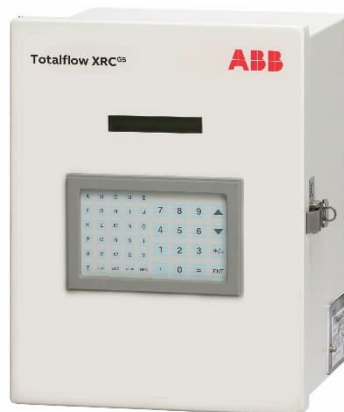


XSeries^{G5} Flow Computers and

Remote Controllers

XFC^{G5} and XRC^{G5}



Scalable
measurement
control for
production

Measurement
made easy

Introduction

This startup guide provides basic installation and configuration procedures for the XFC^{G5} and XRC^{G5}. It is designed for typical installations only, performed by personnel knowledgeable of:

- Flow computers and remote controllers
- Local and national codes as they apply to hazardous areas
- Communication and electrical wiring

Use this guide in conjunction with other drawings and documentation that may accompany the product purchase order. Many sites have unique installation requirements. In these cases, it is important to reference site-specific documentation.

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Cyber security

This product is designed to allow connection, and communicate information and data, via a network interface which should be connected to a secure network. It is the customer's sole responsibility to provide and continuously ensure a secure connection between the product and the customer network or any other network. The customer shall establish and maintain appropriate measures including, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, or installation of antivirus programs, etc. This will protect this product, the network, its system and interfaces against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Inc. and affiliates are not liable for damages and/or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

Although ABB provides functionality testing on the products and update releases, the customer should institute a testing program for all product updates or other major system updates including, but not limited to, code changes, configuration file changes, third party software updates or patches, and hardware change out. This testing will ensure that the security measures that the customer has implemented have not been compromised and that the system functions in the customer's environment as expected.

Additional information

Additional free publications are available for download at www.abb.com/upstream.

Related documents	Document number
XSeries ^{G5} User Manual	2106026
XSeriesG5 Board Replacement Kit Guide	2106079
TFIO Module User Manual	2101226
Wi-Fi antenna kit installation guide	2106123
User Drawings	
XFC ^{G5} Generic Pinout	2106114
XRC ^{G5} Generic Pinout	2106113

Safety

Observe and follow warning signs on packaging in documentation and on the device.

- Installation and maintenance will only be conducted by personnel authorized to work on electrical installation.
- Installation and maintenance will be conducted in accordance with relevant national and local codes.

Safety symbol conventions

The following conventions are used throughout this document to bring attention to important information:



DANGER – Serious damage to health / risk to life. These symbols, and the signal word "DANGER", indicate imminent danger or electrical hazard. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, how to avoid the hazard, and the result if not followed. The bolt is for electrical danger; the exclamation point is for general dangers.



DANGER – Serious damage to health / risk to life. This symbol, and the signal word "DANGER", indicate imminent danger or explosive hazard. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, how to avoid the hazard, and the result if not followed.



WARNING – Bodily injury. These symbols, and the signal word "WARNING", indicate a potentially dangerous situation. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, how to avoid the hazard, and the result if not followed. The bolt is for electrical warnings; the exclamation point is for general warnings.



NOTICE – Equipment damage or loss of data. This symbol indicates a potential for equipment damage, loss of data or other unintended outcome. Failure to observe this information may result in damage to or destruction of the product and/or other system components.



IMPORTANT NOTE: This symbol indicates operator tips, particularly useful information, or important information about the product or its further uses.

Potential safety hazards

The XFC and XRC use voltages in the range of 9-12 Vdc plus some percent of tolerance. There are no hazardous voltages present in the device. However, some optional power sources may convert power from Vac to Vdc.

Pressurized natural gas is present in the measurement pipeline. Natural gas may escape from the pipeline during installation, calibration, or following damage to the pipeline. Only properly trained and authorized personnel should work in hazardous locations.

There are no chemical or burn hazards. Personal Protection Equipment is not required.



WARNING – Bodily injury. Apply power only after the procedures are complete. Technicians must perform the procedures in order: plan, install, wire, verify the power-on sequence, and configure.



WARNING – Bodily injury. Read and follow instructions contained in this guide before and during equipment installation. Failure to do so could result in bodily injury or equipment damage.



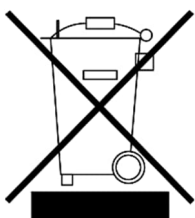
WARNING – Bodily injury. Ensure there is no hazardous atmosphere present when performing maintenance on the unit. Do not separate components when energized. This applies to all connectors and connections, cabling and wiring.



NOTICE – Equipment damage or loss of data. Potential electrostatic charging hazard: clean only with a damp cloth.

Compliance

EU Directive 2012/19/EU – WEEE



Waste Electrical and Electronic Equipment (WEEE) marked using the crossed-out wheeled bin symbol shall not be mixed with general household waste. Correct disposal at a recycling facility will help save valuable resources and prevent potential negative effects on health and the environment. These steps ensure compliance with the WEEE Directive.

FCC RF Compliance

CONTAINS FCC CERTIFIED TRANSMITTER MODULE(S).
THIS PRODUCT CONTAINS FCC ID: Z64-WL18DBMOD.
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES.

THIS PRODUCT CONTAINS IC: 5530C-WL1837MOD. THIS
DEVICE COMPLIES WITH RSS-GEN OF THE IC RULES

OPERATION IS SUBJECT TO THE FOLLOWING 2 CONDITIONS:
THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE.
THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED,
INCLUDING ANY INTERFERENCE THAT MAY CAUSE
UNDESIREED OPERATION.



Considerations before installation

Versions of PCCU32 older than version 7.61 are not compatible. The installation of these meters, senior fitting, tap valves, or other peripheral equipment is outside the scope of this document.

Assumptions

The following is assumed:

The XFC and XRC are designed to adapt to different site scenarios. This guide covers a standard single-tube configuration for the XFC flow computer for a common site scenario which requires:

- Mounting kit
- Resistance temperature detector (RTD)
- Solar panel charger and mounting kit

If the standard configuration differs from the specific site needs, and is not addressed in this guide, see the user manuals listed in [Additional information](#).

This guide assumes an orifice plate as the meter element. The XFC and XRC support other meter types.

For XRC illustrations, see the user manual listed in [Additional information](#).

Application credits

Standard Credits - The XFC and XRC contain many standard applications that are available at no extra cost.

General Credits - 4 general credits come with the device. These can be used to enable any of the general applications.

Explicit credits - There are 2 explicit applications available that must be purchased separately:

- NIST 14 or CO2
- IEC application

1 Site planning and requirements

The XFC and XRC enclosures, power sources, wiring, and location must comply with the specifications described in this section.



WARNING – Bodily injury. Select compliant equipment listed in this section or customer provided equipment. Carefully review the specifications. Failure to comply with these specifications may create unsafe conditions, resulting in bodily injury and equipment damage.



NOTICE – Equipment damage or loss of data. Customers who supply their own ancillary equipment must ensure that equipment is compliant with the requirements in this guide.

1.1 Enclosures

The aluminum enclosure consists of a hinged-door box. The door provides a watertight, corrosion-resistant seal between the outside elements and the components. It is rated NEMA/TYPER 3R or IP54.

Plan the installation based on enclosure dimensions and battery weight per model. See the user manual listed in section [Additional information](#) for more complete dimensions and specifications.

1.2 Battery and charger requirements

- 12 Vdc sealed lead acid battery. Size is dependent on the device enclosure.
- 12 Vdc solar panel, 30 W maximum.

1.3 External power supply requirements

When used for charging batteries:

- 15 Vdc nominal at 1.8 amperes (minimum)
- 15.5 Vdc maximum

1.4 Location specification and design

Determine the device installation location. Review the options in [Basic hardware installation](#). Ensure the required mounting kits and materials are available.

The installation location must allow access to the XFC or XRC, power sources, cables, and connections. More information is available in [Install battery and charger](#).

For solar panel use, determine where and how to install the solar panel outdoors. For optimum charging, avoid placing the solar panel where it will be in shadow any part of the day. More information is available in section [3.2 Install the solar panel](#). This section describes the installation of the power equipment. All wiring must be complete before the device is energized. See section [6 Powering the device](#).

1.5 Wiring requirements

All onboard screw terminal connectors support a wire gauge range of 12 AWG to 22 AWG.

Select the wire gauge compliant with the local electrical code for the type of signal on the connection, voltage and current load, and wire length.



WARNING: Bodily injury. Area classification requirements determine electrical wiring installation. For more information, refer to the certification drawing indicated on the device's name tag, and national and local codes.

2 Basic hardware installation

The XFC and XRC can be pipe-mounted, wall-mounted, or direct-mounted to the meter run.



IMPORTANT NOTE: Do not direct mount the larger enclosures (for XFC – 6713, 6714 and for XRC - 6790, 6890, 6895).

2.1 Required tools and materials

To perform installations and tests, the following tools and materials are required:

Pipe mount installation:

- One (1) enclosure mounting kit (includes instructions, brackets, U-bolts and fastening hardware)
- One (1) pipe saddle with mounting hardware (size determined by technician)
- One (1) 2 inch x 40 inch pipe (length may be extended if mounting a solar panel). See [Figure 3-1: Solar panel](#) .
- EFM plus bolts and washers
- 5 valve manifold
- 2 stabilizers (futbols) plus bolts and washers

Wall mount installation:

- One (1) enclosure mounting kit (includes instructions, brackets, U-bolts and fastening hardware)
- Four (4) wall fasteners (length and girth determined by technician based on wall thickness and materials)
- EFM plus bolts and washers
- 5 valve manifold

Direct mount installation:

- One (1) enclosure mounting kit (includes instructions, brackets, U-bolts and fastening hardware)

Install input lines and manifold:

- Stainless steel tubing (length determined by technician)
- Four (4) sets of tube fittings, including ferrule and nut pairs
- One (1) manifold (3-valve or 5-valve manifold, determined by technician)

Leak-test manifold and tubing connections:

- Liquid leak detector
- Pressure calibration device

Install and wire the RTD to the XFC:

- RTD probe with cable and cable gland installed (probe and cable length determined by technician)
- Nylon tie wraps

Antenna installation:

- Refer to: XSeries^{G5} Wi-Fi antenna kit installation guide. See [Additional information](#).

Solar panel installation:

- One (1) solar panel with cable
- One (1) solar panel mounting kit (includes U-bolts, brackets, and hardware)
- Mounting pipe extension and coupling if required (length determined by technician depending on the size of the solar panel)
- Nylon tie wraps

Install the battery:

- One (1) battery with cable attached

2.2 Unpack and inspect

The XFC and XRC and additional parts ship in a specially-designed shipping carton with a startup guide and packing list.



IMPORTANT NOTE: Inspect the contents for damage before discarding the shipping and packing materials.

Unpack the XFC or XRC and inspect for damaged, missing or incorrect parts:

1. Inspect the shipping carton for damage.
2. Carefully remove items from the carton.
3. Keep all shipping materials to return any damaged or incorrect parts.
4. Compare the packing list with the materials received. Check for missing or incorrect parts.
5. Inspect each item for damage: XFC or XRC exterior, LCD display, optional equipment if purchased.
6. If there are missing, incorrect, or damaged parts or noticeable defects, call the ABB main office number listed in [Contact us](#).



IMPORTANT NOTE: Do not return equipment to ABB without prior written consent. Returns are subject to the terms and conditions specified by ABB.

2.3 Pipe mount installation



IMPORTANT NOTE: Select a mounting location that allows for easy access, is close to the tap valves, and complies with all local and national codes.

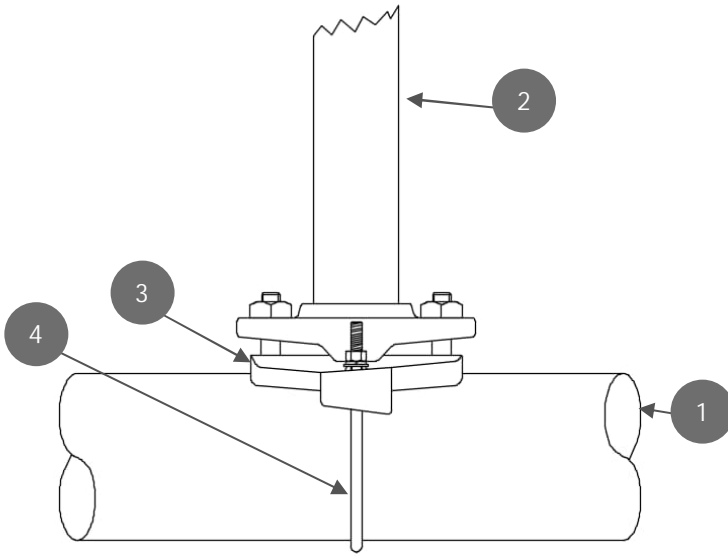
Materials:

- One (1) enclosure mounting kit (includes instructions, brackets, U-bolts and fastening hardware)
- One (1) pipe saddle with mounting hardware (size determined by technician)
- One (1) 2 inch x 40 inch pipe (length may be extended if mounting a solar panel). See [Figure 3-1: Solar panel](#) .

Pipe-mount the XFC (XRC is similar):

1. Position the pipe saddle on the meter run and temporarily attach the saddle to the meter run pipe using the associated hardware.

Figure 2-1: Mounting pipe



Legend: Mounting pipe

1	Meter run	3	Saddle
2	2 inch x 40 inch Mounting pipe	4	U Mounting bolt

2. Screw the mounting pipe into the saddle until it is tight.
3. Level the mounting pipe:
 - a. Level and center the pipe and saddle on the top of the meter run. Tighten the saddle-mounting U-bolt.
 - b. Level the pipe so that the pipe is perpendicular to the meter run using the saddle leveling bolts (if available) on the mounting saddle.
4. Tighten the saddle-mounting U-bolt as tight as possible to avoid vibration-related issues.
5. Install the XFC or XRC mounting brackets to the back of the enclosure using the pipe mount instructions supplied in the mounting kit.
6. Attach the enclosure to the mounting pipe:
 - a. Hold the enclosure in place against the mounting pipe and insert a U-bolt around the pipe and through the corresponding holes on the upper mounting bracket.
 - b. Add the flat washer and split washer onto the U-bolt, then screw the nut onto the U-bolt.

- c. Repeat steps 6a and 6b for the second mounting bracket.
7. Raise the XFC or XRC into position on the mounting pipe.



IMPORTANT NOTE: Position the XFC or XRC high enough to allow some downward slope from the externally mounted manifold to the tap valves.

8. Secure the XFC in place by tightening the U-bolt nuts. This will help to avoid vibration-related issues.



IMPORTANT NOTE: The enclosure mounting kit contains more parts than needed for mounting the enclosure on a meter house wall.

2.4 Wall-mount installation



IMPORTANT NOTE: Select a mounting location that allows for easy access, is close to the tap valves, and complies with all local and national codes.



