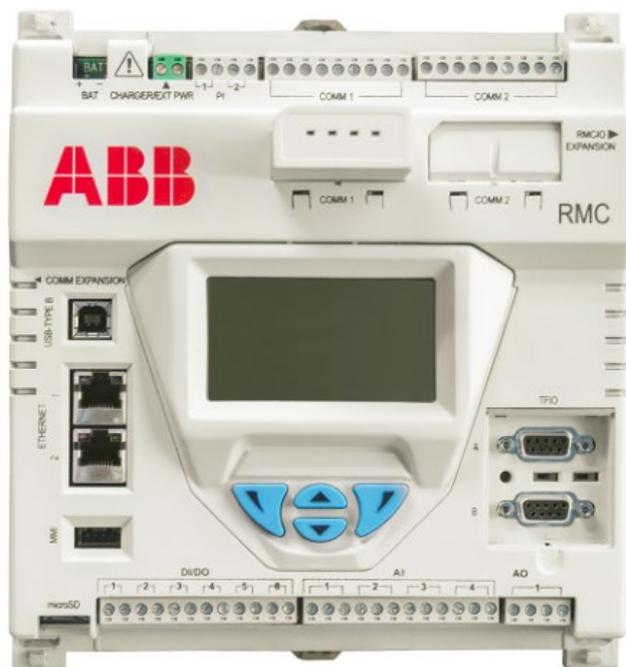


ABB MEASUREMENT & ANALYTICS | 2105552MNAE

Remote Modular Controller User Manual

RMC-100



Measurement made easy

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Additional information

Additional free publications are available for download at www.abb.com/upstream or by scanning this code:



RMC-100 product website

Table 0-1: Document links

RMC documents	Document number
RMC-100 Data sheet	2101126
RMC-100 Quick Start Guide	2107023
RMC-100 Safety and Compliance	2107022
RMC-100 Startup guide	2105551
Wiring diagrams	
RMC Generic pinout User Drawing	2105617
RMC-100 AI to ABB 2600 T pressure transmitter User Drawing	2105593
RMC-100 COMM (RS-485) to ABB XMV (267/269CS/266J) W/RTD User Drawing	2105579
RMC-100 to ABB FCB Coriolis meter User Drawing	2105592
Related documents	
TFIO Module User Manual	2101226
I/O Interface Application Guide	2107012
Network Communication Guide	2107013
XIO Interface Application Guide	2107011
Ethernet-Serial Passthrough Application Guide	2107010
MQTT Configuration Guide	2106521
Digital Oilfield User Manual	2106300

Compliance

Cyber security

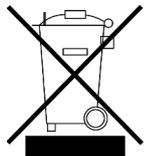
This product is designed to be connected, and communicate information and data, via a network interface. All ABB products should be connected to a secure network. It is the customer's sole responsibility to provide, and continuously ensure, a secure connection between the product(s) and the customer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

Although ABB provides functionality testing on the products and updates it releases, the customer should institute its own testing program for any product updates or other major system updates (to include, but not limited to: code changes, configuration file changes, third party software updates or patches, hardware change-out, etc.) to 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.

Waste Electrical and Electronic Equipment (WEEE)

EU Directive 2012/19/EU

ABB Industrial Automation, Measurement and Analytics is committed to actively protecting the environment. Do not dispose of WEEE as unsorted municipal waste. Collect WEEE separately. Participation in the management of WEEE is critical to the success of WEEE collection.



Do not mix electrical and electronic equipment with general household waste if it displays the crossed-out wheeled bin symbol. Dispose of it correctly at a recycling facility to save valuable resources and prevent potential negative effects on health and the environment. These steps ensure compliance with the Waste Electrical and Electronic Equipment (waste electrical and electronic equipment, WEEE) Directive.

Treat waste electrical and electronic equipment (waste electrical and electronic equipment, WEEE) separately. Use the national collection framework available to customers for the return, recycling, and treatment of WEEE.

Safety

Read these instructions carefully before installation and commissioning. These instructions do not contain all details on all types of products and do not explain all assembly, operating, or maintenance scenarios. Ask the manufacturer for further information.

Observe warning signs on packaging and on the device. Safety symbols are in accordance with IEC 60417 or ISO 7000.

Assign only qualified and authorized specialists for the assembly, electrical connection, commissioning, and maintenance of the equipment. Specialist qualifications include:

- Training or instruction and/or authorization to operate and maintain devices or systems according to safety engineering standards for electrical circuits, high pressures, and aggressive media
- Training or instruction in accordance with safety engineering standards regarding maintenance and use of adequate safety systems



WARNING: According to ISO 9996, use only sufficiently insulated tools for the electrical connection.

Also consider the following regulations:

- The applicable standards and safety regulations concerning the construction and operation of electrical installations
- The regulation on technical working materials (safety guidelines for tools)
- The regulations and recommendations relating to explosion protection
- The recommendations for safe working in the case of installation in a Safety Integrity Level (SIL) loop.
- The regulations that apply in the country of use

Potential safety hazards

The RMC uses voltages in the range of 9-30 Vdc plus some percent of tolerance. There are no hazardous voltages present in the device. However, some optional power sources might convert power from Vac to Vdc.

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

The device can be operated at high levels of pressure and with aggressive media. Serious injury and/or considerable material damage can be caused if this device is handled incorrectly.



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. The device can be operated at high levels of pressure and with aggressive media. Serious injury and/or considerable material damage can be caused if this device is handled incorrectly.



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.

1 System description

The Remote Modular Controller (RMC-100) provides measurement, automation, monitoring, alarming, asset data management, control, and data logging applications. A single RMC-100 controller can manage automation, liquids and gas measurement, and asset data concentration for very large production and transmission facilities.

1.1 Features overview

The RMC provides backward-compatible functionality based on ABB Totalflow software, communications, and I/O technologies. The existing process foundation and the new enhanced technology manage liquid and gas measurement, automation, and asset data concentration for large-scale production and transmission facilities. It is scalable down to a single-board RTU footprint for smaller systems.

The RMC supports I/O and communication expansion.

The RMC supports dual, backward-compatible TFIO buses, doubling the I/O module capacity to 44 modules.

The table below provides the general specifications for the RMC.

