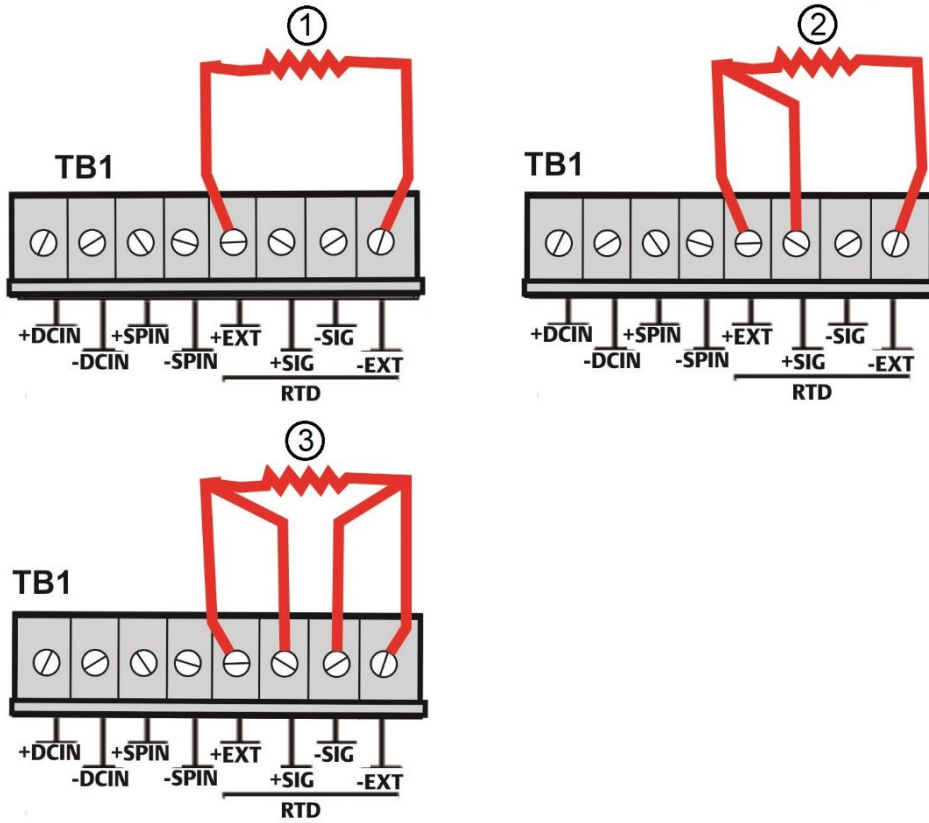
EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

RTD connections reside on the terminal plate under the rear end cap. The flow computer supports 2-wire, 3-wire, and 4-wire operation for a PT100 RTD. Route the RTD cable through the conduit fittings and connect them on the terminal plate (as shown on [Figure 3-21](#) and [Figure 3-22](#)).

**Note**

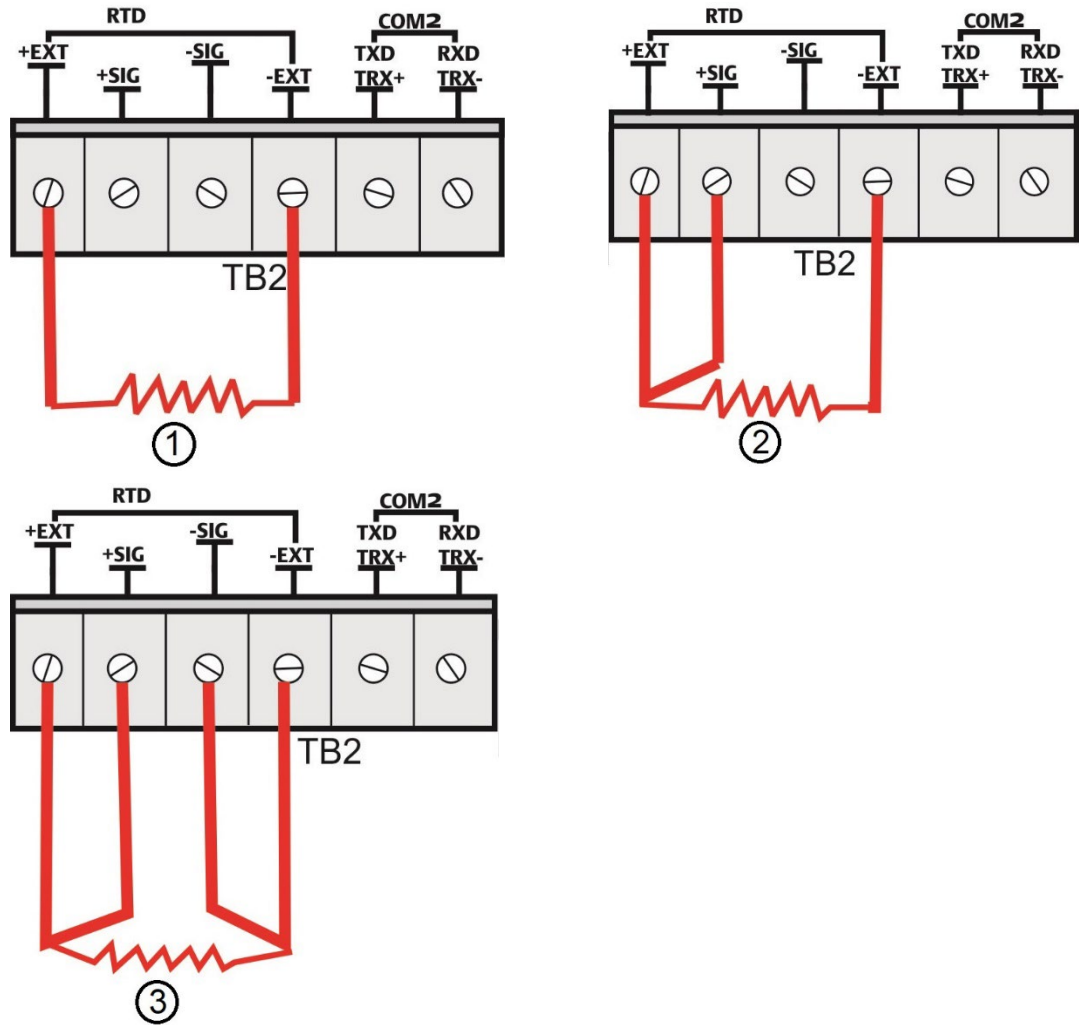
The device **defaults** to the 4-wire RTD configuration; you can change this setting in FBxConnect.