IMPORTANT NOTE: Large enclosures are heavy and bulky. More than one person may be required for installation.

The following steps detail the procedures for wall-mounting the XFC or XRC by the meter run.

Materials:

- One (1) enclosure mounting kit (includes instructions, brackets, U-bolts and fastening hardware)
- Four (4) wall fasteners (length and girth determined by technician based on wall thickness and materials)

Wall-mount the XFC or the XRC:

1. Inspect the installation location:
 - a. Verify that the wall has sufficient strength to support the hanging weight of the unit. For details on the enclosure weight and specifications, refer to the user manual listed in [Additional information](#).
 - b. Verify that there are no obstructions to prevent opening the enclosure door.

- c. Verify that there are no obstacles to prevent the solar panels from charging during daylight hours (if installed.)



NOTICE – Equipment damage. Screw the mounting bolts into a wall stud or wall support of sufficient strength to support the weight of the XFC or XRC.

2. Install the XFC or XRC mounting brackets on the back of the enclosure using the pipe mount instructions supplied with the mounting kit.
3. Determine the appropriate mounting height for the XFC or XRC to allow some downward slope from the XIMV and manifold to the meter run tap valves. This allows condensate to drain back into the pipe.
4. Drill the upper mounting holes in the wall support.
5. Measure the distance between the top and bottom mounting bracket holes.
6. Locate and drill the lower mounting holes in the wall support.
7. Lift and align the enclosure on the wall so that the mounting bolt holes match the pre-drilled holes.
8. Insert the mounting bolts through the upper bracket holes and screw in the bolts until tight.
9. Repeat this procedure for the lower bracket.

2.5 Direct-mount installation

Follow the instructions supplied with the manifold and stabilizer installation kits to mount the XFC directly on the meter run orifice.

Materials:

- One (1) 5-valve manifold
- Two (2) stabilized manifold connectors (compatible with the manifold)

Install the input lines and manifold:

1. Install the manifold on the XIMV using the manufacturer's instructions.
2. Locate the tap valves on the meter run orifice and the corresponding high and low inputs on the installed manifold.
3. Measure, cut, and bend the tubing to ease installation of the fittings into the orifice tap valves and the manifold.
4. Install the nut and ferrule onto the tubing end.

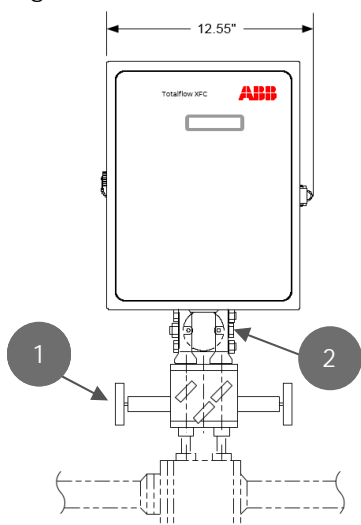


NOTICE – Equipment damage. To avoid damage to the stainless-steel tubing, fittings, and valves, always use a backup wrench to stabilize and eliminate tension on both sides of the connection when tightening. Damaged connections may introduce leaks into the system resulting in inaccurate measurement.

5. Insert the ferrule into the fitting and slide the nut onto the ferrule and tighten.
6. Repeat step 5 for each tubing connection point.

Leak-test the manifold and tap valve connections. See section [2.7: Leak-test manifold and tubing connections](#).

Figure 2-2: XFC with XIMV attached to a 5-valve manifold



Legend - XFC with XIMV attached to a 5-valve manifold

- | | |
|---|------------------------------|
| 1 | Instrument manifold, 5 valve |
| 2 | XIMV |

2.6 Ground equipment

Refer to the requirements of national and local electrical codes for the location. The grounding lug is located on the bottom front of the XFC or XRC enclosure.



NOTICE – Equipment damage or loss of data. The grounding conductor must have a cross-sectional area of at least 12 AWG or 4 mm².

2.7 Leak-test manifold and tubing connections

Install input lines and manifold.

The following procedure provides a generalized guideline to follow for the manifold and tubing installation.

Materials:

1. □ Stainless steel tubing (length determined by technician)
2. □ Four (4) sets of tube fittings, including ferrule and nut pairs
3. □ One (1) manifold (3-valve or 5-valve manifold determined by technician.)

To install the input lines and manifold (XFC):

1. Install the manifold on the XFC IMV using the manufacturer's supplied instructions.
2. Locate the tap valves on the meter run orifice and the corresponding high and low inputs on the installed manifold.
3. Measure, cut, and bend the tubing to ease installation of the fittings into the orifice tap valves and the manifold.
4. Install the nut and ferrule onto the tubing end.



NOTICE – Equipment Damage. To avoid damage to the stainless steel tubing, fittings, and valves, always use a backup wrench to stabilize and eliminate tension on both sides of the connection when tightening. Damaged connections may introduce leaks into the system resulting in inaccurate measurement

5. Insert the ferrule into the fitting and slide the nut onto the ferrule; engage the nut threads and tighten.
6. Repeat step 5 for each tubing connection point.

Manifold and tubing connections must be leak-tested before power application. Connection leaks between the tap valves, the orifice, the manifold, and the XIMV can introduce measurement and calibration errors.

Materials:

- Liquid leak detector
- Pressure calibration device

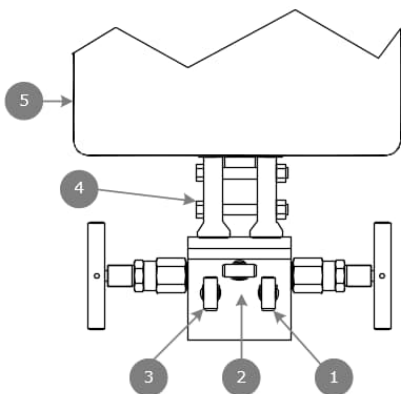


DANGER – Serious damage to health / risk to life. Manifold and tubing connection leaks could create a build-up of explosive gases. Do not apply power before the tubing and connections are leak-free, and explosive gases have dissipated.

To leak-test the manifold and tap valve connections:

1. Open the equalizer valves [Figure 2-3: XFC with XIMV and 5-valve manifold](#) (items 1 and 3) and close the Manifold vent valve (item 2).

Figure 2-3: XFC with XIMV and 5-valve manifold



Legend XFC with XIMV and 5 valve manifold

1	High side equalizer valve	4	XIMV
2	Manifold vent valve	5	Enclosure
3	Low side equalizer valve		

2. Connect the pressure device to the test port.
3. Apply pressure to the port based on the transducer range (100% of range).
4. Squirt liquid leak detector onto the following connections:
 - High and low pressure tap valve connections
 - High and low pressure manifold tubing connections
 - Connection points between the flange and the manifold

Bubbles in the liquid indicate a loose or poor connection.

5. Use a wrench to tighten connections, and recheck.



NOTICE – Equipment damage: Do not over-tighten the connections.

After verification that all connections are leak-free, proceed to install the RTD.

2.8 Install and connect the RTD for the XFC

The RTD probe measures flowing gas temperature. The following procedure describes:

- Installation of the RTD onto the meter run
- Wiring the RTD leads to the XFC electronic board



WARNING: Bodily injury. Install electrical wiring according to requirements for the area classification. Refer to the certification drawing indicated on the device's name tag, and national and local codes.

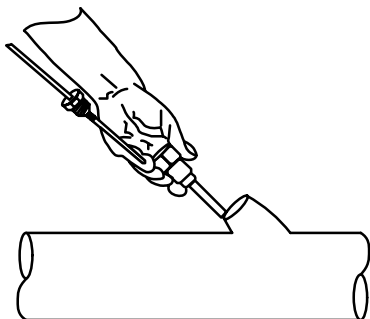
Materials:

- RTD probe with cable and cable gland installed (probe and cable length determined by technician)
- Nylon tie wraps

Install the RTD probe:

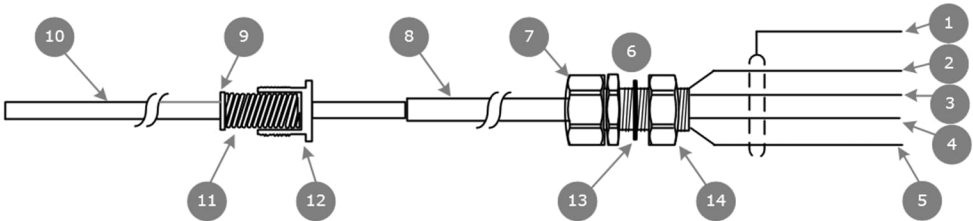
1. Insert the RTD probe into the thermowell to determine the depth setting for the probe spring.

Figure 2-4: Typical RTD installation



2. Use snap-ring pliers to adjust the retaining ring below the spring on the probe. Probe depth should be set so it is spring-loaded against the bottom of the thermowell.

Figure 2-5: RTD probe connector



Legend: RTD Probe Connector

1	SHLD (Drain wire= Green wire)	8	Cable
2	OUT (White wire)	9	Retaining ring
3	(+) (White wire)	10	RTD probe
4	(-) (Black wire)	11	Spring
5	IN (Black wire)	12	Probe connector
6	Cable gland	13	Nylon sealing ring
7	Cord sealing nut	14	Cable nut

3. Screw the probe connector into the thermowell.



IMPORTANT NOTE: Do not wrap the RTD cable around the pipeline. Run the RTD cable along the side of the process stream pipeline in a straight line. Use nylon tie wraps to secure the cable to the pipeline.

4. Install the RTD cable into the flow computer enclosure:
 - a. Remove the shipping plug from the right side of the flow computer enclosure.
 - b. Remove the cable nut from the gland and insert the RTD cable end through the access hole in the enclosure. Leave enough cable inside the enclosure to accommodate wiring to the RTD terminal block (J7).
 - c. Replace the cable nut on the cord and screw the cable nut onto the cable gland inside the enclosure.

- d. Tighten the cord sealing nut to the cable gland against the RTD cable.
- e. Secure the cable outside of the gland so that the cable turns down immediately. This will keep moisture from seeping into the housing along the RTD cable.
5. Wire the RTD sensor cable to the J7 terminal block using the wires identified in [Figure 2-5: RTD probe connector](#), RTD probe connector, and the pinouts identified in the following.

2.9 Wire the RTD to the XFC



WARNING: Bodily injury. Wire peripheral devices to the flow computer electronic board before power is applied. If the flow computer has been powered-up, disconnect power before performing field wiring.

Wire the RTD:

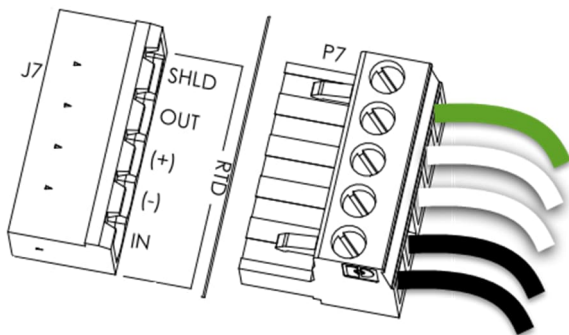
1. Open the flow computer enclosure door.
2. Using a small slotted screwdriver, remove the RTD terminal connector from the J7 terminal block.
3. On the RTD probe wire, remove the spade lugs if installed, and trim the wire cover ends back ¼ inch (6.35 mm).
4. Loosen the screws on the terminal connector for pins 1 through 5.



IMPORTANT NOTE: If the shield is not shorted to the probe, insert the shield wire to pin 1. Do not connect if the shield wire is shorted to the probe.

5. Insert the corresponding wires as identified in [Figure 2-5: RTD probe connector](#) in the RTD pins identified below.

Figure 2-6: RTD sensor wiring to XFC electronic board



6. Gently retighten the terminal connector screws.



NOTICE – Equipment damage. Do not over-tighten the terminal connector screws as this may damage the wires.

7. Reinsert the terminal connector in the J7 terminal block.

2.10 Install antenna (for wireless functionality)



IMPORTANT NOTE: The XSeries Wi-Fi Kit is required for antenna installation. See [Additional information](#).

1. Install the antenna to support onboard Bluetooth® and Wi-Fi® wireless interfaces.
2. Use the onboard connector ANT-1 (J42) to connect the antenna.
3. Use the cap to isolate the unused antenna connector (ANT-2).

3 Install battery and charger

The XFC and XRC support either of two power modes.

- Battery mode: The primary power source to the device is a 12 volt sealed lead acid battery with nominal 12 V solar panel charger.
- External power mode: The primary power source to the device is an external power supply (14.5 to 15.5 Vdc maximum).

Follow this procedure to install a battery and a solar panel charger if operating the XFC or XRC in battery mode.



WARNING: Bodily injury. Once the device has power do not wire peripherals.

This section describes the installation of the power equipment. All wiring must be complete before connecting the battery and the charger to the board. See section 11 [Powering the device](#).

3.1 Install the battery

The battery mounts inside the flow computer enclosure. Before installation, inspect the power cables (where they terminate on the battery) and the connectors for damage.

Material:

- One (1) battery with cable attached.

Install the battery:

1. Open the hinged door on the XFC or XRC. Locate the battery shelf.
2. Place the battery on the compartment shelf; do not allow the battery terminals to contact any metal surface inside the enclosure.



DANGER – Bodily injury. Do not allow the battery terminals to come in contact with any metal surface. When the positive and negative battery terminals contact a conductive material, it creates a short circuit and could result in sparks, property damage, and possible explosion.



NOTICE – Equipment damage. Do not connect the battery cable to the BATT (J1 on XFC, J16 on XRC) until instructed to do so in section [6.4: Connect the battery \(dc power\)](#).



Warning – Bodily injury. All wiring must be complete before the device has power.

3.2 Install the solar panel

Mount the solar panel outside on a 2 inch pipe. See [Figure 3-1: Solar panel](#). After the flow computer is pipe-mounted, install the solar panel on the upper end of the mounting pipe. Add a pipe extension if necessary. For wall- or direct-mount installations, mount the solar panel on a stand-alone pipe or on the top or side of a meter house.



Important Note: For optimum charging, place the solar panel in full sun. Do not place the solar panel where it will be in shadow for any part of the day.

Clean the solar panel on a regular basis to ensure maximum charging.



Important Note: For questions about mounting the solar panel on the top or side of a meter house, call the main office listed on the back cover of this guide and select technical support from the menu options.

Materials:

- One (1) solar panel with cable
- One (1) solar panel mounting kit (includes U-bolts, brackets, and hardware)
- Mounting pipe extension and coupling if required (length determined by technician depending on the size of the solar panel)
- Nylon tie wraps



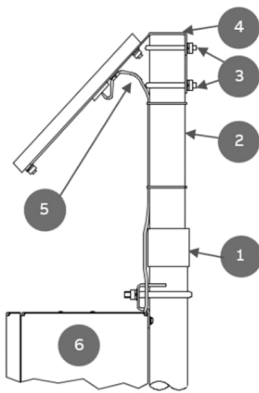
NOTICE – Equipment damage. Exercise caution when handling the solar panel to avoid damage.