Table 1-1: General specifications

Specification	Description
Operating voltage range	12 – 24 Vdc (+/- 20% variation, acceptable input range 9 – 30 Vdc). All voltage output connections of both the onboard and TFIO modules depend on the operating power supply voltage connected to the CHARGER/EXT PWR port.
Nominal power	1.5 watts (5 A maximum with external options connection)
Weight	Minimum (no communication modules inserted): 1.708 lbs. (0.775 kg) Maximum (both communication modules inserted): 1.816 lbs. (0.824 kg)
Dimensions	Width 7.56 inches (19.20 cm)
	Height 8.31 inches (21.11 cm)
	Depth 1.72 inches (4.37 cm)
	Installed Depth On DIN rail 1.79 inches (4.55 cm)
Input/Output	6 DI/DO, 2 PI, 4 AI, and 1 AO
Maximum battery capacity	30 Ah
Mounting	DIN rail mounts on a wall or enclosure that meets the environmental ratings for the environment of the location
Operating temperature	-40 °C to 60 °C (-40 °F to 140 °F) when used with battery -40 °C to 70 °C (-40 °F to 158 °F) when no battery is used Storage temperature of -40 °C to 85 °C (-40 °F to 185 °F)
Electromagnetic compatibility	Emissions (Other): FCC CFR 47, Part 15, Subpart B, Class A (FCC Emissions) IECS-03, Issue 4, CAN/CSA-CEI/IEC CISPR 11 Class A (Canada ITE Emissions) AS/NZS CISPR 11, Class A (Australia/New Zealand)
EMC Directive 2004/108/EC	Emission EN 61326-1: Radiated and conducted Class A Immunity EN 61326-1 to: EN 61000-4-2, ESD, 8 kV Air, 4 kV Contact EN 61000-4-3, RFI, 10 V/m EN 61000-4-4, EFT, 2 kV to DC, 1 kV to Signals EN 61000-4-6, Conducted, 0.15-80 MHz, 3 Vrms
Hazardous location certification (North America)	According to standards for the assurance of fundamental safety requirements in the United States of America: UL No. 61010-1: "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements" ANSI/ISA 12.12.01: "Non-incendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Divisions 1 and 2 Hazardous (Classified) Locations." ANSI/UL 60079-0: "Explosive Atmospheres – Part 0: Equipment – General Requirements" ANSI/UL 60079-15: "Explosive atmospheres – Part 15: Equipment protection by type of protection 'n' " UL No. 50E: "Enclosures for Electrical Equipment, Environmental

Specification	Description
	Considerations" According to CSA standards for the assurance of fundamental safety requirements in Canada: C22.2 No. 61010-1:12: "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements" C22.2 No. 0-10: "General Requirements" C22.2 No. 213-M1987: "Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations Industrial Products" C22.2 No. 60079-0:11: "Explosive Atmospheres-Part 0: Equipment-General Requirements" C22.2 No. 60079-15:12: "Explosive Atmospheres-Part 15: Construction, test and marking of type of protection 'n' electrical apparatus" C22.2 No. 94-2: "Enclosures for Electrical Equipment, Environmental Considerations" C22.2 No. 60529:05: "Degrees of protection provided by enclosures (IP Code)"

2 Physical Description

2.1 RMC-100 housing

A DIN rail mountable plastic housing packages the RMC electronic board and its components.

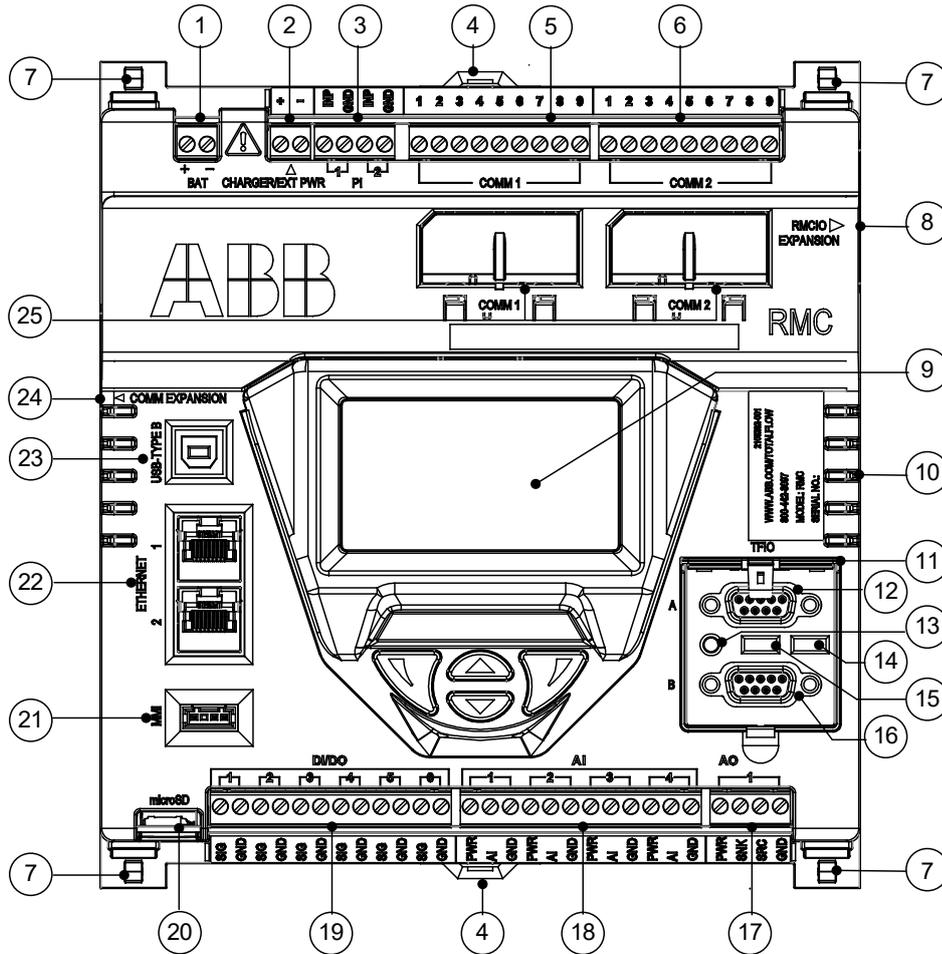


IMPORTANT NOTE: The RMC must be installed on an interior wall, or in an enclosure that meets the environmental ratings for the location. See section [2.1.2](#) for information about ABB enclosures. See section [3.1.1](#) for information about third-party enclosures.

The housing consists of an interlocked top cover and a base.

[Figure 2-1](#) identifies the housing top cover and the accessible components. The cover has labels that identify ports. It provides access to the communication ports, I/Os, security switch, battery backup switch, reset button, LCD display, and four navigation buttons. The cover is removable for part replacement, if necessary. Four release clips on each corner of the top cover easily interlock with or detach from slots on the base.