Figure 3-21. Wiring for 2-Wire, 3-Wire, and 4-Wire RTD (Units with Optional I/O)



- 1 2-Wire RTD
- 2 3-Wire RTD
- 3 4-Wire RTD

Figure 3-22. Wiring for 2-Wire, 3-Wire, and 4-Wire RTD (Units without Optional I/O)

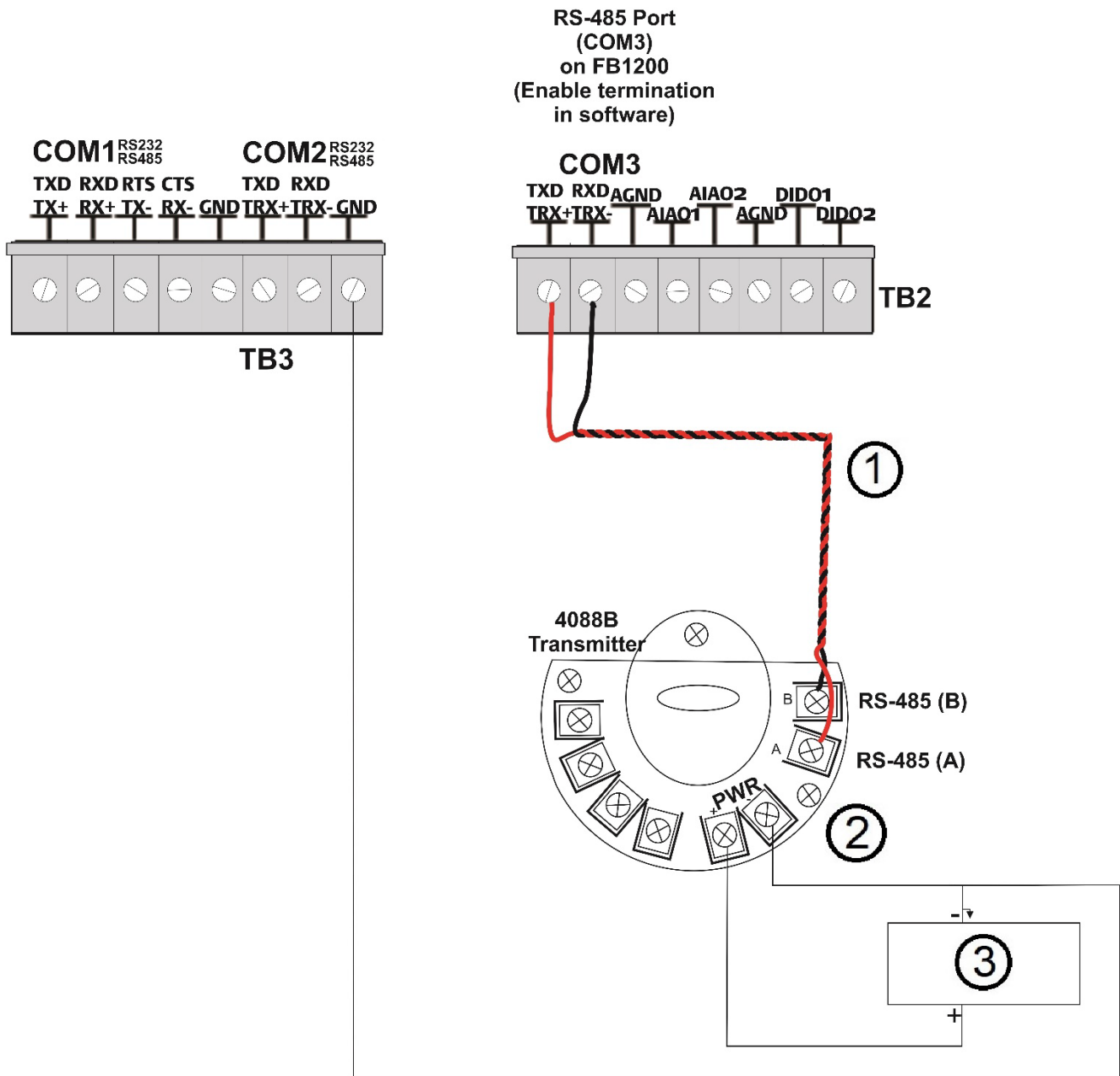


- 1 2-Wire RTD
- 2 3-Wire RTD
- 3 4-Wire RTD

### 3.7 Connecting a Rosemount 4088B Transmitter for Use in a Second Meter Run

Data for the second run comes from an external transmitter such as the Rosemount 4088B.

Figure 3-23. Connecting a 4088B Transmitter for a Second Meter Run



- 1 RS-485 bus, twisted pair required
- 2 Enable AC termination using switches.
- 3 User-provided power supply (5.4V to 30V)



See the *Rosemount™ 4088 Multivariable™ Transmitter Reference Manual* (00809-0100-4088, Rev CB, Feb. 2017) for details on installing the 4088B.

1. Using twisted pair wire, connect the RS-485 terminals for COM3 to the RS-485 terminals on the 4088B as shown in the graphic.
2. Set switches on the 4088B for bus termination or use a 120 ohm resistor.
3. Use FBxConnect software to configure COM3 for RS-485. In particular, enable termination for the port.



# Chapter 4: Operation

This chapter covers the following topics:

- Powering Up/Powering Down the Device
- Establishing Communications
- Communicating using the HMI Module

This section describes day-to-day operation of the Emerson FB1200 Flow Computer including how to turn it on and off and how to communicate with it.

## 4.1 Powering Up/Powering Down the Device

### DANGER

Do not attempt to connect or disconnect power from the unit in a hazardous area. Ensure the area is non-hazardous. Failure to do so could result in an explosion.

---

1. Remove the front end cap.
2. Terminal block TB1 includes connections for DC power (+DCIN, -DCIN) and solar power (+SPIN, -SPIN). Battery power (which is also used with solar power) has its own internal connections.
  - Plug in TB1 to activate DC or solar power. If your device uses an internal battery and it is not connected, connect it as discussed in [2.12.3 Connecting Battery Power](#).
  - Unplug TB1 to deactivate DC or solar power. If your device uses an internal battery, disconnect the main battery.

This turns on (or shuts OFF) power from either an external power supply or the battery pack/solar panel.