Install the solar panel:

1. Verify that the solar panel is operating properly before installation:
 - a. Check the solar panel using a digital voltmeter to verify polarity and output voltage before installation.

- b. If the measured output voltage is within the manufacturer's specification, as defined by the specification sheet supplied with the panel, continue with the installation.
 - c. If the measured voltage is out of specification, contact ABB for a replacement panel.
2. Install the mounting bracket on the solar panel using the provided hardware.
3. If installation requires a mounting pipe extension:
 - a. Attach the pipe coupling to the top end of the flow computer mounting pipe.
 - b. Securely tighten the pipe coupling.
 - c. Attach the extension pipe to the pipe coupling.
4. Attach the solar panel mounting bracket to the top end of the mounting pipe with the U-bolts and associated mounting hardware. Do not tighten completely.

Figure 3-1: Solar panel



Legend: Solar panel

1	Pipe coupling	4	Solar mounting bracket
2	Extension pipe	5	Solar panel cable
3	U-bolts	6	Flow computer

5. In the northern hemisphere, position the solar panel facing south. In the southern hemisphere, position the solar panel facing north.



IMPORTANT NOTE: Position the solar panel correctly before tightening the U-bolts.

6. Tighten the solar panel mounting hardware.



WARNING – Bodily injury. Install the electrical wiring according to requirements for the area classification. Refer to the certification drawing indicated on the device's name tag, and national and local electrical codes.

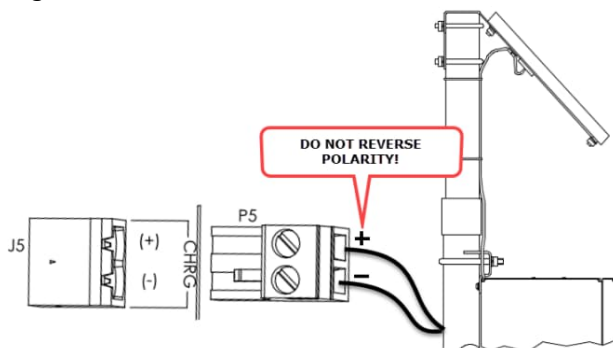
7. Secure the solar panel cable to the pipe:
 - a. Do not wrap the cable around the mounting pipe. Run the solar panel cable along the mounting pipe and use nylon tie wraps to secure the cable.
 - b. Gather excess cable and attach it to the mounting pipe using a nylon tie wrap.
8. Install the cable and cable gland in the enclosure:
 - a. Remove a shipping plug from the left side of the flow computer enclosure.
 - b. Open the hinged door on the flow computer and visually locate the CHRG terminal block (J5 on the XFC, J17 on the XRC).
 - c. Remove the cable nut from the cable conduit elbow and insert the cable and conduit ends through the access hole in the enclosure.
 - d. Pull the cable into the enclosure leaving enough cable to reach the CHRG terminal block (J5 on the XFC, J17 on the XRC).
 - e. Replace the cable nut on the cord and conduit end inside of the enclosure and screw the nut onto the conduit end finger-tight.
 - f. Position the conduit elbow so that moisture will not follow the cable and seep into the gland. Tighten the cable nut.
 - g. Using a small slotted screwdriver, remove the terminal connector from the CHRG terminal block (J5 on the XFC, J17 on the XRC).
9. Wire the solar panel cable to the unattached CHRG connector:



NOTICE – Equipment damage. Do not insert the connector into the CHRG terminal block (J5 on the XFC, J17 on the XRC) until instructed to do so in section [6.5: Connect the charger](#).

- a. On the solar panel cable, trim the wire cover ends back ¼ inch (6.35 mm) if necessary.
- b. Loosen the terminal connector screws for pins 1 and 2.
- c. Insert each solar panel cable wire, as identified by the cable label (+ or -), into the corresponding CHRG pin (+ or -), as shown in the figure below. Gently tighten the terminal connector screws.

Figure 3-2: CHRG terminal block on the XFC



NOTICE – Equipment damage. Do not reverse polarity when wiring the XFC J5 (or XRC J17) terminal connector. Irreversible damage to the charger circuit will occur if wires do not match the polarity required. This voids product warranty.



NOTICE – Equipment damage. Do not over-tighten the terminal connector screws as this may damage the wires.



NOTICE – Equipment damage. Do not connect the solar panel to the electronic board before battery connection. Damage to the board will void any warranty.

4 Wire COMM ports

Wire the XFC or XRC COMM ports to communicate with and power external devices. Wiring for communication depends on the type of serial interface required by the device. Wiring for power is required if there is no external supply powering the external device.

Install the required communication modules in the correct slot on the XFC or XRC board.



IMPORTANT NOTE: Refer to the XFC or XRC user drawings for COMM generic wiring or detailed wiring for specific external devices. See [Additional information](#).

Table 4-1: Serial communication specifications

Type	Maximum Length	Termination/connector type
RS-232	50 feet (15 meters)	Screw terminal connector blocks, removable for convenient wiring
RS-485	4000 feet (1220 meters)	

NOTICE – Equipment damage. External devices can be powered from the (VBAT) or (SW VBAT) pins on the XFC or XRC COMM ports.



The output voltage at these pins is dependent upon the external power supply connected to the CHRG connector (J5 on XFC, J17 on XRC). The voltage range at J5 or J17 can be from 9 Vdc to 15.5 Vdc (The XFC and XRC are 12 Vdc nominal powered devices).

Before connecting an external device to VBAT or SW BAT, ensure that the device is compatible with this voltage range. Connecting an incompatible device may result in damage to the device.

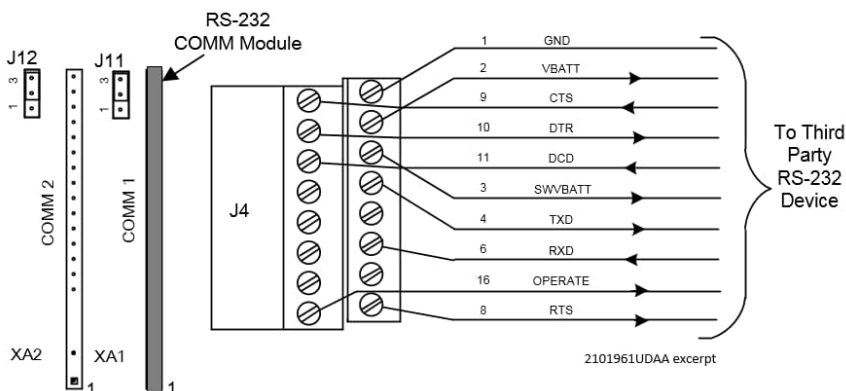
4.1 XFC COMM pinouts

To wire equipment to the XFC serial communication ports, determine the COMM port to use, insert the correct communication module type in the available slot, then refer to the generic wiring drawings or pinout tables.



IMPORTANT NOTE: Use pins on both terminal blocks to wire COMM1 or COMM2 on the XFC. Remove both terminal block connectors from the board to wire based on communication type.

Figure 4-1: XFC R-232 COMM1



IMPORTANT NOTE: Typically only TXD, RXD and GND may be required to communicate with a third party RS-232 device. The figure above illustrates all lines associated with COMM 1 or COMM2 RS-232 module.

Figure 4-2: XFC R-232 COMM2

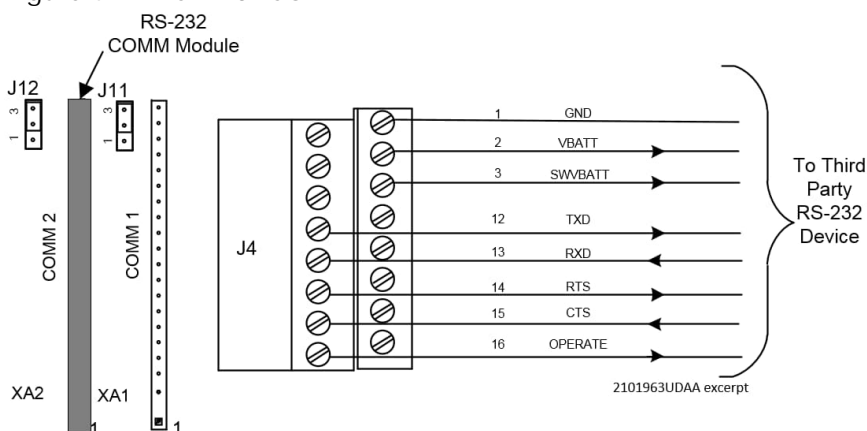


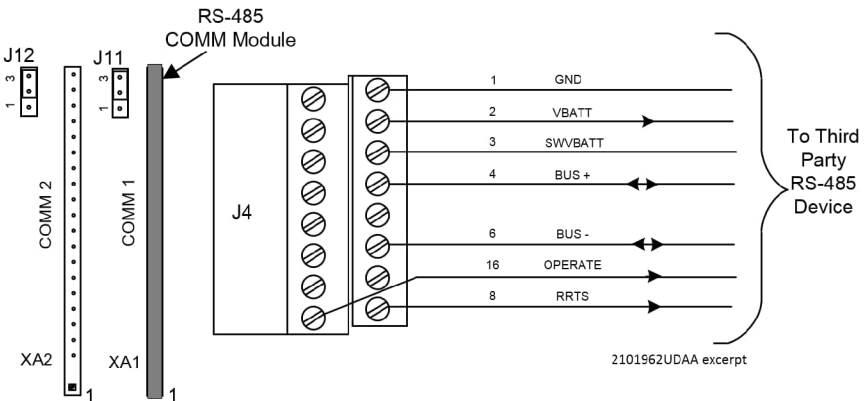
Table 4-2: XFC RS-232 COMM1 and COMM2 pinouts

PIN	RS-232 COMM 1	RS-232 COMM 2
1	GND	GND
2	VBATT	VBATT
3	Sw VBATT	Sw VBATT
4	TXD	
5		
6	RXD	
7		
8	RTS	
9	CTS	
10	DTR	
11	DCD	
12		TXD
13		RXD
14		RTS
15		CTS
16	OPERATE	OPERATE

*Blank cells carry no signal.

i **IMPORTANT NOTE:** Figure 4-3 (COMM1) and Figure 4-4 (COMM2) show connection lines to a single device. RS-485 supports multiple devices per port. For additional wiring options, search additional user drawings at www.abb.com/upstream.

Figure 4-3: XFC-485 COMM1





IMPORTANT NOTE: Typically only BUS+, BUS- and GND may be required to communicate with a third party RS-485 device. The figure above illustrates all lines associated with COMM 1 or COMM2 RS-485 module.

Figure 4-4: XFC R-485 COMM2

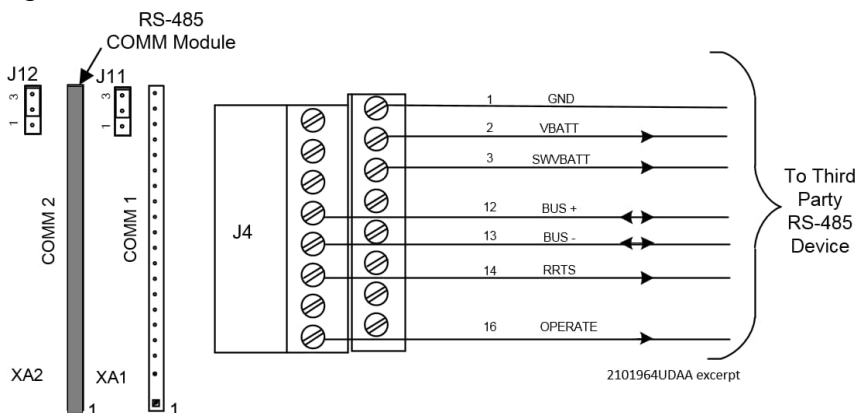


Table 4-3: XFC RS-485 COMM1 and COMM 2

PIN	RS-485 COMM 1	RS-485 COMM 2
1	GND	GND
2	VBATT	VBATT
3	Sw VBATT	Sw VBATT
4	BUS(+)	
5	BUS(+)	
6	BUS(-)	
7	BUS(-)	
8	RRTS	
9		
10		
11		
12		BUS(+)
13		BUS(-)
14		RRTS
15		
16	OPERATE	OPERATE

*Blank cells carry no signal.

i IMPORTANT NOTE: If wiring for RS-485 communication, set the termination jumpers (J11 or J12) in the correct position. See details in Table 10-2 (COMM1) or Table 10-3 (COMM2).

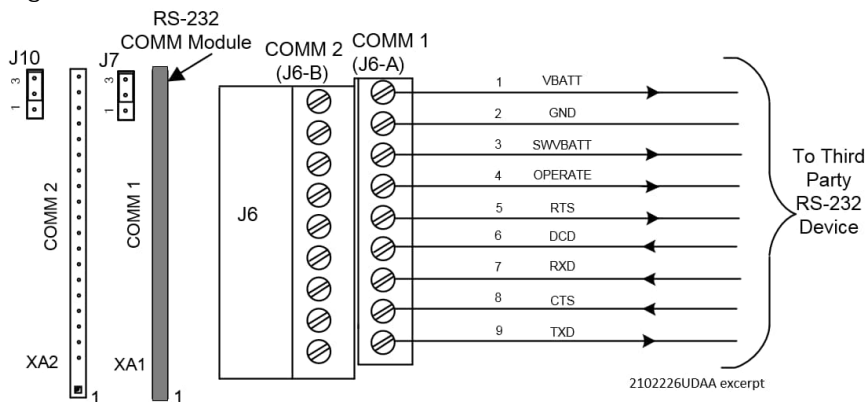
4.2 XRC COMM pinouts

To wire equipment to the XRC serial communication ports, determine the port, insert the correct communication module type in the available slot, then refer to the generic wiring diagram or pinout table.

COMM 1 and COMM 2 have identical pinouts. Use J6-A to wire COMM1 or J6-B to wire COMM2. See [Figure 4-5](#) (RS 232) or [Figure 4-6](#) (RS 485). Refer to [Table 4-3](#) for complete pinout for both ports.

i IMPORTANT NOTE: When wiring for RS-485 communication, set the termination jumpers (J7 or J10) in the correct position. See details in [Table 10-2](#) (COMM1) or [Table 10-3](#) (COMM2).

Figure 4-5: XRC RS-232 COMM 1



i IMPORTANT NOTE: Typically only TXD, RXD and GND may be required to communicate with a third party RS-232 device. The figure above illustrates all lines associated with COMM 1 or COMM2 RS-232 module.

i IMPORTANT NOTE: Figure 4-6 (RS-485 COMM1) shows connection lines to a single device. RS-485 supports multiple devices per port. For additional wiring options search additional user drawings at www.abb.com/upstream.