Figure 2-1: RMC-100 housing cover exterior

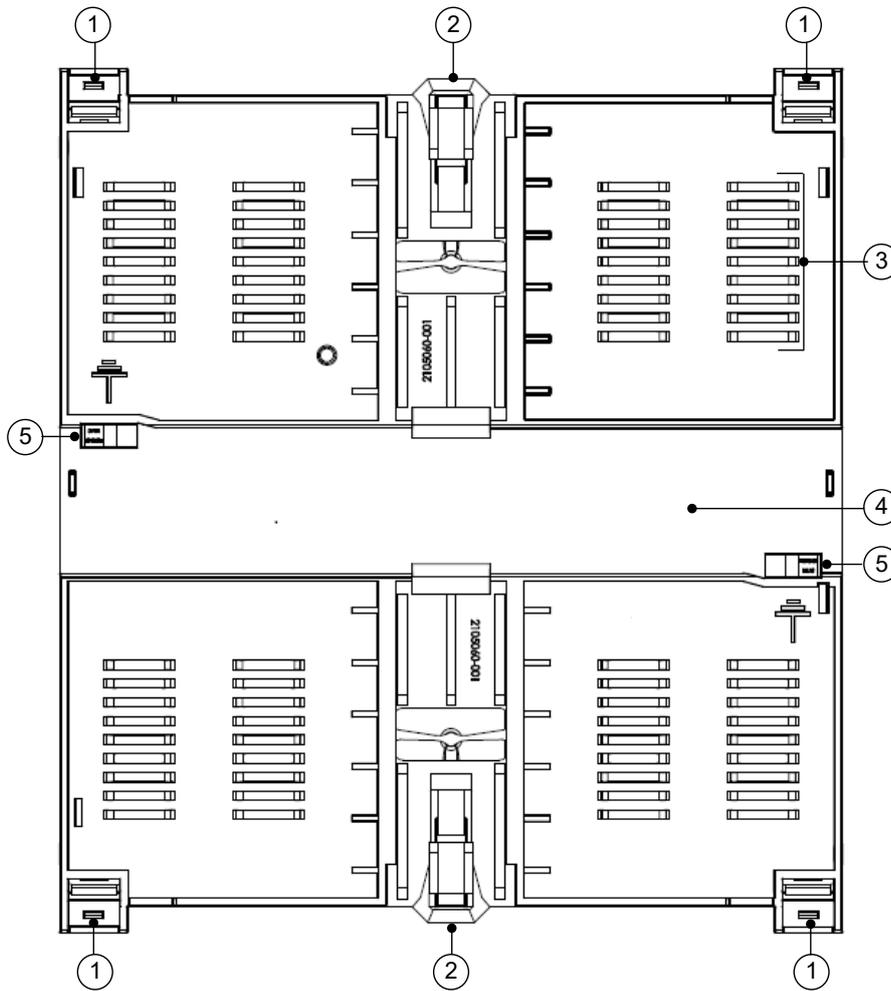


Legend for Figure 2-1: RMC-100 housing cover exterior

ID	Description	ID	Description
1	Battery connection (BAT)	13	Reset button
2	Charger input when battery-powered, or external power supply when not battery-powered (CHARGER/EXT PWR)	14	Security switch
3	Pulse input (Pulse Input, PI)	15	Lithium battery switch
4	DIN rail release clip	16	TFIO B I/O module interface
5	COMM 1 connector	17	Analog output (Analog Output, AO)
6	COMM 2 connector	18	Analog input (Analog Input, AI)
7	Clip to hold the top to the housing base	19	Digital input/output (DI/DO)
8	RMC I/O expansion connector (future use)	20	Micro SD card holder (future use)
9	LCD display assembly and 4 directional buttons	21	MMI port (MMI)
10	Vents	22	Ethernet 1 and 2 ports
11	TFIO cover	23	USB Type B port
12	TFIO A I/O module interface	24	COMM Expansion (future use)
		25	COMM 1 and COMM 2 plug-in module slot covers

The base holds the electronic board in its interior. Screws secure the board to the base, and the mounting clips are accessible on the exterior. [Figure 2-2](#) identifies the exterior of the housing base.

Figure 2-2: RMC-100 housing base exterior



Legend for Figure 2-2: RMC-100 housing base exterior

ID	Description	ID	Description
1	Housing slot (secures top cover)	4	Horizontal DIN rail slot
2	Spring release clip (secures RMC to DIN rail)	5	Grounding slot (for the electronic board grounding clips)
3	Vents		



IMPORTANT NOTE: The RMC has grounding clips attached to the bottom of the electronic board. The grounding clips fit through the base grounding slots to contact the DIN rail when mounted. Be sure to ground the DIN rail.

2.1.1 LCD display

The display assembly consists of the graphic LCD display and the directional buttons that navigate through the display groups and associated variables. The display parameters are read-only.

The LCD size measures approximately 1 $\frac{5}{8}$ x 2 $\frac{7}{8}$ inches, with 128 x 64 pixels for display status and configuration data. [Table 2-1](#) provides the LCD display characteristics and [Figure 2-3](#) shows the display.

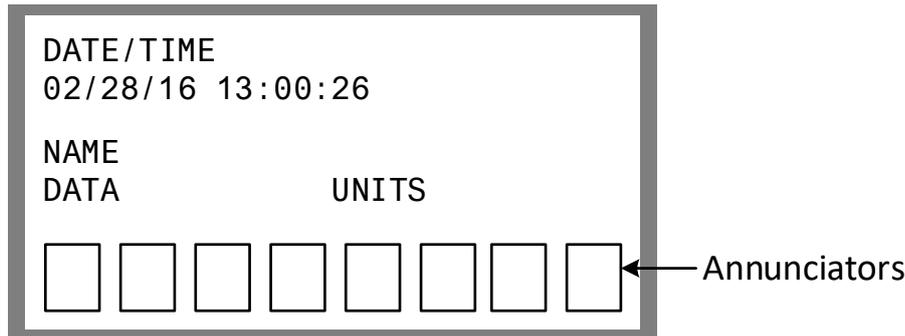
Table 2-1: LCD display characteristics

Characteristic	Display
Number of lines on the display	8 lines
Maximum number of characters per line	21

Characteristic	Display
Character font size	8 x 6 pixels
Number of items displayed at one time	2 items (each item uses 2 lines to display)
Annunciator font size	16 x 12 pixels
Annunciator position	Lines 7 and 8
Annunciator position control	Fixed
Annunciator and plots	Displays both at the same time
Number of plots displayed at one time	2

Each display item has two lines as the data scrolls up the screen. The name of the item is on the first line. The measurement value and unit display on the second line. A blank line displays between the two items. The plot for the item displays on the right side of the display.