---

#### Note

When you turn power on, the backlight on the HMI module lights, momentarily turns off and then remains lit while the INPUT LED blinks. After approximately one minute the initialization process finishes and the HMI starts to display live data.

---

## 4.2 Establishing Communications

The flow computer supports three ways to establish communications: through the host SCADA system, through a local laptop computer running FBxConnect, or through the HMI module.

## 4.2.1 Communicating with the SCADA Host

Communication to the flow computer through a SCADA host computer requires configuration of the host computer software, which varies depending upon whether you are using OpenEnterprise or another host software package. Much of this configuration is beyond the scope of this topic, but no matter which host you are using, there are certain steps you must take:

1. Decide how the SCADA host should communicate with the flow computer. This could be through connection with one of the communication ports. A serial port connection could be a cable directly connected to the SCADA host or there could be intermediate connections through a radio or modem. An Ethernet port connection must be through an Ethernet switch with an appropriate Category 5 shielded patch cable.
2. Decide which communication protocol you will use. This could be DNP3, ROC, or BSAP. See these documents for more information:
  - *Emerson FB Flow Computer DNP3 Protocol Specifications Manual (D301806X012)*
  - *ROC Protocol Specifications Manual (for Emerson FBx-series) (D301828X012)*
  - *BSAP Communication Guide for FB1000/FB2000 Series Flow Computers (D301808X012)*
3. Provide the SCADA host with information about the various parameters it needs to extract from the application running in the flow computer. Typically, the SCADA host software includes a utility that allows you to identify this information so it can be incorporated into the database at the SCADA host.
4. Using whatever human-machine interface (HMI) tools exist for the SCADA host, create graphical displays or reports that include the parameters from the application required for successful operator interaction (setpoints, flow variables and so on).