Figure 4-6: XRC RS-485 COMM 1

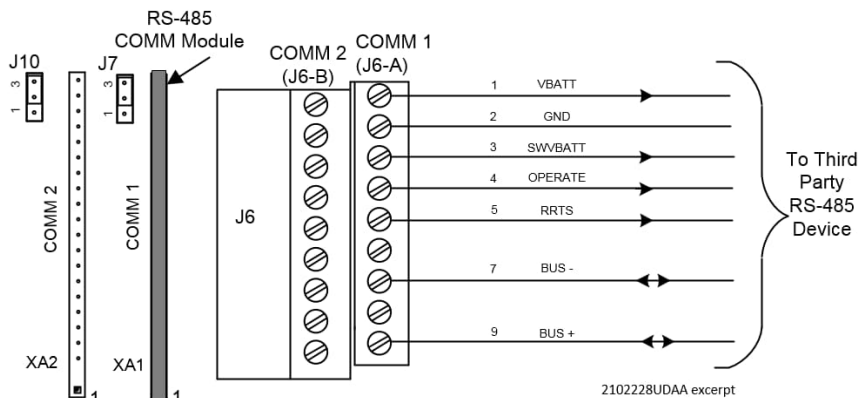


Table 4-4: XRC COMM 1 and COMM 2 pinouts

PIN	RS-232 COMM 1 and 2	RS-485 COMM 1 and 2
1	VBATT	VBATT
2	GND	GND
3	SW VBATT	SW VBATT
4	OPER	OPER
5	RTS	RRTS
6	DCD	BUS-
7	RXD	BUS-
8	CTS	BUS+
9	TXD	BUS+

5 Wire I/Os

Wire the XFC or XRC I/O ports to monitor or control external devices.



IMPORTANT NOTE: Refer to the XFC or XRC user drawings for I/O wiring details for specific external devices. See [Additional information](#).

NOTICE – Equipment damage. An external device can be powered from VBAT or SW VBAT pins on the COMM terminals.



The output voltage at these pins is dependent upon the external power supply connected to the CHRG connector (J5 on XFC, J17 on XRC). The voltage range at J5 or J17 can be from 9 Vdc to 15.5 Vdc. The XFC and XRC are 12 Vdc nominal powered devices.

Before connecting an external device to VBAT or SW BAT, ensure that the device is compatible with this voltage range. Connecting an incompatible device may result in damage to the device.

5.1 Analog input (AI) pinouts

The XFC has two onboard analog inputs. Determine the AI and refer to the pinout table for wiring.



IMPORTANT NOTE: The XFC AIs support voltage inputs by default. To support current (4 – 20 mA) inputs add a 250 ohm resistor across the + and – terminals.

Figure 5-1: XFC AI terminals

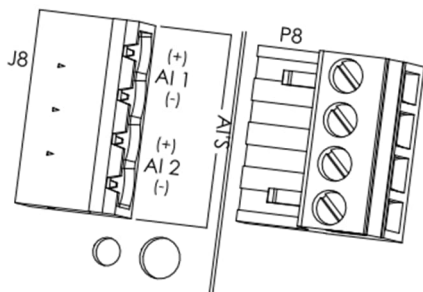


Table 5-1: XFC AI Pinouts

Input	Pin	Description
AI-1	1	(+) Input signal
	2	(-) Input ground
AI-2	3	(+) Input signal
	4	(-) Input ground

The XRC has five onboard analog inputs. Determine the AI and refer to the pinout table for wiring.

Figure 5-2 shows the XRC analog input terminals and the input mode selector jumpers. Use these jumpers to set the analog input for the type of input signal expected (voltage or current). Follow the legend to set the correct AI to the correct mode. By default, all analog inputs are set for voltage inputs (0 -10 V).

Figure 5-2: XRC AI terminals and input mode selector jumpers

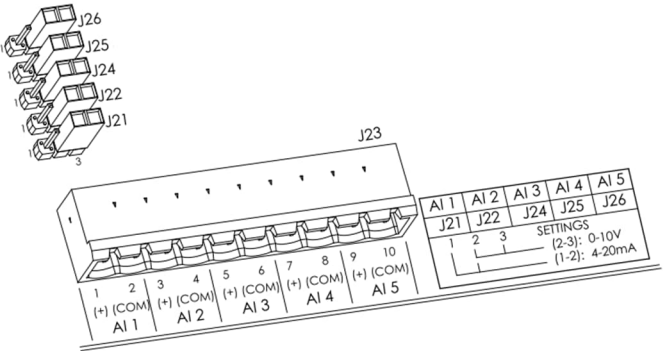


Table 5-2: XRC AI Pinouts

Input	Pin	Description
AI-1	1	(+) Input signal
	2	(COM) Input ground
AI-2	3	(+) Input signal
	4	(COM) Input ground
AI-3	5	(+) Input signal
	6	(COM) Input ground
AI-4	7	(+) Input signal
	8	(COM) Input ground
AI-5	9	(+) Input signal
	10	(COM) Input ground

5.2 Digital input and output (DI/DO) pinouts



IMPORTANT NOTE: Digital inputs may be used as Pulse Inputs.

The XFC has 2 onboard digital outputs and 2 onboard digital inputs. [Figure 5-3](#) shows the Digital I/O terminals on the XFC and the input mode switches. The input mode switches support standard pulse inputs (STD) or pulse inputs from Coriolis (IEC). Remember to set the switch to the correct position based on the type of pulse input signal expected. Use S3 for DI/PI 1 or S4 for DI/PI 2.

Listed below are the DIs and DOs for the XFC and the XRC.

Figure 5-3: XFC DI/PI/DO terminals and input mode switches

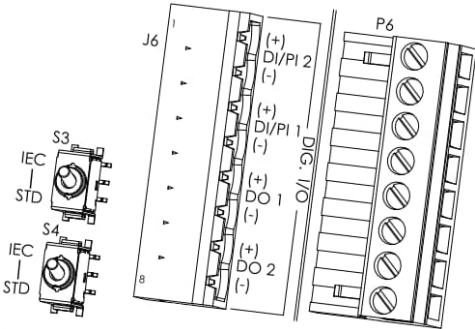


Table 5-3: XFC DI/PI/DO pinouts

I/O	Pin J6	Description
DI2/PI2	1	(+) Input signal
	2	(-) Input ground
DI1/PI1	3	(+) Input signal
	4	(-) Input ground
DO1	5	(+) Output signal
	6	(-) Output ground
DO2	7	(+) Output signal
	8	(-) Output ground

The XRC has four onboard digital outputs and four onboard digital inputs. Figure 5-4 shows the Digital I/O terminals on the XRC, the input mode switches, and the debounce jumpers. The input mode switches support standard pulse inputs (STD) or pulse inputs from Coriolis (IEC). Remember to set the switch to the correct position based on the pulse input signal expected (Use S3 for DI/PI 1, S4 for DI/PI 2, S7 for DI/PI 3 and S8 for DI/PI 4).

By default the debounce jumpers are set to enable debounce on the DI/PI.

Figure 5-4: XRC DI/PI/DO terminals, input mode switches, and debounce jumpers

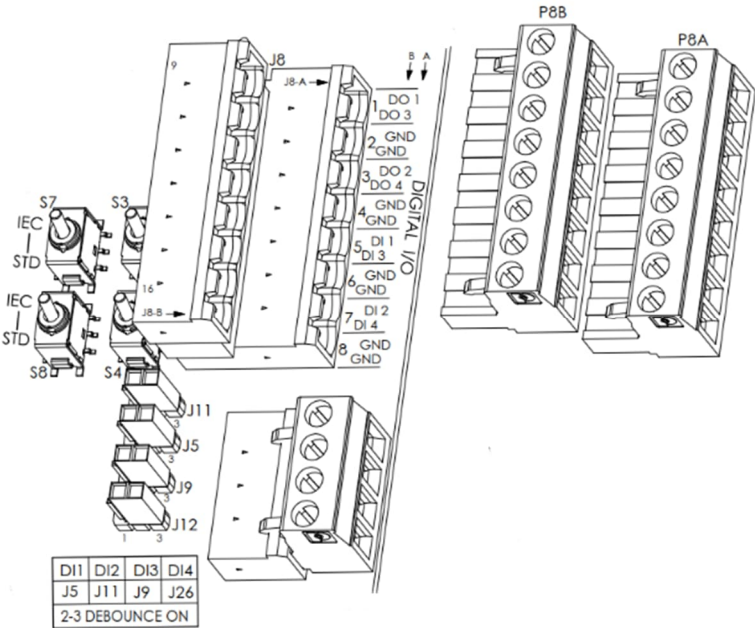


Table 5-4: XRC DI/PI/DO Pinouts

I/O	Pin J8-A	Description	I/O	Pin J8-B	Description
DO1	1	Signal	DO3	1	Signal
	2	GND		2	GND
DO2	3	Signal	DO4	3	Signal
	4	GND		4	GND
DI1/PI1	5	Signal	DI3/PI3	5	Signal
	6	GND		6	GND
DI2/PI2	7	Signal	DI4/PI4	7	Signal
	8	GND		8	GND

6 Powering the device

Apply power to the XRC or XFC by making the correct connections for the power mode chosen. The XFC and XRC support two power modes:

- Battery mode: The primary power source is a 12 volt battery with a charger.
- External power mode: The primary power source is an external power supply.

6.1 Super capacitor charging at boot time

The XFC and XRC design includes a super capacitor (Super CAP) that serves as a short-term power reservoir. Allow 2 minutes to charge the super CAP the first time you connect the unit to power. The Super CAP must recharge if the XFC or XRC is powered off for several hours. After the capacitor is fully charged, the boot time is considerably less.



IMPORTANT NOTE: In the event of a loss of power or reset, the charged super capacitor prevents the supply voltage from falling to zero for a short period of time (2.5 seconds). This delay allows the system time to save all persistent data such as trending, restart configuration, etc.

6.2 Power-on sequence

The XFC and XRC power-on sequence is initiated as soon as power is connected. LCD displays the following information as the controller completes the startup:

Figure 6-1: XFC Display startup messages (part numbers are examples)

Screen 1	Totalflow 32 Bit XSeries Loading Boot Loader ...
Screen 2	Totalflow 32 Bit XSeries Loading Linux OS...
Screen 3	OS Part N0. 2105097-xxx Super CAP Charging
Screen 4	OS Part N0. 2105097-xxx Super CAP Charged
Screen 5	Totalflow.exe Startup Exe Part No. 2105005-xxx
Begin to scroll standard displays	Station ID Totalflow



IMPORTANT NOTE: If the LCD fails to display the startup sequence, see section [13: Troubleshooting](#).

6.3 Power with battery and charger

Operating in battery power mode requires a 12 volt sealed lead acid (SLA) battery and a charger to recharge the battery. This mode requires connection of the battery and the charger. The battery and charger must be installed. See section [3 Install battery and charger](#). Adapt these instructions for alternate installations.

6.4 Connect the battery (dc power)

Connect the 12 volt SLA battery using the battery cable.



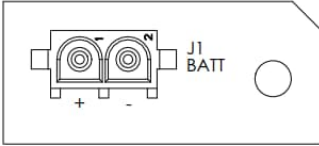
WARNING– Bodily injury and property damage. Complete all wiring of peripheral or external devices to the controller before power is applied.

Connect the battery before connecting the charger cable.

Connect the battery:

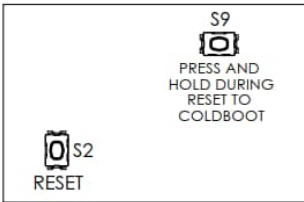
1. Connect the battery to the BATT terminals on the XFC (J1 as shown below) or XRC (J16). Observe the polarity (+ and -).

Figure 6-2: XFC BATT connector



2. Confirm that the battery is supplying power to the XFC or XRC by observing the power-on sequence information scrolling on the LCD (see details in Section [6.1 Super capacitor charging at boot time](#)).
3. If the power-on sequence fails to initiate or complete, press the reset button (shown below).

Figure 6-3: Reset button and coldboot button



6.5 Connect the charger

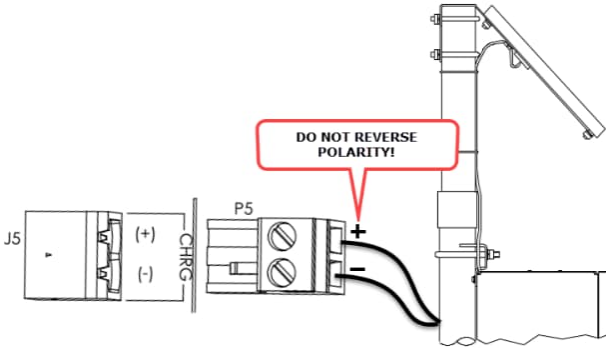


NOTICE – Equipment damage. Always connect the battery to the BATT port before connecting the solar panel or alternate charger cable to the XFC or XRC.

6.6 Connect the solar panel charger:

1. Reinsert the CHRG connector wired to the charger cable to the CHRG terminal on the XFC (J5 shown below) or XRC (J17).

Figure 6-4: XFC charger connection



NOTICE – Equipment damage. Do not reverse polarity when wiring the XFC J5 (or XRC J17) terminal connector. Irreversible damage to the charger circuit will occur if wires do not match the polarity required. This voids product warranty.

6.7 Power with external power supply

An external power supply can power the XFC and XRC.

The XFC and XRC are 12 Vdc nominal powered devices. The voltage range from an external supply must be 9 Vdc to 15.5 Vdc.

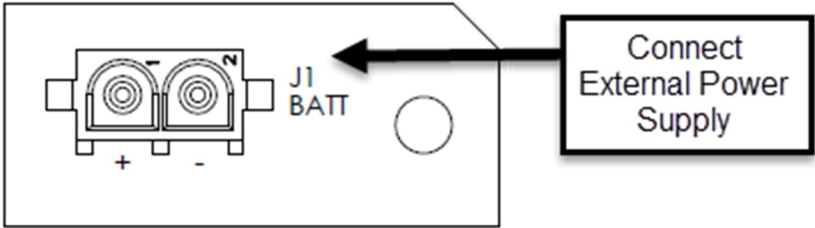


NOTICE – Equipment damage: A battery cannot be used when the XFC or XRC is in external power mode.

Wire or connect an external power supply to the XFC or XRC:

1. Review the manufacturer's instruction supplied with the external power supply.
2. Wire or connect the external power supply cable to the BATT connector as shown below. Observe the polarity (+ and -).

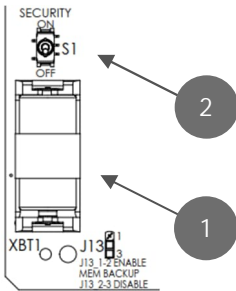
Figure 6-5: Connect the external power supply



3. Confirm that the XFC or XRC is receiving power by observing the power-on sequence information scrolling on the LCD (see details in section [6.1 Super capacitor charging at boot time](#)).
4. If the power-on sequence fails to initiate or complete, see section [13.2 Failure to start](#).