Figure 2-3: LCD Display



Four directional buttons control and display items from the LCD interface. The button directions are: up, down, left (previous) and right (next). Use the up and down buttons to view individual display items for a display group. Use the left and right buttons to view the display groups. By default, the first annunciator displays the selected group. The directional buttons do not allow any data entry.

2.1.2 Enclosures

The RMC can be purchased already installed in an enclosure. ABB offers the Xcore enclosures described in [Table 2-2](#). For more information and complete specifications see www.abb.com/upstream.

Table 2-2: Xcore enclosures available

Part number	Size	Weight
2424	24 x 24 x 12 inches (61 x 61 x 30 cm)	45 pounds maximum (Fully loaded system)
3630	36 x 30 x 12 inches (91 x 76 x 30 cm)	75 pounds maximum (Fully loaded system)

Figure 2-4: Xcore 3630 medium size enclosure (front view)



Figure 2-5: Xcore 2424 small size enclosure (internal view displays installed RMC)



2.2 Electronic board

[Table 2-3](#) provides the electronic board component specifications. All RMC input and output connections have snap-in connector terminals.



DANGER – Serious damage to health / risk to life. Explosion Hazard: Do not connect or disconnect connectors or their terminations while energized unless the area is known to be non-hazardous.

Table 2-3: RMC-100 electronic board specifications

Component	Description
Core processor	Cortex A8 processor
Operating speed	300 MHz, or 720 MHz option at time of purchase
Memory	256 Mbyte mDDR
	Application data and configuration files permanently stored in eMMC

Component	Description
	Flash. Factory-supplied registry (MAC address) is stored in 256-byte E2PROM
LCD interface	Parallel 128 x 64 graphic LCD with backlight
Directional button interface	Dedicated 4 button interface: up, down, left, and right
Communication ports	2 software-configurable RS-232/RS-485/RS-422 hot-swappable serial ports with 2 communication modules 1 USB 2.0 device interface 3-port 10/100 Mbps Ethernet switch: 2 external ports available for operator use, 1 internal port (not available for operator use) 1 MMI port backward compatible with XSeriesG4 and XSeriesG5 MMI port
Digital input/output	6 open/drain outputs, each pin configurable as input or output
Analog inputs	4 single-ended channels, 0-30 Vdc or 4-20 mA loop
Analog output	1 four-wire analog output 4-20 mA (non-isolated, 4-20 mA)
Analog to digital resolution	24-bit maximum resolution (0.00038% FS) 24-bit nominal resolution (0.0015% FS)
Pulse inputs	2 dedicated pulse inputs with configurable debounce (With no debounce: 0 to 20 KHz; with debounce: 0 to 550 Hz)
I/O scan rate	Configurable up to 4 times per second
I/O expansion interfaces	2 interfaces for TFIO modules (handled by independent buses) 1 RMC IO expansion interface (available for future use) 1 Type A USB COM expansion (available for future use)
Power	Battery mode: 12 Vdc SLA battery input External power mode: 9 – 30 Vdc external power source (no battery)
Charger	Solar: Nominal 12 Vdc charger controller; solar panel maximum 20 watts (60 °C); Maximum 30 Ah SLA battery when using integrated charger controller Alternate charger: Power source, 14.5 Vdc to 15.5 Vdc
Security switch	On/Off supported in combination with two configurable security code levels
Lithium battery switch	On/Off supported with two configurable security code levels
Time-based stability	± 7.5 ppm (parts per million)

2.2.1 Processor and memory

The RMC processor is available in two speeds, 300 MHz or 720 MHz, depending on the embedded software on the purchased system. The RMC standard system runs at 720 MHz with full application support. The RMC-LITE system runs at 300 MHz and supports a lesser number of applications. To determine the speed of your system or details on the embedded software part numbers, see section [8.4 Update device software](#). [Table 2-4](#) indicates the memory components of the electronic board.

Table 2-4: Memory components

Component	Description
Flash	32-bit flash (flash device software image, configuration and measurement data)
RAM	256 MB RAM storage
Clocks	TCXO 32.768 k Oscillator to ensure accurate clocks (+/- 5 ppm accuracy, 5 ppm drift over time). Standard 50 ppm Oscillator at 25 MHz to generate the core and peripheral clocks

2.2.2 Communication ports

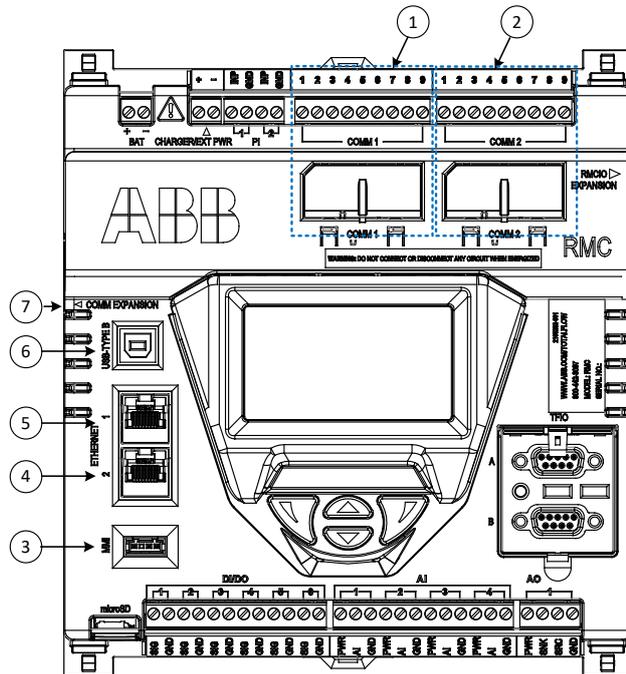
Communication ports provide communication between the RMC and host systems or external devices. Factory preconfigured ports support typical communication scenarios. The ports support several available communication protocols.

Ports configured for local communication (direct connection) support either local access from a host system, or connection to external devices or peripherals (measurement transmitters, additional automation or control equipment, flow computers or analyzers).

Ports configured for remote communication connect the RMC to a communication network and allow remote access or management over that network.

The RMC has six communication ports. The design allows communication expansion to support future external communication modules. [Figure 2-6](#) identifies the ports and communication expansion interfaces.