## 4.2.2 Communicating with a Laptop Using One of the Serial Ports

- If the flow computer is not awake, you must wake it up first. (See [Section 4.3](#))
- Your laptop must have Field Tools software with FBxConnect software installed.
- You must know a valid username/password combination for the flow computer.

** DANGER**

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

1. Connect a cable between a serial port (or serial/USB adapter) on your laptop and port COM2 on the flow computer.
2. Launch Field Tools and add a new serial connection for this device; this launches FBxConnect configuration software. (If you already have an existing saved serial connection for this device in Field Tools, just double-click on it in the Connections list.)
3. Log into the flow computer if prompted.
4. Use the FBxConnect configuration software to view or change any desired parameters.
5. When finished, log off the flow computer and disconnect the cable from its serial port.

### 4.2.3 Communicating with a Laptop Using Ethernet

Your laptop must have Field Tools software with FBxConnect software installed.

You must know a valid username/password combination for the flow computer.

** DANGER**

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

1. Connect a Category 5 shielded cable between an Ethernet port on your laptop and an Ethernet switch for your network.
2. Connect a Category 5 shielded cable between your Ethernet switch and the Ethernet port on the flow computer.
3. Launch Field Tools and add an IP connection for the device then click Connect to start the FBxConnect software. (If you already have an existing saved IP connection for this device in Field Tools, just double-click on it in the Connections list.)
4. Log into the flow computer if prompted.
5. Use the FBxConnect software to view/change any desired parameters.
6. When finished, log off from the flow computer and disconnect the cable.

## 4.2.4 Communicating with a Laptop Wirelessly with FBxWifi

You must have purchased the flow computer with the optional FBxWifi communications feature to connect to a laptop PC wirelessly. Additionally:

- Wi-Fi<sup>®</sup> must be configured and working on your laptop PC.
- Your laptop PC must have Field Tools software with FBxConnect installed.
- You must know a valid username/password combination for the flow computer.
- You must know the name of the wireless network and the security key required to connect to it.
- Your laptop PC must be within line-of-sight with either the front display of the flow computer or of an external antenna for the FBxWifi communications module.
- If the flow computer is not awake, you must wake it up first. (See [Section 4.3](#))

### WARNING

Ensure that you and your laptop PC are in a non-hazardous area.

1. Launch Field Tools software and add a new wireless connection. (If you already have a saved wireless connection for this device in Field Tools, just double-click on the device in the Connections list and skip to Step 4.)
2. Select the wireless network to which the flow computer belongs and enter the appropriate security key.
3. Click **Connect** to start the FBxConnect software.
4. Log into the flow computer if prompted.
5. Use the FBxConnect software to view or change any desired parameters.
6. When finished, log off the flow computer and disconnect from the wireless network.

## 4.3 Communicating using the HMI Module

You must have purchased the flow computer with the HMI module version that includes the optional display. Not all models include the display. Units without the display still include a button to wake up the device and status LEDs.

### Notes

- If the device is configured to require logins to view data, you must know a valid username/password combination for the flow computer.
- To conserve power, the HMI module enters sleep mode after a period of inactivity. Sleep mode disables FBxWifi communication. In FBxConnect, you can configure the number of minutes of inactivity triggering sleep mode through the LCD Sleep Time

parameter. Setting this parameter to 0 disables sleep mode which keeps the HMI module on but uses significantly more power.

The operator “awakens” the device by holding a finger against the front cover glass over the Hold to Wake button (the left-most button) for typically five to ten seconds. You can also pre-define a number of automatic wake-up times during the day from the Power Control screen in FBxConnect.

To temporarily keep the HMI module out of sleep mode, maintain an active FBxConnect connection. So long as communications remain active, the HMI module does not sleep.

---

1. Go to the front of the flow computer and touch your finger on the glass above the **Hold to Wake** button until the display lights up. (This may take several seconds.)
- 

**Figure 4-1. Waking the Display**



2. If prompted, login using a valid username/password combination. For information on how the buttons work, see [Table 4-1](#).
3. The display enters Screen Saver Mode where it sequentially presents a series of screens showing details about the meter run flow rates, totals, and current process variables.

Figure 4-2. Infrared (IR) Button Location







- 1 Left Infrared (IR) Button
- 2 Down Infrared (IR) Button
- 3 Up Infrared (IR) Button
- 4 Right Infrared (IR) Button

**Note**

When using the IR buttons, aim your finger at the round spot just below the arrow.