6.8 Enable real time clock backup

Figure 6-6: Battery and switch



Legend – S1 Security switch

1	Battery
2	Security switch

The lithium battery maintains operation of the real time clock. The lithium battery backup jumper (J13) is located near the lithium battery slot. The two settings are:

1. Enable – Jumper settings 1-2. The lithium battery backs up the real time clock. If power is lost or disconnected, the real time clock continues to operate until depletion of the lithium battery.
2. Disable – Jumper settings 2-3. The lithium battery does not back up the real time clock. The real time clock will continue to operate for 24-36 hours under typical conditions. The real time clock will

stop operation and lose time without power. At the next startup the system will restore the last known good time which can be one of the following:

- a. Last Totalflow Running Time: Last time Totalflow was running or when the power was lost. This is the time most often used.
- b. OS Build Time: In case Last Totalflow Running Time could not be retrieved, the build time of the OS will be used as the last known good time.

If system time is lost, the system and event logs will display the following messages:

- System Log: "System time was lost, so restoring the last known time."
- Event Log in Tube: "System Time Lost."

7 Local communication with the device

Initial communication with the XFC or XRC can be established with a direct connection to the RS-232 (MMI) or USB ports. Note that communication on the USB port is faster.

Use the appropriate cable for each port. For details on cable specifications, adapters or drivers, refer to the user manuals.

Use PCCU32 software version 7.61 or newer to connect and configure the XSeries^{G5} devices.



IMPORTANT NOTE: PCCU32 version 7.61 software or newer is required to communicate with the XFC or XRC for configuration. Previous versions of PCCU32 are not compatible. It is assumed that PCCU32 is already installed in the PC or laptop used to connect to the XFC or XRC. To download the latest PCCU32 version, see [Additional information](#). For PCCU32 installation instructions, see the user manuals listed in [Additional information](#).



IMPORTANT NOTE: PCCU32 has context-sensitive online help. Click Help on the screen of interest to view the topic applicable to the screen.



IMPORTANT NOTE: Local communication using Ethernet, Bluetooth or Wi-Fi are all supported on the XFC and XRC, but these interfaces must be enabled first. See section [10.3: Configure for network communication](#).

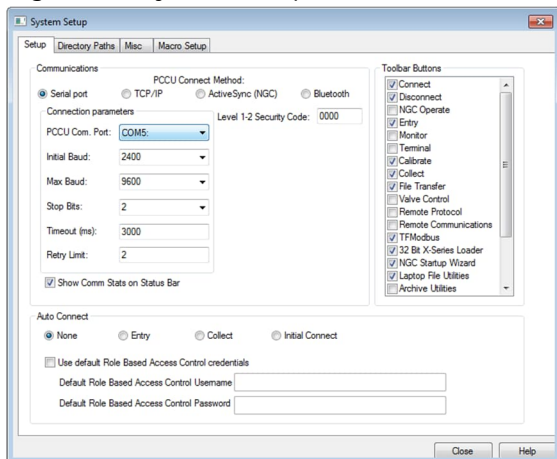
7.1 Set up PCCU for connection

Configure PCCU for the type of port used:

1. Connect the laptop or PC running PCCU32 to the flow computer with either an MMI cable (RS-232) or a USB cable.
2. Start the PCCU32 software program by double-clicking the desktop icon or selecting PCCU32 from the Start > Program menu.
3. Define the local connection parameter:
 - a. Click the Setup icon on the toolbar or click Operate > Setup > System Setup. The System Setup window displays.

- b. Under Communications, select Serial port.
- c. Under Connection Parameters, on the PCCU Com. Port drop down list, select the port on the PC or laptop assigned to the local connection.

Figure 7-1: System Setup



4. Click Close.

7.2 Establish connection with the XFC or XRC

Connect to the device entry mode:

1. On the PCCU32 tool bar, click Entry to connect to the device.

Figure 7-2: PCCU32 Tool bar and Entry

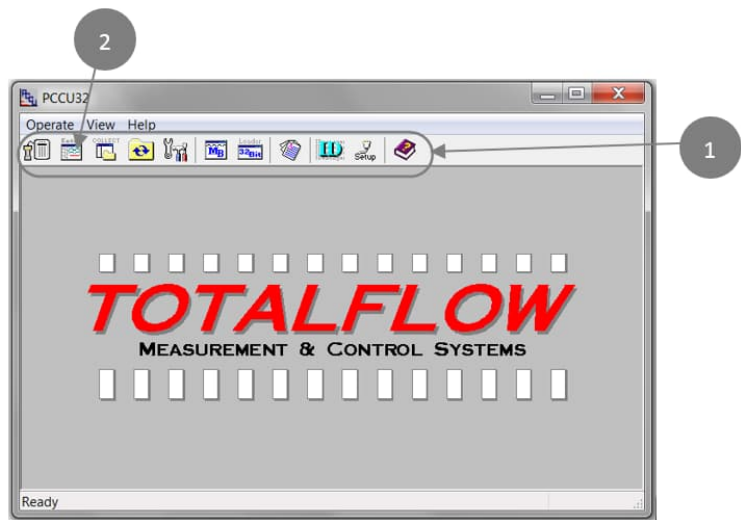
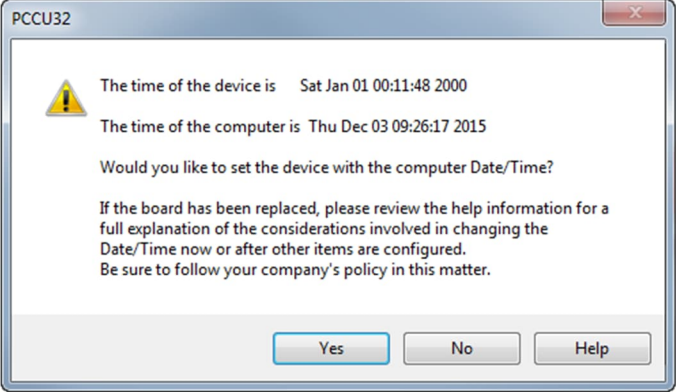


Table 7-1: PCCU 32 Elements

Number	Element name
1	Tool bar
2	Entry button

2. If the XFC or XRC clock date and time is different from the laptop's, a message box displays with the option to synchronize the date and time.

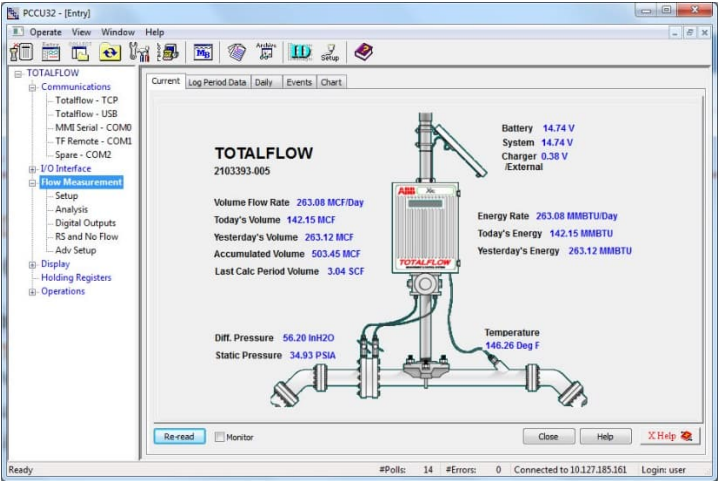
Figure 7-3: PCCU32 Date/Time synchronization warning



i IMPORTANT NOTE: Click Help for more information.

- Click No to set the time and date later during the installation, or click Yes to synchronize date and time. When successfully connected to the XFC or XRC, the screen displays the device and measurement variables.

Figure 7-4: PCCU32 XFC G5 Entry Screen

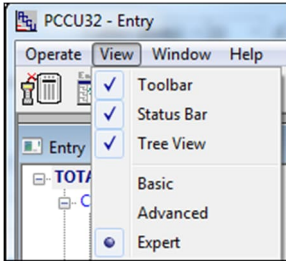


7.3 Change to Expert view

Use PCCU Expert view to complete initial and advanced configuration. Change the view while connected to the XFC or XRC:

1. While connected to the XFC or XRC (Entry mode), on the top PCCU32 menu bar, select View.
2. Select the Expert option.

Figure 7-5: PCCU32 Views



3. Click Yes at the warning notice and wait for the PCCU32 Entry mode screen to refresh.
4. Wait for the Entry mode screen to reappear.

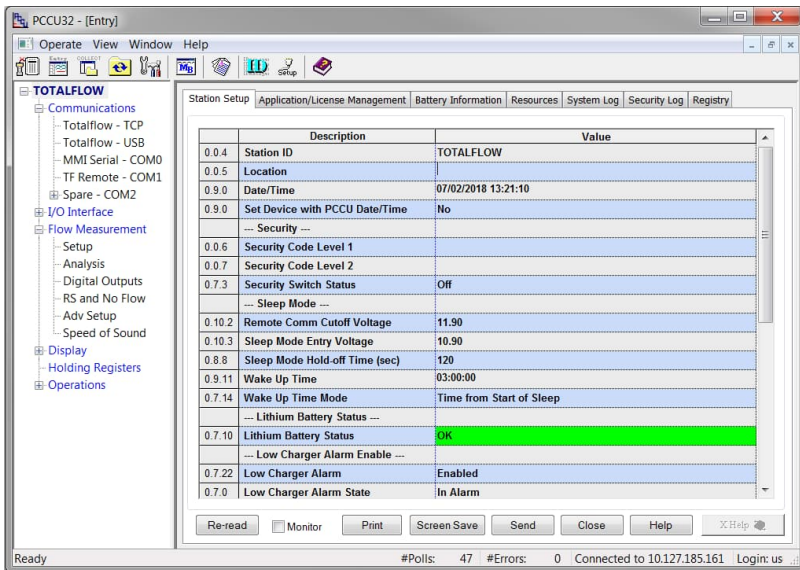
8 Configure the basic parameters

8.1 Station parameters

Configure basic station parameters:

1. At the PCCU32 Entry screen, click the station ID (TOTALFLOW) at the top of the navigation tree. The Station Setup tab displays.

Figure 8-1: Station Setup



2. Set up the basic station configuration parameters identified in the following table.

Table 8-1: Required Station Setup

Entry	Format	Description
Station ID	10 digit alphanumeric	The station identifier code is unique. If running a multiple tube station, the station ID is the same for all tubes on the device. If left blank on a single tube device, the station ID will be the same as the device ID.
Location	24 digit alphanumeric	The location identifier describes the location, such as the county name or a road number. Not mandatory.
Date/Time	MM/DD/YYYY HH:MM:SS (24 hour clock)	Date and time must be set correctly and should agree with the collection equipment if measurement tubes are instantiated.

1. Verify the Lithium Battery Status is OK with a green bar, see [Figure 8-1: Station Setup](#). If the status is Low Voltage or Not Connected, the field background color is red.
2. Change settings in the Station Setup tab as needed. Leave PCCU open on the Station Setup tab. For more information, refer to the XFC or XRC user manual.

8.2 Change the default time and date format

The factory configuration has a default date and time displayed on the LCD.

Change the default format to preferred settings:

1. On the Station Setup tab, scroll down to the LCD Display Date/Time Format. See the figure below.

Figure 8-2: Station Setup Detail

Station Setup			Applications	App Licensing	Battery Information	Resources	System Log	Security Log	Registry
	Description		Value						
	--- LCD Display Date/Time Format ---								
0.7.15	Date/Time Format		mmddyy hhmmss						
0.7.16	Date Separator		Slash /						
0.7.17	Time Separator		Colon hh:mm:ss						

2. Select the preferred Date/Time Format (mmddyy or yymmdd).
3. Select the preferred Date Separator (slash, dash, or period).
4. Select the preferred Time Separator (colon or period).
5. Click Send to save all station settings.

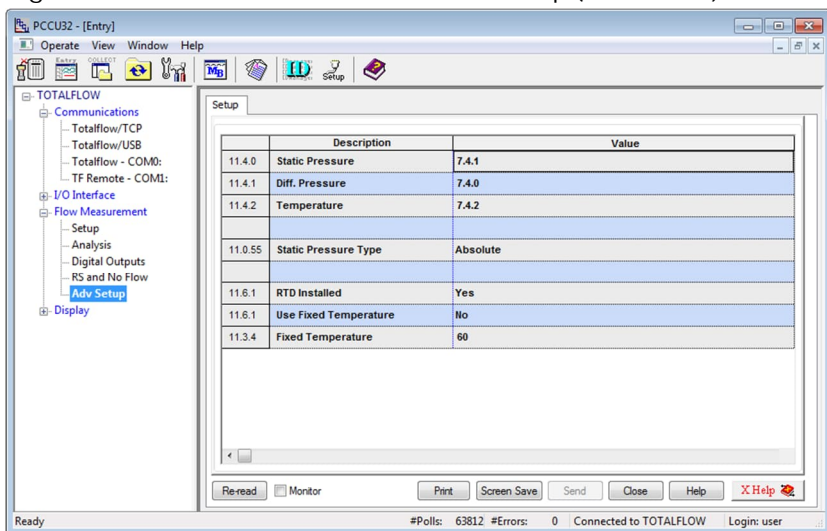
9 Initial measurement application setup

The XFC or XRC shipped with standard configuration and the gas orifice measurement application configured by default. This procedure describes the setup of that flow measurement application (single tube). To set up additional tubes, or for different measurement application types, refer to the user manuals listed in [Additional information](#), the application instructions, or click Help for online topics on the specific application required.

Set up the gas orifice flow measurement application:

1. On the PCCU navigation tree, click Flow Measurement > Adv Setup.

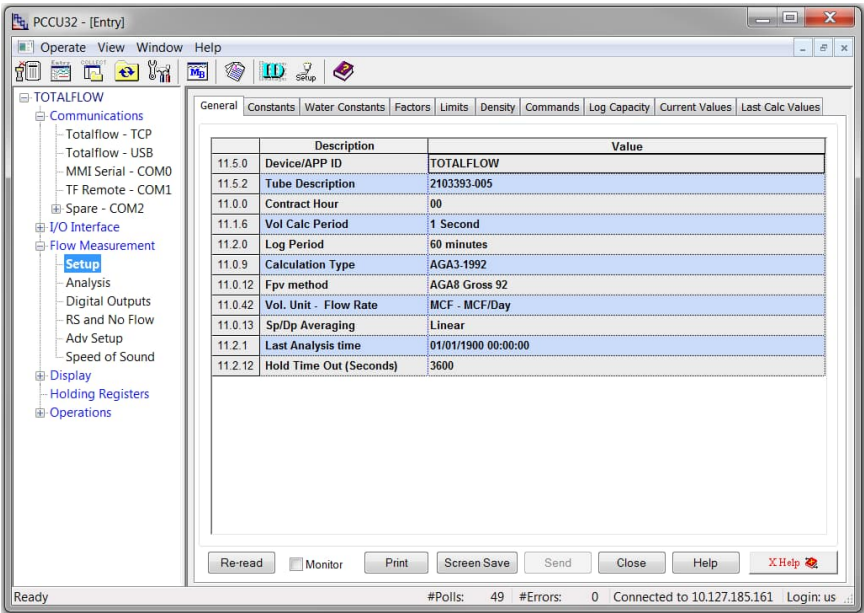
Figure 9-1: Flow Measurement Advanced Setup (Gas orifice).