Figure 2-6: Communication ports



Legend for Figure 2-6: Communication ports

ID	Port name	Connector type	Data transfer rate (port speed)	Use (connections)
1, 2	COMM 1, COMM 2	Removable terminal connector (9 POS), screw termination. Wire gauge 12 AWG to 22 AWG	Baud Rate: 2,400 to 115,200 bps (Manually configurable from the user interface)	Remote or local serial communication configurable for either RS-232, RS-422 or RS-485
3	MMI	Proprietary	Baud Rate: 2,400 to 115,200 bps (Manually configurable from the user interface)	Local serial communication (RS-232) Available only on external weatherproof circular military-type connector on ABB Xcore enclosures (MMI-to-military cable required: Part number 2101412-001)
4, 5	ETHERNET 1, ETHERNET 2	RJ-45	100 Mbps or 10 Mbps full duplex (Supports auto-negotiation, uses standard or straight-through Ethernet cable)	<ul style="list-style-type: none"> – Local communication (high-speed TCP/IP-based local operator interface) – Remote communication using TCP/IP connections over a network (management port) – Connect other Totalflow equipment (for example, additional RMCs, flow computers, transmitters) – Connect Ethernet-to-serial devices
6	USB	USB Type B	Supports USB 2.0 full speed mode and high-speed mode	Local communication (high-speed serial local operator interface)

ID	Port name	Connector type	Data transfer rate (port speed)	Use (connections)
7	COMM EXPANSION	Proprietary	(Future use)	For future serial communication modules to expand serial port capacity

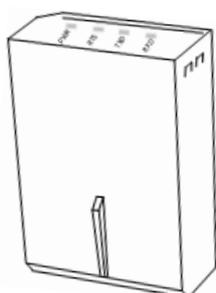
2.2.2.1 Serial communication ports

The COMM 1 and COMM 2 slots each contain a 40-pin connector to support a hot-swappable serial communication module ([Figure 2-7](#)). This module is software-configurable for serial (RS-232, RS-485, or RS-422) communication between the RMC and external measurement equipment such as pressure or temperature transmitters, or communication equipment such as radio systems.



DANGER – Serious damage to health / risk to life. Explosion Hazard: Do not connect or disconnect connectors or their terminations while energized unless the area is known to be non-hazardous.

Figure 2-7: Hot-swappable communication module



The configured interface type and the distance between the RMC and the connected external device determine maximum serial communication speed. Supported port speed ranges from 2,400 bps to 115,200 bps.

2.2.2.2 USB port

The USB Type B port provides high-speed serial communications between the RMC and equipment, host systems or computers with USB interfaces. The port supports local operator access through PCCU32.

The USB port has two speed modes: full speed and high speed. The RMC automatically negotiates data transmission rates with the host system.

2.2.2.3 Ethernet ports

The RMC has an embedded managed Ethernet switch. It has two Ethernet ports (E1 and E2) for communication between the RMC and external devices. [Table 2-5](#) indicates the uses of the external Ethernet ports.

Table 2-5: Ethernet ports

Port name	Data transfer rate (port speed)	Use
ETHERNET 1 (E1) or ETHERNET 2 (E2)	10/100 Base-T: 100 Mbps or 10 Mbps full duplex (supports auto-negotiation and uses standard or straight-through Ethernet cable)	<ul style="list-style-type: none"> – Local communications (high-speed TCP/IP-based local operator interface) – Remote communication using TCP/IP connections over a network (management port) – Connect other Totalflow equipment (for example, XIOs, additional RMCs, flow computers, etc.): – Connect third-party Ethernet-to-serial devices.

The RMC supports 2 modes for Ethernet port configuration:

- 1 Network mode (E1 + E2): Configures both Ethernet ports into a single LAN (2-port switch) and combines network traffic on both ports. This is the RMC’s default Ethernet configuration.
- 2 Networks mode (E1, E2): Configures Ethernet ports into two separate and independent LANs. This separates network traffic for each port. This option isolates network traffic on one port from the other. Communication between these two networks requires an external router. Each Ethernet interface must have its own IP parameter configuration.

Ethernet mode selection depends on field configurations, cybersecurity requirements, type of ABB devices connecting to the RMC, and available network equipment. The 1 Network mode can simplify device management and IP configuration. For more complex applications, the 2 Network mode may be required.



IMPORTANT NOTE: For additional details on Ethernet connections click **Help** on the Networking tab when connected to the device with the user interface (PCCU32).

2.2.2.4 MMI port

The onboard MMI port provides an RS-232 (EIA/TIA – 232) serial interface. MMI access or direct connection from a PC or laptop is only available on the port on the enclosure. Direct connection to the onboard MMI port requires a special cable adaptor not shipped if the RMC is ordered for a standalone installation. Weatherproof MMI connectors are available on all Xcore enclosures.

The port is factory-configured to support local operator access using PCCU32. The supported port speed ranges from 2,400 bps to 115,200 bps.



IMPORTANT NOTE: The MMI interface is included in the RMC design to support legacy systems. Connections to the enclosure's military-type connector require cable adapters to support RS-232 interfaces on older PCs or laptops. Legacy systems with traditional DB-9 serial interfaces require DB-9 to military-connector cables. Newer PCs or laptops do not have legacy RS-232 interfaces. Therefore, additional cable adaptors or converters are still necessary (DB-9 to USB converters, for example). The Digi® Edgeport®/1 converter is recommended and can be purchased from ABB (part number 1801382-001). Contact technical support to order, or for more details.

Enclosures include Ethernet and USB ports, which provide faster and more convenient local access options than traditional RS-232. If possible, use the USB or Ethernet ports.

2.2.3 Inputs/Outputs

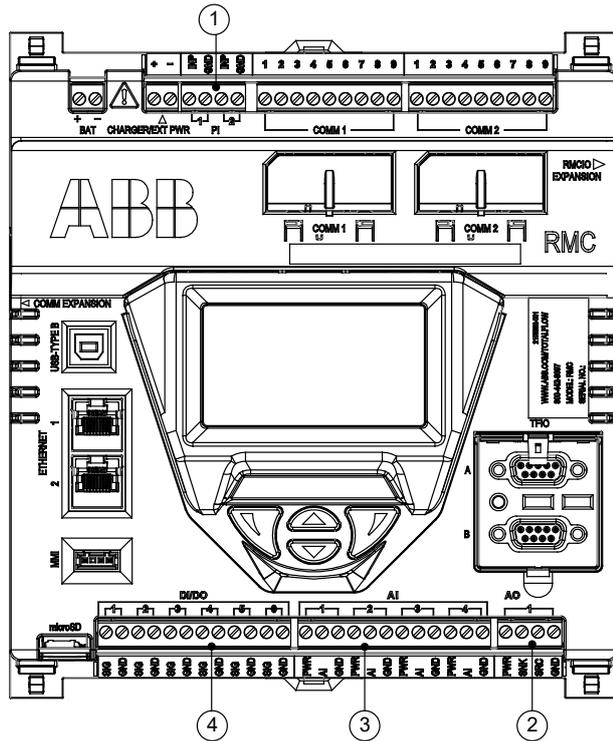
Inputs allow you to read and monitor signals transmitted from external devices. Outputs send signals to control external devices. The following I/Os are available on the RMC board:

- 6 Digital Inputs and Outputs (DI/DO)
- 4 Analog Input (AI)
- 1 Analog Output (AO)
- 2 Pulse Inputs (PI)

The I/Os operate in failsafe mode during communication loss, power loss, restore, or processor reset. The failsafe mode maintains the last input or output values when an event occurs.