**Table 4-1: Infrared (IR) Buttons on HMI Module**

| Button   | Mode         | Use   |
|--|--------------|---|
|  OR  | Screen Saver | <ul style="list-style-type: none"> <li>Tap once to move up or down one item through list of parameters.</li> <li>Hold to stay on current parameter.</li> </ul>  |
|  | Data Entry   | <ul style="list-style-type: none"> <li>Tap (UP) once to move the cursor to the previous character in the list or (DOWN) once to move the cursor to the next character in the list.</li> <li>Hold (UP) or (DOWN) to scroll more quickly through the character list.</li> </ul> |
|   | Idle Mode    | Hold to wake the display (if screen is off)   |
|  | Screen Saver | Log out (if logged on)  |
|  | Data Entry   | <ul style="list-style-type: none"> <li>Tap once to move the cursor to the left.</li> <li>Hold to perform action shown on screen (such as "Hold to Accept")</li> </ul>   |
|   | Data Entry   | <ul style="list-style-type: none"> <li>Tap once to move the cursor to the right.</li> <li>Hold to perform action shown on screen (such as "Hold to Cancel")</li> </ul>  |

Symbol(s) representing the status of a value may appear in the upper right of the display, next to the description. Multiple symbols may display. If there are no data quality issues, no symbols display.

**Table 4-2: Symbols on Display**

| Symbol  | Meaning   |
|---|---|
|  | <b>Alarm:</b> The parameter value shown is in an alarm state (such as High Alarm, Low Alarm, etc.).   |
|  | <b>Override:</b> The parameter value shown is in override mode (that is, a user-entered fixed value).   |
|  | <b>Fault:</b> The parameter value shown is somehow invalid.   |
|  | <b>Unverified:</b> For parameter values that require additional validation (beyond simple database min/max range checking), the firmware has not yet validated the parameter value shown. |



# Chapter 5. Service and Troubleshooting

This chapter covers the following topics:

- Returning the Unit for Repairs
- Interpreting the Status LEDs
- Switch and Buttons
- Removing/Replacing the HMI Module
- Replacing the Main Battery Pack
- Removing/Replacing the SRAM Battery
- Upgrading System Firmware

To maintain hazardous location certifications, you can only replace components in the field with the exact same part so that the model string on the data plate remains correct. This means you cannot add any hardware not reflected in the model string or upgrade a hardware component to a newer version; any such upgrades are prohibited and void the hazardous location certification.

For a list of user serviceable parts contact your Emerson Energy and Transportation Solutions sales representative or Emerson Impact Partner.

This chapter describes the service tasks that everyone needs to know such as replacing batteries or installing a firmware upgrade. A separate series of field replacement guides covers major field replaceable components.

Any replacement not covered in this chapter or in the field replacement guides (such as adding or upgrading hardware or replacing sensors) can only be performed at an Emerson-authorized repair facility.