2. On the Setup tab, verify and change if necessary, the following settings:
 - a. If receiving live flowing temperature values from an RTD, set the RTD Installed field to Yes.
 - b. If using a fixed temperature value instead of live readings, set the Use Fixed Temperature field to Yes.
 - i. In the Fixed Temperature field, type the value for the fixed temperature.
3. On the navigation tree, click Flow Measurement > Setup.

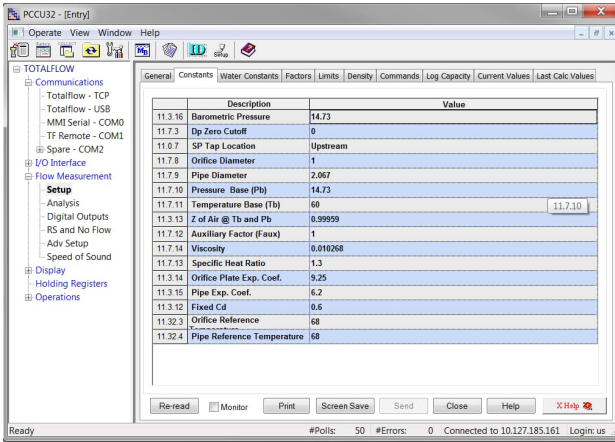
4. On the General tab, verify and change if necessary, the required parameters:
 - a. In the Calculation Type field, select the calculation standard for this tube.
 - b. In the Fpv Method field, select the compressibility method for this tube.

Figure 9-2: Flow measurement > setup > General tab



5. Click Send.
6. Select the Constants tab.

Figure 9-3: Constants Tab



7. Verify or update the following:
 - a. For Barometric pressure, type the value, subtracted from the absolute pressure readings when calibrating in gauge pressure.



IMPORTANT NOTE: Barometric pressure is area dependent. Use the correct barometric pressure for the area or the contracted value.

- b. For Orifice diameter, type the diameter in inches.
 - c. For Pipe diameter, type the pipe diameter in inches.
 - d. For Temperature base (Tb), type the value as defined by the existing contractual agreement (default is 60 °F).
8. Click Send.
9. Continue to the other tabs for additional configuration if needed.



IMPORTANT NOTE: The previous steps are the minimum requirements to get a Totalflow XFC or XRC online and measuring gas. There are many more steps depending on the site and company requirements.

10 Configure communications

Configure and enable communication interfaces when needed:

- Before configuration, wire communication or peripheral equipment to the serial communication (COMM) terminals. See section [4: Wire COMM ports](#).
- For remote or local network communication, note that enabling Ethernet, Wi-Fi or Bluetooth will cause additional power consumption.

10.1 Configure COMM1

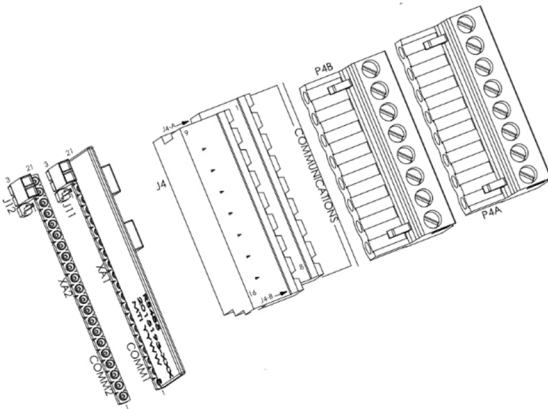
The XFC and XRC have standard configurations with COMM1 configured for remote communications with a host. The port TF-Remote – COM1 is configured to support the Totalflow Remote Protocol by default.

For additional details, click Help from the Communications Setup tab screen for details.

Configure COMM1:

1. Install the communication module for the required serial interface type (RS-232 or RS-485) in the COMM1 slot on the XFC or XRC board.

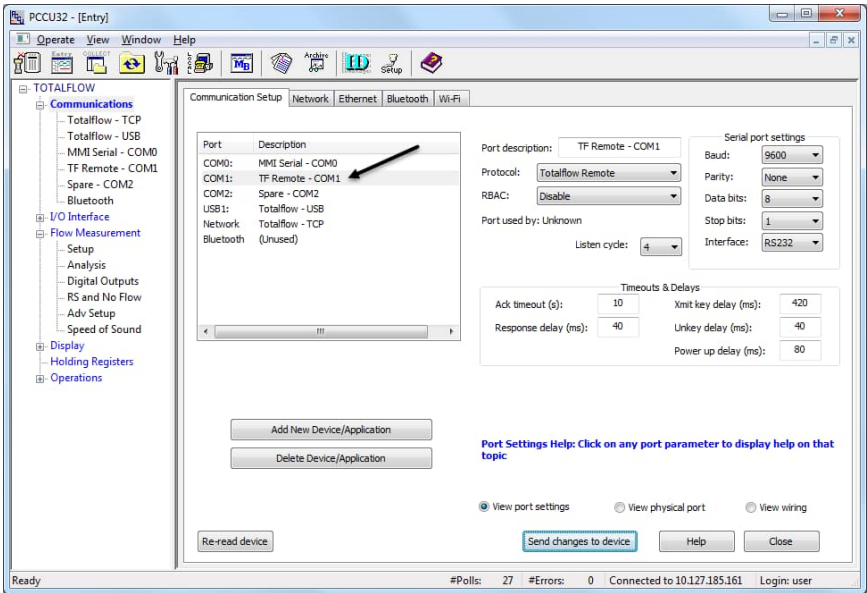
Figure 10-1: XFC COMM terminals (Module in COMM1 slot shown)



2. Wire the communication equipment according to the type of serial interface required. See section [4: Wire COMM ports](#).
3. In the PCCU navigation tree, click Communications.

- On the Communication Setup tab, select COM1: TF Remote – COM1.

Figure 10-2: TF Remote - COM 1



- On the Protocol menu, select the appropriate protocol if not using the default Totalflow Remote.
- Under Serial Port Settings, on the Interface menu, select the communication interface (RS-232, RS-485, or RS-232 Modem).
- Verify, and change if necessary, the remaining serial port settings and timeouts and delays.

Table 10-1: Communication setup parameters

Timeouts and delays		Serial port settings	
Parameter	Default	Parameter	Default
Ack timeout (s)	15	Baud	9600
Response delay (ms)	40	Parity	None
Xmit key delay (ms)	420	Data bits	8
Unkey delay (ms)	40	Stop bits	1
Power up delay (ms)	80		

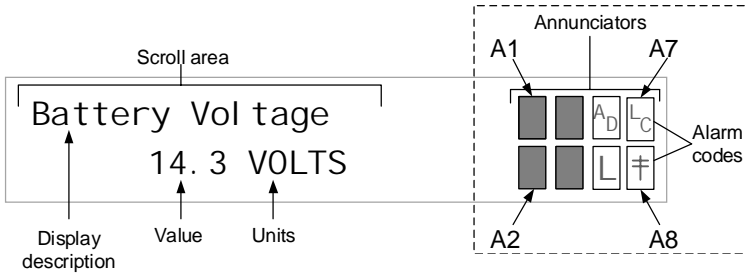
8. For RS-485 communication, position the termination jumpers according to the following table:

Table 10-2: RS-485 Termination on COMM1

Position of the device on the Bus	XFC J11	XRC J7
Last or only unit	1-2	1-2
Intermediate unit	2-3	2-3

9. Click Send changes to device after all values have been set.
10. Observe the LCD on the enclosure door. The annunciator in position A8 should periodically flash the \dagger symbol to indicate that the COMM1 port is active and listening for communication. See the following figure.

Figure 10-3: Verify the communications set up for COMM1



i **IMPORTANT NOTE:** The \neq symbol flashes according to the Listen Cycle defined for the communication port. The default Listen Cycle is 4. If set to zero, the symbol should be displayed continuously. See the PCCU32 Help files for communication port setup to learn how this setting effects power usage.

11. To set up and schedule the remote communication port for power conservation:
 - a. Select TF Remote – COM1 on the navigation tree.
 - b. Select the Schedule tab. Click Help to locate schedule parameter definitions.
 - c. Set required values and Click Send.
12. If RS-232 Modem was selected in step 6:
 - a. Select the Modem tab to set up modem parameters. Click Help to locate parameter definitions.
 - b. Click Send after all values have been set.

10.2 Configure COMM2

The XFC and XRC standard configurations come with COMM2 configured as a spare port and set up for generic serial communication.

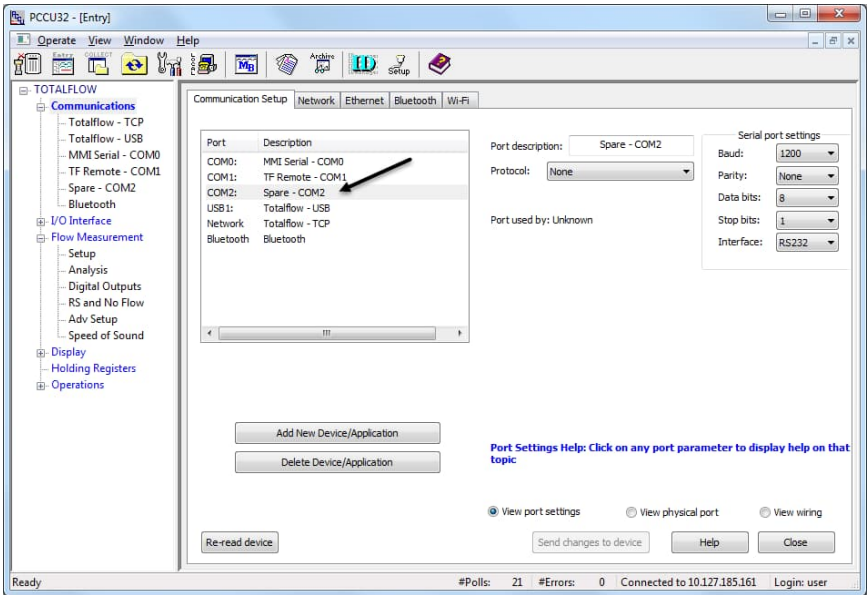
i **IMPORTANT NOTE:** This procedure assumes that the default generic serial communication configuration is used. Additional configuration options, which optimize support for specific ABB products, are also available (for example, the XMV Interface application). For details on these options, click Help from the Communications Setup tab screen and configure the port as required by the external device.

Configure COMM2:

1. Install the communication module for the required serial interface type (RS-232 or RS-485) in the COMM2 slot on the XFC or XRC board.

2. Wire the communication equipment according to the type of serial interface required. See section [4: Wire COMM ports](#).
3. On the PCCU navigation tree, click Communications.
4. In the Communication Setup screen, select COM2: Spare - COM2.

Figure 10-4: Spare - COM 2



5. In the Port description field, type a description for the port. Ensure that the port description uniquely identifies the port.
6. From the Protocol menu, select the protocol required by the external device.

i **IMPORTANT NOTE:** If the protocol selected is any of the MODBUS® options in the list, select the appropriate register format (in the Modbus Format Settings fields).

7. Verify or configure the serial port settings to match the settings of the external device.
8. For RS-485 communication, position the onboard termination jumpers according to the following table:

Table 10-3: RS-485 Termination on COMM2

Position of the device on the Bus	XFC J12	XRC J10
Last or only unit	1-2	1-2
Intermediate unit	2-3	2-3

9. Click Send changes to device when configuration is complete.
10. Verify that the new port name displays under Communications on the navigation tree.

10.3 Configure for network communication

The XFC and XRC can connect to several types of wired or wireless networks. The Ethernet port supports connection for both local and remote communication. The Wi-Fi and onboard Bluetooth wireless interfaces support connection for local wireless communication.

This procedure enables the device Network ID which is required before enabling Ethernet, Wi-Fi or Bluetooth communication (the same Network ID applies to all three types of connections).

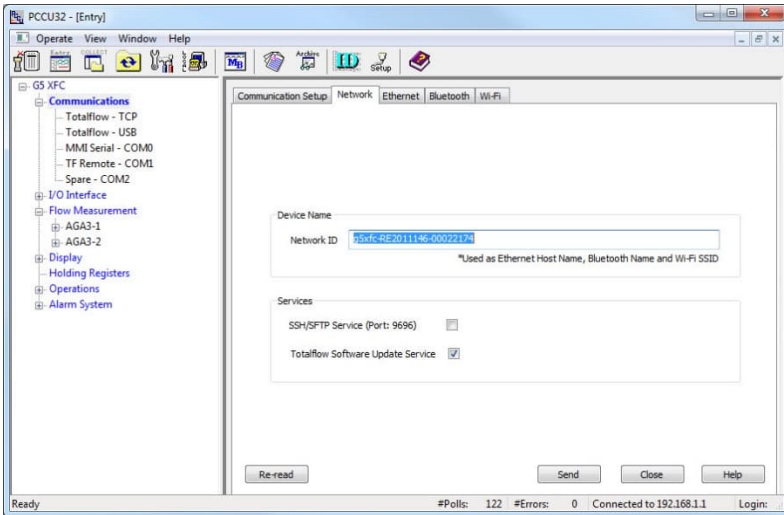


IMPORTANT NOTE: The Network ID is the name or ID that uniquely identifies the device on Ethernet, Wi-Fi, or Bluetooth networks. The default network ID combines the device type (name) and serial number. If changing the default, ensure that the name is unique. The Network ID is the name broadcast on the wireless networks and must be detected by wireless devices prior to establishing connection.

Configure the network ID:

1. On the PCCU Entry mode navigation tree, select Communications.
2. Select the Network tab.
3. To change the default in the Network ID field, type the desired name (not recommended).
4. Click Send to save.
5. Use the Network ID to identify the XFC or XRC for connections on Wi-Fi or Bluetooth.