[Figure 2-8](#): Inputs and outputs identifies the inputs and outputs.

Figure 2-8: Inputs and outputs



Legend for Figure 2-8: Inputs and outputs

ID	Port name	Terminal type
1	PI	Removable terminal connector (4 POS), screw termination. Wire gauge 12 AWG to 22 AWG.
2	AO	Removable terminal connector (4 POS), screw termination. Wire gauge 12 AWG to 22 AWG.
3	AI	Removable terminal connector (12 POS), screw termination. Wire gauge 12 AWG to 22 AWG.
4	DI/DO	Removable terminal connector (12 POS), screw termination. Wire gauge 12 AWG to 22 AWG.

2.2.3.1 Analog input

The RMC provides four analog inputs. Each port consists of a power source input pin, input signal pin, and input ground pin. For specific pinout information, see section [3.5.5.1 Analog input pinouts](#).

Each of the four analog inputs (AI) consists of an analog input point capable of handling voltage or current inputs. The voltage range is 0-30 Vdc. The current range is 4-20 mA.

[Table 2-6](#) provides the analog input specifications.

Table 2-6: Analog input specifications

Electrical specification (each point)	Description	Value
AI mode	Each AI point supports voltage or current mode operation, configurable from the user interface.	Voltage / Current
AI input voltage	Input voltage range	0 – 30 Vdc
AI input current	Input current range when configured for current mode	0 – 20 mA
AI input impedance (voltage mode)	Resistance to ground on AI in voltage mode	90 kΩ typical
AI input impedance (current mode)	Resistance to ground on AI in current mode	255 Ω typical
AI current source max Isrc	A current limited voltage-sourcing pin provides a sourcing loop current for 4-20 mA current loops.	25 mA dc max
AI resolution	Analog to digital converter (Analog to digital)	24 bits

Electrical specification (each point)	Description	Value
AI input protection (Vtvs)	converter, ADC) resolution for the input Each AI input has TVS protection, typical V threshold level to begin conducting.	32 Vdc typical

2.2.3.2 Analog output

The RMC provides a single (1) analog output. The AO has a voltage-sourcing diode input voltage pin, a current sinking pin, a current sourcing pin, and a ground pin. The AO can provide 4-20 mA output through the sink and source pins. Calibrate the AO from the user interface. For specific pinout information, see section [3.5.5.2 Analog output pinouts](#). [Table 2-7](#) provides the analog output specifications.

Table 2-7: Analog output specifications

Electrical specification (each point)	Description	Value
AO output current	Current that the sinking and sourcing pins can drive	0 – 24 mA dc
AO sink to source resistance	Resistance in the loop on the RMC	154 Ω
AO voltage sourcing (Vaosrc)	Voltage provided at Pin 1	V input to RMC – 0.6 V (typical)
AO current sourcing (Iaosrc)	Current range provided at Pin 1	0-24 mA dc
AO output resolution	Digital to analog converter (Digital to analog converter, DAC) resolution for the output	16-bit resolution
AO output protection (Vtvs)	Each AO has onboard TVS protection, typical V threshold level to begin conducting.	32 Vdc typical

2.2.3.3 Pulse input

The RMC provides two pulse inputs (Pulse input, PI). Each PI can accept a variety of input types: 0-5 Vdc TTL input, Open-Collector (Open-Collector, OC), Open-Drain (Open-Drain, OD), or dry switch type contact. A Schmidt Trigger type gate provides input hysteresis for improved noise protection. Each PI has a debounce filter configurable from the user interface. For specific pinout information, see section [3.5.5.3 Pulse input pinouts](#). [Table 2-8](#): Pulse input specifications provides the pulse input specifications.

Table 2-8: Pulse input specifications

Electrical specification (each point)	Description	Value
PI open circuit Voc	PI open circuit voltage	5 Vdc
PI pull up resistance	10 kΩ nominal through a diode to input	10 kΩ
PI input capacitance in low pass filter mode	Capacitance to ground applied to input gate	0.1 μF
PI input frequency range with debounce enabled	Frequency range of input (50% duty cycle, OC)	0-550 Hz
PI input frequency range with debounce disabled	Frequency range of input (50% duty cycle, OC)	0-20 kHz
PI Vhighmin	High input detection voltage threshold minimum	2.4 Vdc (TTL level)
PI Vlowmax	Low input detection voltage threshold maximum	0.8 Vdc (TTL level)
PI supported inputs	PI supports: open collector, open drain, dry switch, 5 V TTL type inputs	Not applicable

2.2.3.4 Digital input and output

The six (6) RMC DI/DO support the configurable input or output modes of operation.

The digital input mode handles up to 30 Vdc. The configurable built-in pull-up resistor reads signals from devices with dry contact and open collector/drain output types.

The digital output mode provides a MOSFET open drain (OD) type output that sinks up to 2 Adc current.

[Table 2-9](#) provides the digital input and output specifications. For specific pinout information, see section [3.5.5.4, Digital input and output pinouts](#).

Table 2-9: Digital input and output specifications

Electrical specification (each point)	Description	Value or range
DI/DO voltage	Voltage range for both input and output modes	0 – 30 Vdc
DI Vlow threshold	Maximum voltage threshold for detecting a closed input configurable in system	0.8 Vdc default, configurable (0-30 Vdc)
DI Vhigh threshold	Minimum voltage threshold for detecting an open input configurable in system	2.4 Vdc default, configurable (0-30 Vdc)
DI Vpullup	Open circuit voltage on input with DI 10 K pull-up enabled	3.4 Vdc +/- 0.3 Vdc
DI Iminsink	Minimum external sinking current required to detect closed input with DI 10 kΩ pull-up enabled	0.2 mA
DI/DO Rinput	Input impedance to GND of DI/DO with DO open	75k Ω nominal
DI/DO Ileakage	Short circuit leakage current with DI 10 kΩ pull-up enabled	450 μA typical
DI/DO shielding	Shielded signal pairs, shielded to prevent spurious signals	Not applicable
DI/DO Vtvs	Each DI/DO point has onboard TVS protection, typical V threshold level to begin conducting.	32 Vdc typical
DO type	Output type	FET open drain (OD)
DO Vdoutoc	Open circuit voltage	0 Vdc
DO Idoutcont	Maximum continuous sink current	2 Adc
DO Idoutpulsed	Maximum pulse current	3 Adc for 5 seconds
DO RdoutmaxON	Max on resistance of MOSFET OD output to GND	0.1 Ω

2.2.4 TFIO expansion interfaces

The RMC provides expansion interfaces to add modular I/O. The RMC has two TFIO interfaces, TFIO A and TFIO B. Each TFIO interface supports up to 22 TFIO modules (44 total).