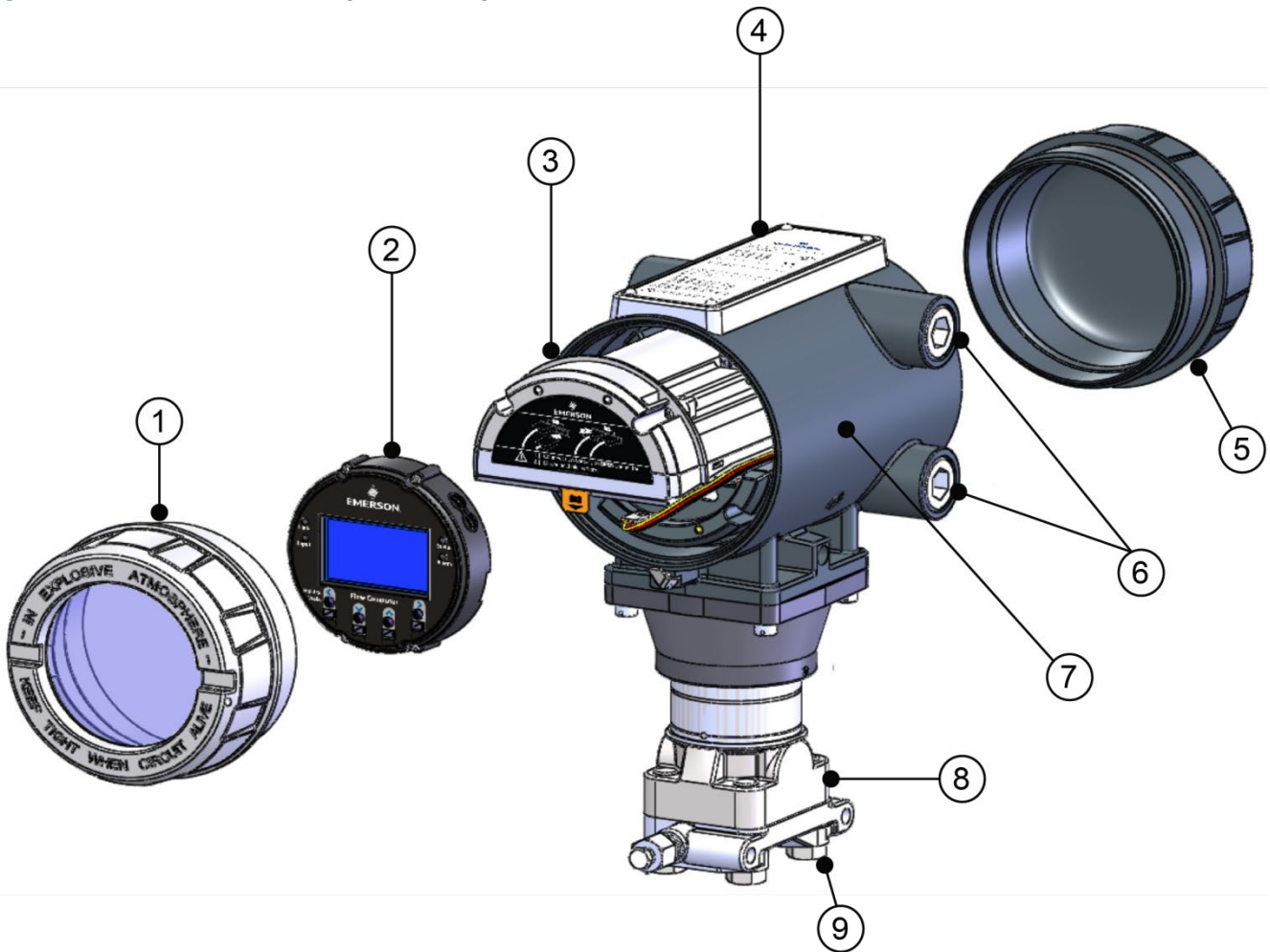


## Important

Use **only** batteries supplied with the flow computer or sold by Emerson as spare parts for this flow computer. If you substitute a battery you obtain elsewhere you will void your certification unless it is the identical part from the same manufacturer as that supplied with the flow computer from Emerson.

---

Figure 5-1. FB1200 Flow Computer Components



- 1 Front end cap (cover)
- 2 HMI module
- 3 Battery pack
- 4 Data plate
- 5 Rear end cap (cover)
- 6 Threaded  $\frac{3}{4}$  in NPT to M20 x 1.5 conduit fitting (2 of 4 shown)
- 7 Housing/Enclosure
- 8 Sensor Module
- 9 Mounting hardware

## 5.1. Returning the Unit for Repairs

Only certain field replacement procedures are allowed under warranty and hazardous location certification. Other types of repairs cannot be performed in the field. In those cases, you must ship the unit to an Emerson-authorized repair facility. Contact Emerson

Energy and Transportation Solutions for a return authorization number and instructions for where to ship the unit.

**⚠ WARNING**

International safety regulations restrict the shipment of lithium batteries. If you need to return the flow computer, remove the lithium battery before you ship the unit. Failure to remove the lithium battery may delay or prevent shipment of the flow computer.

## 5.2. Interpreting the Status LEDs

The flow computer display has four (4) status LEDs. The meaning of each LED varies depending upon the color displayed or whether the LED flashes.

**Figure 5-2. LED Locations**



- 1 Input LED
- 2 Link LED
- 3 Status LED
- 4 Alarm LED

**Table 5-1: LED Descriptions**

| LED        | Color/State     | Meaning  |
|------------|-----------------|--|
| Link LED   | GREEN           | An active wired Ethernet connection exists. Otherwise it is off. (FB1200/FB2200 only)  |
| Input LED  | GREEN           | One of the IR buttons is being pressed.  |
|            | Flashing YELLOW | CPU booting or CPU has not yet recognized HMI module when HMI first powered on; goes off when recognized.  |
| Status LED | GREEN           | OK – Main power battery pack charged or not in use.  |
|            | Flashing RED    | Main power battery pack low. Replace/re-charge lead acid battery pack soon. (If FB1100 Flow Computer with lithium battery pack– replace battery pack.) |
|            | Flashing YELLOW | FB1100 Flow Computer with lithium battery pack only: Unit has switched to C cell battery internal to battery pack. Replace battery pack soon.          |
|            | Off             | No power   |
|            | Flashing GREEN  | Main power battery pack charging   |
| Alarm LED  | GREEN           | No alarms.   |
|            | Flashing RED    | HMI firmware update in progress.   |
|            | RED             | Alarms are present.  |

**Table 5-2: Special LED Sequences using Multiple LEDs**

| LED Sequence   | Color/State  |
|--|--|
| Link, Input, Status, and Alarm all solid RED           | HMI module failed. Replace with spare or return for repairs. |
| Link and Alarm alternately flash RED; sequence repeats | CPU stuck in boot mode. Contact technical support.           |

### 5.3. Switch and Buttons

A momentary switch and two push buttons on the HMI module provide trouble-shooting options for the flow computer.

** DANGER**

**EXPLOSION HAZARD:** Never remove end cap(s) in a hazardous location. Removing end cap(s) in a hazardous location could result in an explosion.