Figure 10-5: Network tab – Configure network ID



10.4 Enable and configure Ethernet

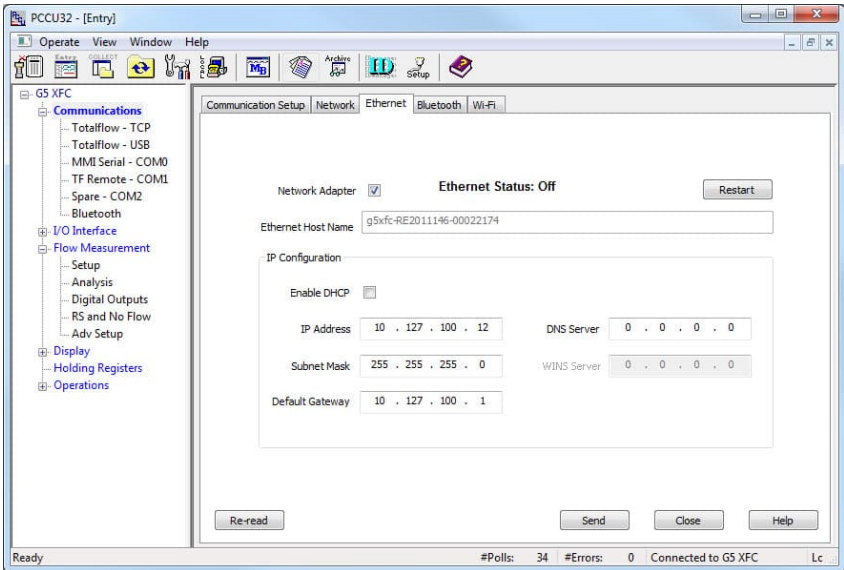
To connect the XFC or XRC to a network, enable the Ethernet interface (Network Adapter) and configure the device with a valid public IP address. The Ethernet interface supports static (manual) or dynamic (DHCP) IP addressing. If configuring the address manually, obtain a valid IP address from the IT administrator.

For additional details, click Help from the Ethernet tab screen.

Configure the Ethernet interface:

1. Configure Network ID.
2. Connect the Ethernet cable from the XFC or XRC to the network communication equipment (hub, switch, router, etc.).
3. On the PCCU Entry mode navigation tree, select Communications.
4. Select the Ethernet tab.
 - a. Select the Network Adapter checkbox.
 - b. If using static addresses, type the IP Address, Subnet Mask, and Default Gateway, provided by the IT administrator.
 - c. If using DHCP for dynamic addressing, select the Enable DHCP checkbox.

Figure 10-6: Enable and configure Ethernet communication



5. Click Send. A message displays to confirm the change.
6. Click Yes to confirm.
7. Click Re-read to refresh the screen and verify that the Ethernet Status displays Ready.
8. Verify that the saved IP configuration is correct.
 - a. If DHCP is enabled, the IP parameters automatically configure.
 - b. If the IP parameters are not displayed, the device did not obtain the parameters from the DHCP server.
 - i. Ensure that the connection to the corporate network is active and verify that the DHCP server is running and available.
 - ii. If unable to connect to the DHCP server, contact the IT administrator.
9. Ping the IP address of the device from the corporate network or local switch and verify that the device replies.



IMPORTANT NOTE: To restart or reinitialize the Ethernet interface, click Restart on the Ethernet screen. It is no longer necessary to restart the device.

10.5 Enable Wi-Fi

The XFC and XRC support Wi-Fi Access Point (AP) functionality. This allows wireless local access for clients with Wi-Fi wireless capabilities. When enabling Wi-Fi, the factory default parameters offer the highest security and number of users. Change the default configuration to meet field security requirements.

This procedure enables Wi-Fi and changes the default security passcode (recommended). For non-default configuration or additional details click Help from the Wi-Fi tab screen.

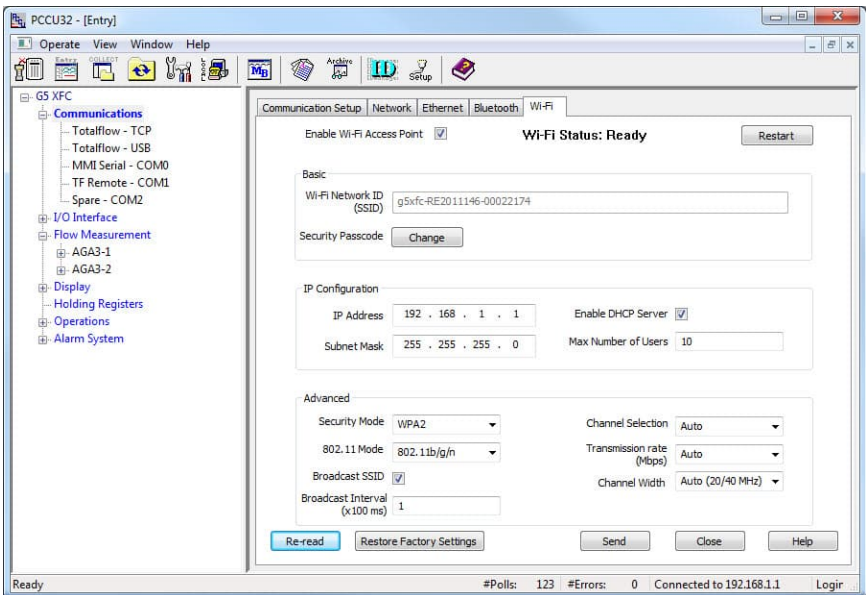


IMPORTANT NOTE: An XFC or XRC enabled as a Wi-Fi Access Point does not provide bridging or routing between the wireless (Wi-Fi) and the wired (Ethernet) networks.

Enable as a Wi-Fi Access Point:

1. Install the antenna. See [2.10 Install antenna](#).
2. Configure the Network ID.
3. On the PCCU Entry mode navigation tree, select Communications.
4. Select the Wi-Fi tab.

Figure 10-7: Wi-Fi tab screen



5. Select the Enable Wi-Fi Access Point checkbox.
6. Change the default security passcode by clicking Change.
7. At the dialog box, type the factory default passcode: totalflow. Type and confirm a new passcode, and click OK. Take note of the new security passcode and keep it safe as it will be required to establish a connection from Wi-Fi clients.



IMPORTANT NOTE: If planning to leave the XFC or XRC with the security switch on, make sure to test the passcode before leaving the field. Turn off the onboard security switch to reset to factory defaults remotely if the new passcode is lost. Note that resetting Wi-Fi to factory defaults resets all Wi-Fi parameters, not only the passcode.

8. Click Send to save the new passcode.
9. Click Yes to confirm. A message displays indicating that the passcode change is successful.
10. Take note of the IP address (default: 192.168.1.1) as it is required to establish connection using PCCU.



IMPORTANT NOTE: The default IP address assigned to the XFC and XRC for Wi-Fi connections is not the same as the default IP address assigned to Ethernet. When configuring PCCU for either type of connection, make sure to use the correct address.

11. Test that the Wi-Fi enabled XFC or XRC is available and establish connection. This test can be performed from the same laptop or PC used during this configuration if it is enabled for Wi-Fi.
 - a. On the laptop, click the Windows Start button and go to Control Panel>Network and Internet>Network and Sharing Center>Connect to a network.
 - b. View wireless networks detected and verify that the network ID assigned to the XFC or XRC displays.
 - c. Select Network ID and click Connect.

Figure 10-8: Network connections



- d. When prompted, provide the security passcode and click OK.
 - e. View the list of wireless networks again and verify that the client shows Connected. A connected status indicates that the Wi-Fi client has been authenticated and automatically assigned an IP address.
12. Verify connection from PCCU:
- a. Start a new instance of PCCU or close the current PCCU connection. The main PCCU screen displays.
 - b. On the PCCU toolbar, click Setup.
 - c. On the Setup tab, for Communications/PCCU Connect Method, select TCP/IP.
 - d. In the Network ID or IP field, type the IP address assigned to the XFC or XRC for the Wi-Fi network (default: 192.168.1.1).
 - e. Click Close to exit PCCU setup and return to the main PCCU screen.
 - f. On the PCCU toolbar, click Entry and verify connection is established.

10.6 Enable Bluetooth

The XFC and XRC support Bluetooth functionality to allow wireless local access. This procedure enables onboard Bluetooth.

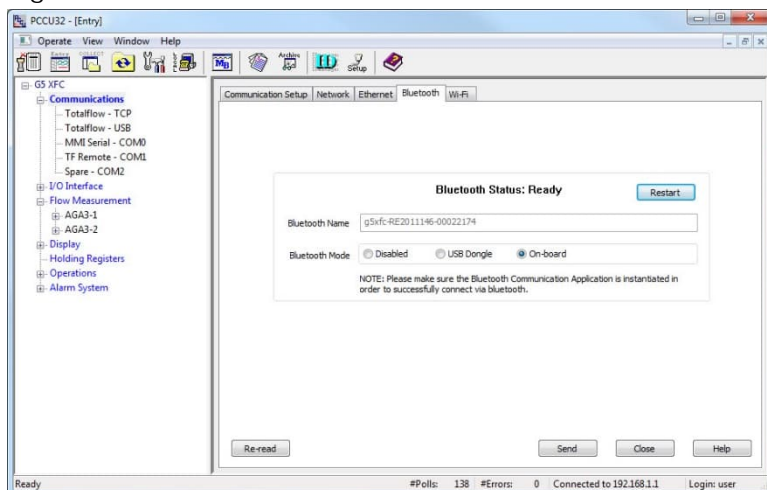
For additional details, or if using a USB dongle, click Help from the Bluetooth tab screen or refer to the user manuals, see [Additional information](#).

Enable onboard Bluetooth:

1. Ensure the antenna has been installed. See [2.10 Install antenna](#).

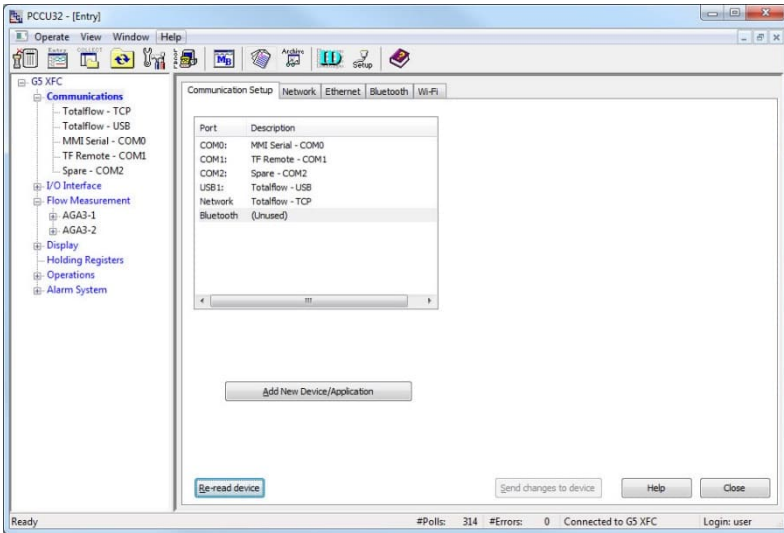
2. Configure the Network ID. See section [10.3 Configure for network communication](#).
3. On the Entry mode navigation tree, select Communications.
4. Select the Bluetooth tab.
5. For the Bluetooth mode, select On-board.
6. Click Send.
7. Click Yes to confirm. Wait for Bluetooth to initialize.
8. Verify that the Bluetooth Status displays Ready.

Figure 10-9: Enable Bluetooth



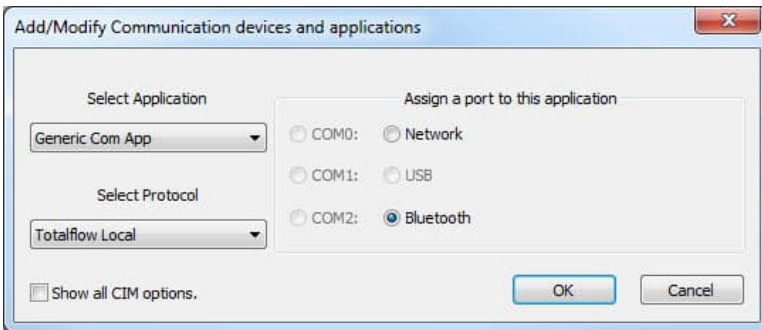
9. Select the Communication Setup tab. The Bluetooth port displays as unused in the port list.

Figure 10-10: Communication Setup for Bluetooth



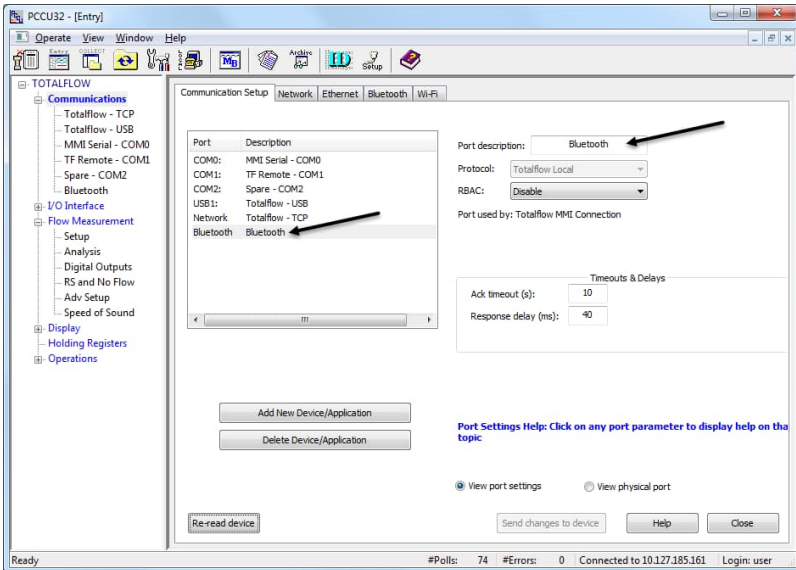
10. Select Bluetooth (Unused).
11. Select Add New Device/Application. See the figure below.

Figure 10-11: Add/Assign Bluetooth application to Bluetooth interface



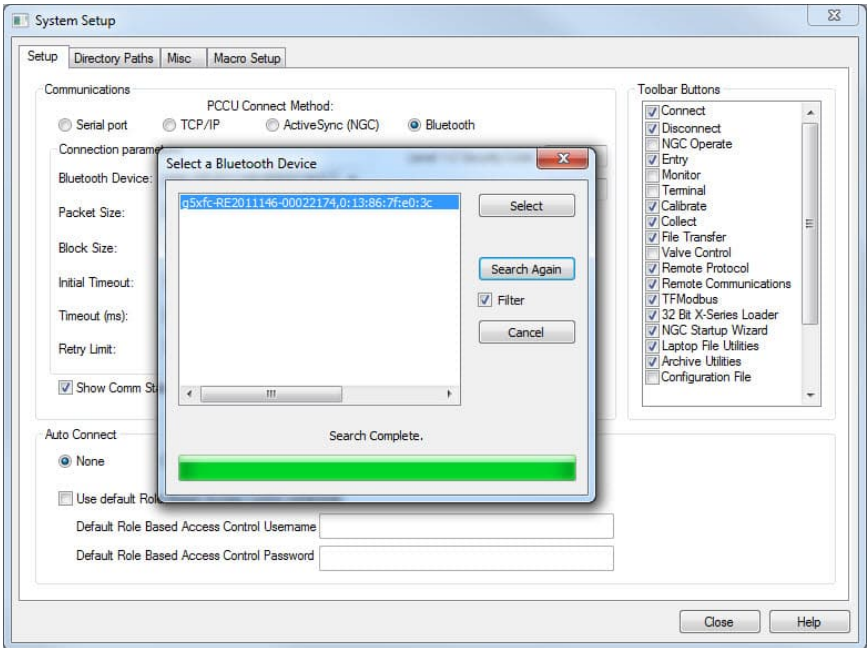
12. Select Bluetooth.
13. Click OK.
14. Click Send Changes to device.
15. On the Communication Setup tab, verify that the port list and the description both display Bluetooth. See the figure below.