The RMC uses two independent buses to communicate with the modules. ABB Totalflow devices have an I/O protocol to exchange information with the modules. The buses operate in a master/slave mode, with the main device board acting as master.

The TFIO modules are DIN rail mountable and employ contact technology for field wiring. The modules interconnect with each other to provide the necessary power and interface signals along the bus.



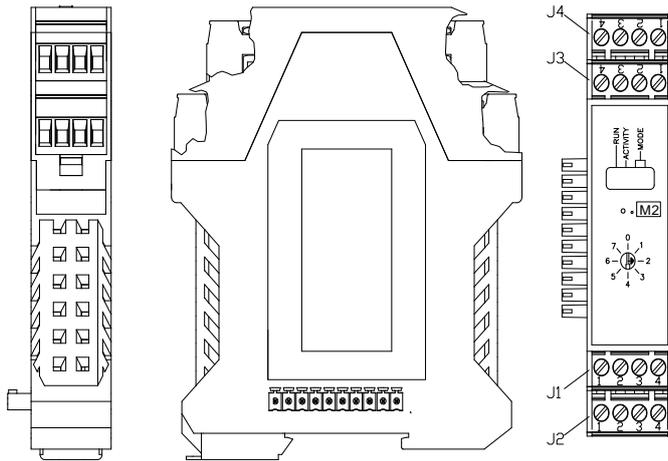
IMPORTANT NOTE: The RMC does not support the TFIO CIM module. The RMC supports the modules labeled for use with 24 Vdc.

All modules have four LED lights, a manual reset button, and a selectable address from zero through seven ([Figure 2-9](#)). On the faceplate of each module is:

- Type of module
- LED light panel
- Reset button
- Module address selector

For additional information, refer to the TFIO Module User Manual. See [Additional information](#) for a link to the manual.

Figure 2-9: TFIO module



2.2.5 Power ports

The RMC has two ports supporting two power connection options or modes. Select one of the following modes:

- Battery mode: a 12 volt Seal Lead Acid (SLA) battery with a charger supplies power.
- External power mode: an external power source supplies power.

[Table 2-10](#) provides the power port or terminal specifications and [Figure 2-10](#) shows the ports on the RMC. The BAT port connects to a battery. The CHARGER/EXT PWR connects to either a charger or an external power source, depending on the power mode.

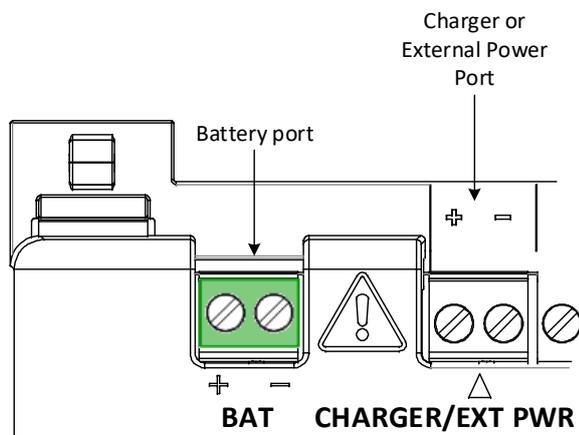
Table 2-10: Power connector specifications

Port name	Terminal type
BAT	Removable terminal connector (2 POS), screw termination. Wire gauge 12 AWG to 22 AWG
CHARGER/EXT PWR	Removable terminal connector (2 POS), screw termination. Wire gauge 12 AWG to 22 AWG



IMPORTANT NOTE: Select wire gauges based on the voltage and current requirements of the circuitry and the expected length of the wires. The gauge differs for each application.

Figure 2-10: Power ports



[Figure 2-11](#) illustrates an example of the connections for the battery mode when a solar panel is the charger. The battery connects to the BAT port, and the solar panel connects to the CHARGER/EXT PWR port. In this configuration, the solar panel powers the controller during daylight hours and recharges the battery when the battery power is low. During nighttime hours, the battery supplies the power.



IMPORTANT NOTE: The charger controller is a component on the RMC electronic board that controls the battery charging process. The charger controller's design optimally controls the charge and hold cycle for the battery. It prevents overcharging or complete draining of a battery. It supports the three charge states: high current bulk charge, controlled over-charge, and a float charge.

Figure 2-11: Battery mode with solar charger

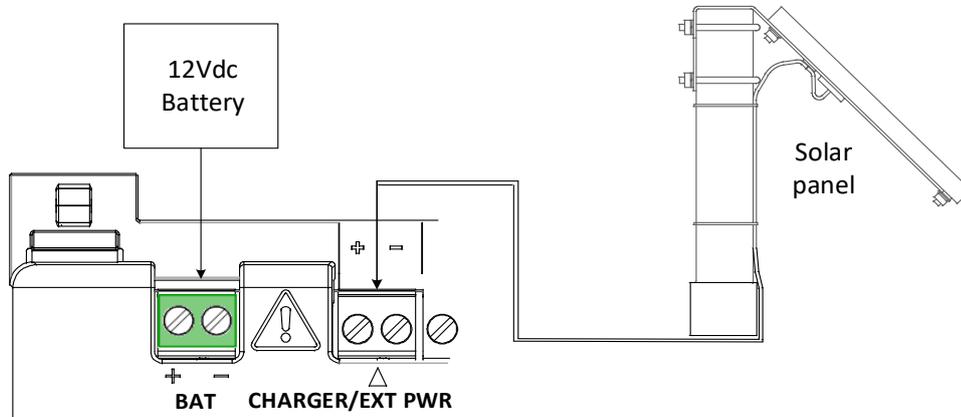
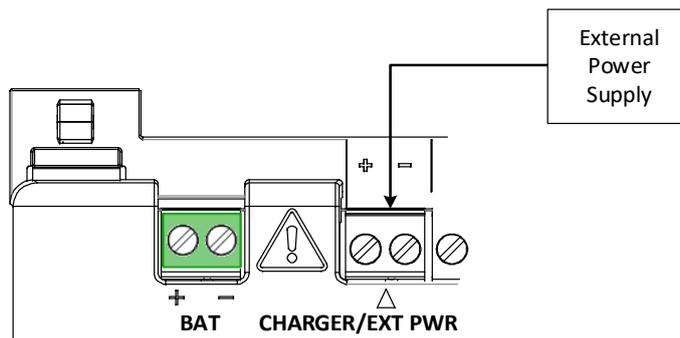


Figure 2-12 illustrates the external power mode connection where an external power source supplies the power to the RMC at the CHARGER/EXT PWR port. In this configuration, the external power supply is the sole source of power to the controller.