**Table 5-3: Switch and Buttons**

| Button Name  | Purpose   | Procedure  |
|--------------|---|--|
| SYSTEM RESET | Resets power. This momentary switch interrupts power to the flow computer to reset it. Used if system is powered on but is non-functional; this attempts a reboot.  | Move the SYSTEM RESET switch either up or down. Unit powers off and then restarts.   |
| A            | Clears memory (SRAM). The SRAM memory holds current data values and pending alarm messages. If unit has unexpectedly stopped operating, you can depress this button on power-up to clear that information from memory (hard reset). Try this if a SYSTEM RESET alone does not work. | <ol style="list-style-type: none"> <li>1. Press and hold the <b>A</b> button.</li> <li>2. While continuing to hold the <b>A</b> button, move the SYSTEM RESET switch either up or down to initiate a reset.</li> <li>3. Release the <b>A</b> button. The system clears SRAM during the power up sequence.</li> </ol> |
| B            | Currently undefined   | None   |

## 5.4. Removing/Replacing the HMI Module

You do not need to power down the unit to replace the HMI module.

### DANGER

Ensure the flow computer is in a non-hazardous area. Never remove/replace the HMI module in a hazardous area.



### Important

The HMI module includes the FBxWifi transceiver; once you remove the HMI module; Wi-Fi communication with the flow computer ceases.

1. Remove the retaining clamp from the front end cap (if present). (See [Section 2.6.1.](#))
2. Unscrew the front end cap.
3. Loosen the four captive fastening screws on the HMI module.

Figure 5-3. Captive Fastening Screws



4. Grasp the HMI module and remove it by gently pulling it straight out.
5. To replace the HMI module, line up the printed circuit board (PCB) with the slot on the back and gently press it back on. Tighten the four captive fastening screws.
6. Replace the front end cap. Screw the end cap clockwise (eight full turns) until it is tightly sealed to the enclosure. Replace the retaining clamp, if applicable (see [Section 2.6.1](#)).

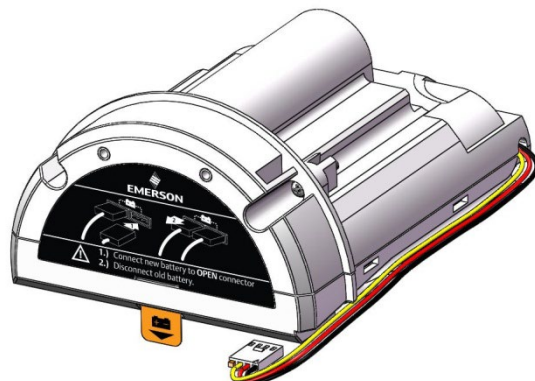
## 5.5. Replacing the Main Battery Pack

Periodically you must replace the main battery pack. FBxConnect provides a battery life indicator to show the number of days in use.

### **⚠ WARNING**

If lead acid battery voltage falls below **4.7V**, the battery can no longer be recharged, and the charging system considers the battery dead. **You must replace the battery.**

Figure 5-4. Main Battery Pack





The device provides two battery connectors, enabling you to hot-swap the battery pack in a non-hazardous location. Slide out the first battery pack (leaving it connected), attach the new battery to the second (available) connector (so both batteries are connected), and then disconnect the old battery pack.

### DANGER

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

---

### DANGER

EXPLOSION HAZARD: Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

---

### DANGER

EXPLOSION HAZARD: Substitution of any components may impair suitability for Class I, Division 1 or Class I, Division 2.

---

### DANGER

EXPLOSION HAZARD: Do not replace batteries unless power has been switched off or the area is known to be non-hazardous. Batteries must only be changed in an area known to be non-hazardous.

---

### WARNING

There are **no** user-serviceable parts inside the battery pack. Do not open the battery pack as you may damage the battery pack or injure yourself.

---

#### Restriction

Battery packs **cannot** be used with ATEX or IECEx applications.

---

Keep the replacement battery pack handy during the procedure.

1. Remove the retaining clamp from the front end cap (if present). (See [Section 2.6.1.](#))
2. Remove the front end cap.
3. Loosen the two bottom captive fastening screws on the HMI module. Leave the two top screws connected to the battery pack.
4. Grasp the HMI module and gently pull it and the battery pack out of the enclosure, leaving the battery still connected.

**Figure 5-5. Removing the Battery Pack**



5. Connect the new battery to the open connector. Route the wires so they are in the recessed area. Make sure the wires won't get caught in the end cap threads.
6. Disconnect the old battery pack's connector from the unit and set the old battery pack aside.
7. Slide the new battery pack into the unit.
8. Loosen the top captive fastening screws on the HMI module to separate it from the old battery pack.
9. Align the HMI module with the new battery pack and the tab on the CPU carrier board (bezel). Gently press the assembly on, being careful not to pinch the battery wires. Tighten all four screws.
10. Replace the front end cap. Screw the end cap clockwise (eight full turns) until it is tightly sealed to the enclosure. Replace the retaining clamp, if applicable (see [Section 2.6.1](#)).