Figure 10-12: Verify Bluetooth application assignment



16. Start a new instance of PCCU to test the Bluetooth connection or close the current connection:
 - a. Start PCCU, from the top menu, and select Setup.
 - b. Under Communications/PCCU Connect method, select Bluetooth.
 - c. Select Search for Bluetooth devices.
 - d. Verify that the XFC or XRC Network ID displays in the list of detected devices (see [Figure 10-13: PCCU Connection Setup for Bluetooth](#)). If unable to detect the XFC or XRC device, see section [13: Troubleshooting](#).
 - e. Select the device on the list and highlight.
 - f. Click Select.

Figure 10-13: PCCU Connection Setup for Bluetooth



17. Click Close to exit PCCU connection setup.
18. On the top PCCU menu, click the Entry icon to connect to the XFC or XRC.
19. When the connection is successful, continue with configuration procedures or click Close to close the Bluetooth connection.
20. For further configuration or changes to the Bluetooth setup, refer to the user manuals or Bluetooth help topics.

11 Configure basic security (recommended)

This procedure configures activates secured access to the XFC or XRC by changing the default (OFF) position of the onboard security switch and configuring the bi-level security codes.

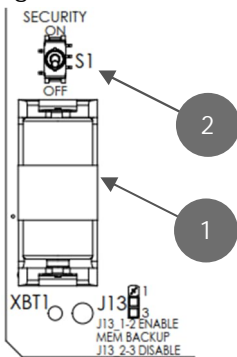


IMPORTANT NOTE: After this procedure is completed, connection to the XFC or XRC is restricted to users with the correct security codes. This procedure requires opening the enclosure to access to the XFC or XRC board.

Configure the security settings:

1. Open the XFC or XRC enclosure door and locate the onboard security switch (S1). See the figure below.

Figure 11-1: S1 Security switch

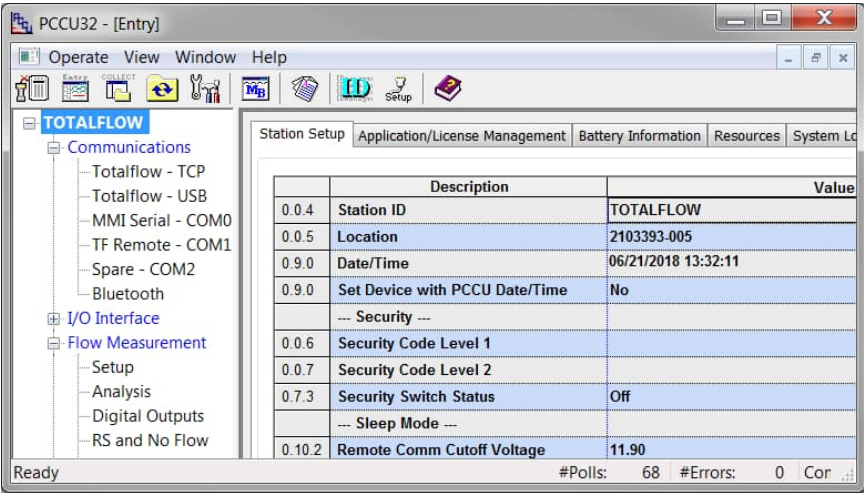


Legend – S1 Security switch

1	Battery
2	Security switch

2. Ensure the security switch is set to OFF.
3. On the Station Setup tab, verify that the Security Switch Status field shows off.

Figure 11-2: Station Setup tab – Security switch status



4. Type a four digit security code for Security Code Level 1 (read only access).
5. Type a four digit security code for Security Code Level 2 (read and write access).

i IMPORTANT NOTE: Record the security codes. Once saved, they are not visible on the Station Setup tab.

6. Click Send.
7. On the board, set the XFC or XRC security switch to ON.
8. On the Station Setup tab, click Re-read and check that the security switch status is On. Enforcement of the security codes is in effect.

i IMPORTANT NOTE: The codes will be required the next time PCCU32 attempts to connect to the device.

12 Commission the device

Commissioning the XFC or XRC is a two-part process:

- Validate the device measurement
- Place the device in service.

12.1 Validate the device measurement

The XFC and XRC are calibrated at the factory before shipping. However, shipping and installation may introduce errors into the measurement results. To verify measurement accuracy, perform pressure checks.



IMPORTANT NOTE: Save the device's data and configuration before and after calibration procedures. For details on calibration or device data backup, refer to the Calibration and Preserve device data and configuration sections in the user manual (See [Additional information.](#))

Validate measurement:

1. Perform static pressure (SP) and differential pressure (DP) calibration pressure checks.
2. If it is necessary to correct errors in the measurement system, proceed to the calibration instructions in the user manual.

12.2 Place the device in service

The following instructions provide general guidelines for placing the XFC in service.

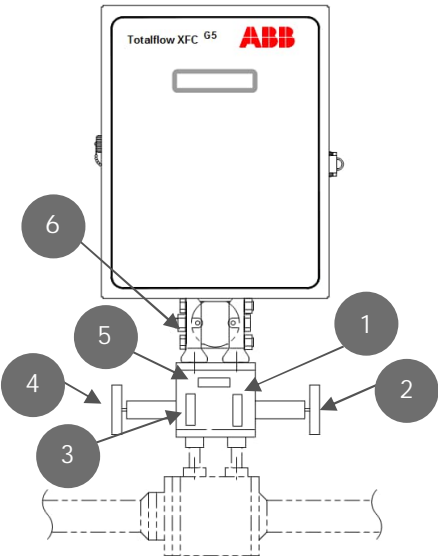


IMPORTANT NOTE: The following procedure is based on the flow computer attached to a 3-valve manifold. For all other applications, adapt these instructions to the specific manifold.

Place the XFC in service:

1. Close the high and low pressure tap valve connections on the stream to shut off the process flow. (See the figure below, item 6.)

Figure 12-1: Flow computer with 5 valve manifold



Legend XFC^{G5} with XIMV and 5 valve manifold

1	High side equalizer valve	4	Low side tap valve
2	High side tap valve	5	Manifold vent valve
3	Low side equalizer valve	6	XIMV

2. Verify the equalization valves (items 1 and 3) are open.
3. Verify the manifold vent valve (item 5) is closed.
4. Slowly open the stream tap valves (items 2 and 4) to open the process stream, creating flow.
5. Wait until the system has pressurized (typically less than 1 minute) before continuing.
6. Close the equalization valves (items 1 and 3) on the manifold.

12.3 Optional volume reset (recommended)

This procedure allows the device to have an official starting point for valid live data. The Events file keeps the record of the volume reset and time stamp.

To reset volume:

1. On the PCCU navigation tree, click Flow Measurement > Setup > Commands.
2. On the Reset Volume value field, select Yes.

3. Click Send and select Yes to confirm.

13 Troubleshooting

This section discusses a few potential issues during the initial startup of the flow computer.



IMPORTANT NOTE: For complete troubleshooting instructions, refer to the Troubleshooting section of the user manual, see [Additional information](#).

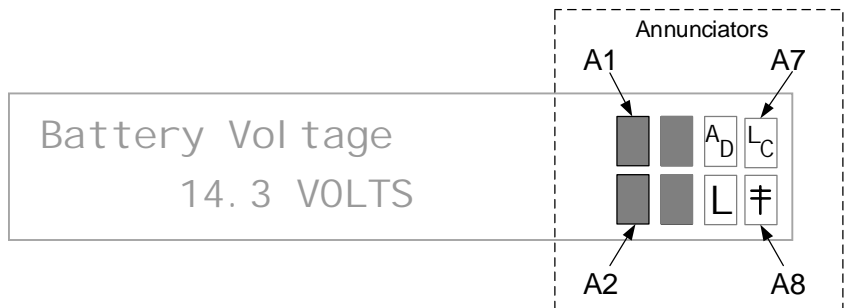
13.1 LCD visual alarm and status codes

The LCD displays alarm conditions and status codes in the Annunciator area, see [Figure 13-1: XSeriesG5 annunciators](#).



IMPORTANT NOTE: Alarms are recorded in the Log period flow record.
Status codes are not recorded in the Log period flow record.

Figure 13-1: XSeries^{G5} annunciators



The following table lists the indicator symbol and description of the status and alarm codes.

Table 13-1: XSeries^{G5} status and alarm codes

Indicator	Description
System	
LL	Low Lithium Battery Alarm: When LL (low lithium) is displayed, the lithium battery voltage is below 2.5 Vdc. A new lithium battery measures approximately 3.6 Vdc.
LC	Low Charger: When LC (low charger) is displayed, the XSeries ^{G5} battery charging voltage is (+) 0.4 Vdc, or is less than or equal to the battery voltage.
Communication Protocols	
→	Transmitting Data: Sending a response
←	Receiving Data: Processing request
!	Nak: Negative acknowledgement with packet list
+	Ack: Positive acknowledgement of receipt of request
⏸	Waiting for Ack: Waiting for response after transmission
?	Exception Alarm Processing
¥	ID Recognized: Recognized and receiving request
‡	Listen Cycle: Flashes if this remote port is active and running Totalflow Remote Protocol. Flashes in sync with the listening cycle that occurs at 1, 2 or 4 second intervals. When the baud rate is faster than 2400, then the flashing symbol may not be visible. The annunciator will remain on listening cycle if the listen cycle is set to zero.
M	MODBUS® ASCII: MODBUS® ASCII protocol is selected for the port assigned to this annunciator.
m	MODBUS® RTU: MODBUS® RTU protocol is selected for the port assigned to this annunciator.
L	Local Protocol: Displayed when the PCCU32 port is active and running Totalflow Local Protocol
¥	ID Recognized: The recognized ID is waiting for sync.
u	USB Protocol: Displayed when the USB port is active and running the Totalflow Remote Protocol
n	Ethernet Protocol: Displayed when the Totalflow/TCP port is active.
Measurement Applications	
BF	Back Flow Condition: Visible only when the DP variable is displayed
Z	Zero Flow Condition: Visible only when the flow rate is displayed
H	Hold: Displayed when PCCU32 has entered hold
A	Alarm Condition: Need to view alarm. Compare application

Indicator	Description
	limits to the current values to determine where the alarm condition is present.
AD	A to D Failure: Displayed if the A to D converter's absolute differential pressure, absolute static pressure, or temperature readings exceed the maximum counts or are less than the minimum counts
Display Applications	
1	A number represents the Display Group number currently displayed.
↑	The displayed item's value is above the Data High Limit value on the display Item Setup screen.
↓	The displayed item's value is below the Data Low Limit value specified on the display Item Setup screen.



IMPORTANT NOTE: The status and alarm code area is customizable. Each of the 8 annunciator display fields, shown in [Figure 13-1: XSeriesG5 annunciators](#), may be programmed to display any of the available indicators in any of the 8 locations.

13.2 Failure to start

The LCD displays the startup sequence after power up. See details in section [6.1 Super capacitor charging at boot time](#). The display should begin cycling through the pre-programmed items. If it fails to cycle and locks up, follow the procedure below.



IMPORTANT NOTE: Display time for screens 1 through 4 will vary. If the startup cycle stops, record the details on the screen. Provide the screen details to technical support to help them resolve the issue.

13.3 The screen has locked up

Follow this procedure to correct the problem:

1. Attach the lithium battery to the board.
2. Perform a warm boot:
 - a. Locate RESET (XFC S2 and XRC S6) on the electronic board, press and hold for 10 seconds.
 - b. View the screen during startup to verify that the unit warm-starts and begins cycling.

- i. If the display moves through the startup screens and begins cycling correctly, the reset was successful and it is not necessary to continue this procedure.
 - ii. If the display does not begin cycling correctly or locks up on one of the startup screens, continue to step 3.
3. Perform a cold boot:
 - a. Locate the COLDBOOT button (S9) and the RESET button (XFC S2 and XRC S6) on the electronic board.
 - b. Press and hold the COLDBOOT button and at the same time press and hold the RESET button for 10 seconds.
 - c. The LCD displays "Loading Boot Loader".
 - d. Verify the Power On sequence is completed.
 - e. If the display moves through the startup screens and begins cycling correctly, the COLDBOOT was successful.
 - f. If the display does not begin cycling correctly or locks up on one of the startup screens, contact technical support for additional instructions.



IMPORTANT NOTE: To reach technical support, call the ABB Totalflow main office, listed under [Contact us](#) and select technical support from the menu options.

13.4 Remote communication failure



IMPORTANT NOTE: Use COMM1 for remote communication.

Use the following list to eliminate possible remote communications issues (in any order):

1. Verify that the † symbol flashes in the A8 display position, see [Figure 13-1: XSeriesG5 annunciators](#). This indicates that the port is actively running Totalflow Remote Protocol. Each flash identifies the Listen Cycle time period.
 - a. If the † symbol is not flashing:
 - i. Set the port Listen Cycle to zero. The symbol should display continuously.
 - ii. Select Totalflow Remote Protocol in the configuration of the port, see [10.1: Configure COMM1](#).

- iii. Increase the cutoff voltage value specified in Station Setup > Remote Comm Cutoff Voltage. This helps determine if COMM1 is deactivated due to a drop in the voltage to the device. The default is 11.9 Vdc. Use voltage values based on the power mode used. Click Help in the Station Setup screen for more details
2. Verify that these are correct:
 - a. The communication port wiring on the flow computer
 - b. The communication port wiring on the radio
 - c. All communication cables are intact and undamaged
3. Verify that the antenna is properly installed:
 - a. Properly wired to the radio
 - b. Frequency range is correct
 - c. Directional antenna is pointed toward the base radio ($\pm 6^\circ$)
 - d. Mounted vertically and the vanes are perpendicular to the ground
4. Verify that the base radio (host device, typically running WinCCU) is working at other locations, using the same frequencies as the remote radio.
5. Verify the configuration of the host communication application (typically WinCCU):
 - a. The Station ID and the Device ID match the host settings.
 - b. No other device is using the same Station ID or Device ID.
 - c. The baud rate, stop bits, security code, and listen cycle time agree between the host (WinCCU) device and flow computer.
 - d. The host (WinCCU) is using packet protocol.

More information about identifying and correcting radio communication issues is available in the Communication troubleshooting section of the user manual. See [Additional information](#).

For troubleshooting other communication equipment, including modems, cellular equipment, or telephone line, contact the ABB Totalflow main office, listed under [Contact us](#), and select technical support from the menu options.

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