## 5.6. Removing/Replacing the SRAM Battery

A lithium coin cell battery provides backup power for the SRAM and the real time clock. The SRAM backup battery can last for up to 10,000 hours of cumulative operation, and only runs if the main power system fails. You do not need to power down the unit to replace the SRAM backup battery.



### Important

- If the unit is ever powered down without the SRAM battery installed, SRAM data is lost. Always back up your data **before** you remove the SRAM battery if you know that main power will also be off.
  - Replacement SRAM backup batteries **must** be either Rayovac® Model BR2335 or Panasonic® Model BR2330.
-

**⚠ DANGER**

Ensure the flow computer is in a non-hazardous area. Never remove end caps in a hazardous area.

**⚠ DANGER**

Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

**⚠ DANGER**

EXPLOSION HAZARD: Substitution of any components may impair suitability for Class I, Division 1 or Class I, Division 2.

**⚠ DANGER**

EXPLOSION HAZARD: Do not replace batteries unless power has been switched off or the area is known to be non-hazardous. Batteries must only be changed in an area known to be non-hazardous.

1. Remove the retaining clamp from the front end cap (if present). (See [Section 2.6.1.](#))
2. Remove the front end cap.
3. Remove the HMI module.
4. Grasp the coin cell battery and remove it from its slot.

**Figure 5-6. Removing/Replacing the Coin Cell Battery**



5. Insert the new coin cell battery in the slot. The positive side (+) must be on top.

### CAUTION

When inserting the SRAM coin cell battery, push the battery gently into its slot until it stops. The battery should slide in easily. Do not use excessive force.

---

6. Replace the HMI module.
7. Replace the front end cap. Screw the end cap clockwise (eight full turns) until it is tightly sealed to the enclosure. Replace the retaining clamp, if applicable (see [Section 2.6.1.](#)).

## 5.7. Upgrading System Firmware

Periodically Emerson releases new system firmware for the flow computer to introduce new features or update system functions.

You must know a valid username/password combination for the flow computer to complete this process.

### DANGER

EXPLOSION HAZARD: Ensure the area in which you perform this operation is non-hazardous. Performing this operation in a hazardous area could result in an explosion.

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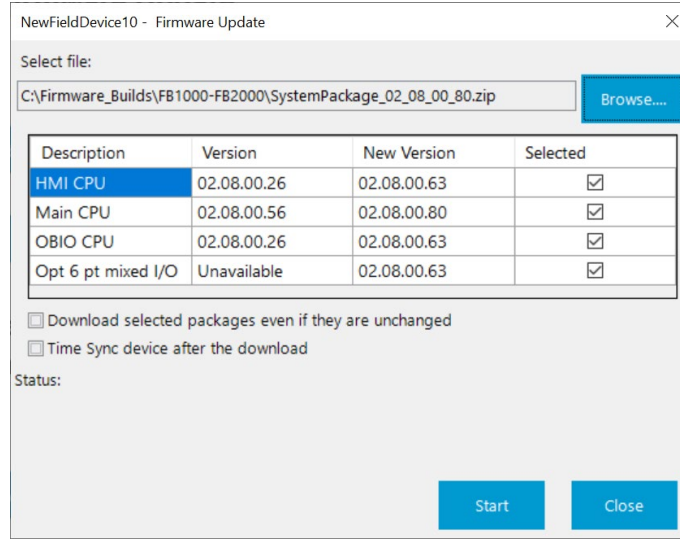
#### Important

- A power loss occurring during a firmware update to a unit with a dead SRAM coin cell battery can corrupt SRAM memory and place the flow computer in a continuous boot cycle, requiring you to return the device to the factory for repairs. To avoid this, be sure to replace the SRAM coin cell battery when its power is low. To check this in FBxConnect, click **Services > System Power** and look at the **SRAM Battery Status** field on the display.
  - When upgrading system firmware version 01.xx.xx.xx to version 2.05.xx.xx or newer, allow up to 10 minutes to complete the upgrade and **do not** power cycle the unit.
- 

1. Launch Field Tools and use FBxConnect to connect to the flow computer.
2. Click the **Services** tab, then click **Firmware Update**.
3. Click **Configuration Save** to save the flow computer's configuration.
4. Click **History Collection** to save the historical data contained in the flow computer.
5. Click **Firmware Update**.

- In the Firmware Update dialog box, click **Browse** and navigate to the zip file containing your new system firmware. The grid updates with details of the firmware version currently in the device, and the firmware version in the zip file.

**Figure 5-7. Firmware Update Dialog Box**



- Select the checkbox in the **Selected** column to choose the firmware. If you are downloading the **same** version that is already installed on the device, select **Download Even If Unchanged**.
- Select **Time Sync device after the download** if you want to synchronize the flow computer's clock with your PC clock after the download completes.

Click **Start** to begin the firmware download. Allow the download to proceed to completion. If you choose to cancel the firmware download before it completes, the system restores the current version already in the device.



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