Figure 2-12: External power mode



IMPORTANT NOTE: If you do not use ABB-approved power sources, verify that customer-supplied power sources meet these requirements. For additional details about requirements, see section [3.1 Site planning and requirements](#).

Table 2-11: Power source requirements per mode

Power mode	Source type	Requirement	Description
Battery mode (Battery and charger)	Battery charger: solar panel	Nominal: 12 Vdc, 20 W or less	The solar panel charger provides power to the RMC during daylight hours and recharges the battery when the battery power is low.
	Battery charger: alternate charger	Power source: 14.5 Vdc to 15.5 Vdc, 1.65 A	The charger provides power to the RMC and recharges the battery when the battery power is low.
	Battery	Nominal: 12 Vdc SLA, 30 Ah	Use Seal Lead Acid (SLA) batteries only. The battery supplies 12 Vdc at the BAT port.
External Power mode	External power supply	Power source: +9 Vdc to 30 Vdc, 5 A maximum	The external power supply is the sole supplier of power to the RMC in this mode. The battery cannot be connected when using an external power source.

[Table 2-12](#) and [Table 2-13](#) provide the battery port (BAT) and CHARGER/EXT PWR port specifications.

Table 2-12: Battery port specifications

Electrical specification	Description	Value or range
Battery voltage	Valid battery voltages for SLA	9.0 - 15.5 Vdc
Charging battery current range	Maximum charge current	0.05 - 1.65 A
Maximum battery capacity	Maximum recommended SLA battery	30 Ah

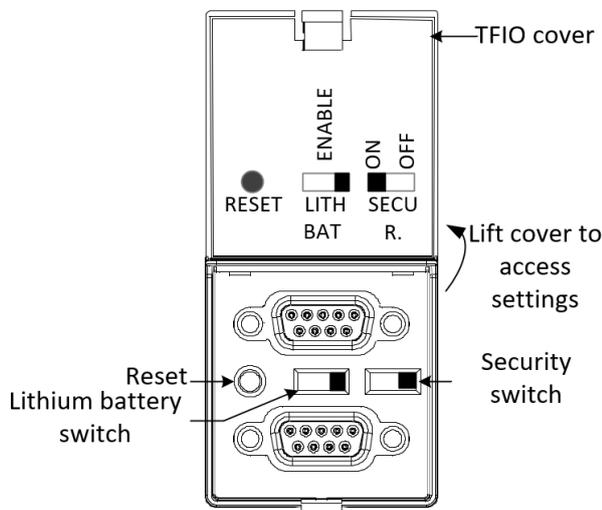
Table 2-13: Charger/External power port specifications

Electrical specification	Description	Value or range
Voltage	Voltage range of input	9-30 Vdc
Current (minimum)	Minimum configuration RMC, 300 MHZ clock rate	125 mA at 13.4 Vdc
Current (typical)	Minimum configuration RMC, 720 MHZ clock rate	150 mA at 13.4 Vdc
Typical load current	Maximum configuration RMC, 720 MHZ clock rate 2 amperes output power (1 A for each of the two COMM modules) AO delivering max current Two TFIO module banks operating	5 A at 13.4 Vdc

2.2.6 Security switch

The RMC has a security switch located between the TFIO A and B connectors ([Figure 2-13](#)). Lift the cover over TFIO A and TFIO B to access the switch. When the security switch is in the ON position, PCCU requires security codes to connect with the device. For security information see section [6 Configure security \(recommended\)](#).

Figure 2-13: Security switch



2.2.7 Reset button

The RMC has a reset button located between the TFIO A and B connectors ([Figure 2-13](#)). Lift the cover over TFIO A and TFIO B to access the reset button. Press the reset button to restart the RMC with the running (warm) configuration.

2.2.8 Lithium battery switch

The lithium battery maintains the real time clock. It operates continuously in the controller in case power is lost or removed. Enable the battery backup with the lithium battery backup switch to ensure that the continuity of the date and time is accurate for recordkeeping. The switch is located between the TFIO A and B connectors ([Figure 2-13](#) above). Lift the cover over TFIO A and TFIO B to access the switch.

2.2.9 Super capacitor

The RMC design includes an onboard super capacitor (Super CAP) that serves as a short-term power reservoir. In the event of a loss of power or a reset, the charged capacitor prevents the supply voltage from falling to zero for 2.5 seconds. This delay allows the system time to save data, such as trending files, and restart configuration. The capacitor charges automatically when the controller is powered on for the first time, or after the controller is powered off for several hours or longer. The capacitor remains charged as long as the controller is powered on. The capacitor takes two minutes to charge.

2.3 Embedded software and data

The RMC non-volatile memory contains the software required for operation and provides storage space for customer data.

The embedded software has the following components:

- Operating system: Required for system boot, operation, and execution of all applications
- Applications: Totalflow applications that define the RMC functions for the required scenarios
- Configuration: Files that contain factory default and user-defined settings and parameters required by the applications active on the RMC

The stored customer data consists of all the data generated by each of the active applications, such as the measurement data from the gas orifice application (AGA-3 tube). Stored data depends on the configured applications for the specific site requirements.

2.3.1 Operating system

The RMC uses a thread-priority preemptive real-time operating system (Linux-based OS). The software architecture prioritizes real-time functionality (measurement and control applications) before executing non-real-time functions (post measurement data processing and file system access). The RMC OS supports:

- Execution of the entire XSeries^{G4} and XSeries^{G5} suite of applications
- Backward-compatible protocol transactions for all applications
- Battery condition metering
- Improved real-time performance metrics

The OS file system has a RAM file system and an eMMC (embedded multimedia card) data journaling file system. The applications access the RAM file system, which provides increased performance. The RAM file system is backed up into the eMMC file system at the following triggers:

- Once a minute at the fourth second of each minute
- Prior to all warm restarts (triggered from PCCU Station Setup, terminal mode, the device loader, or the reset button)

2.3.2 Applications

The RMC supports all XSeries^{G4} and XSeries^{G5} applications. All applications have real-time performance metrics that monitor the overall health of the system.

2.3.2.1 Supported applications on the RMC

[Table 2-14](#) identifies the applications for use in the United States (US) or internationally (SU).



IMPORTANT NOTE: The US and SU identifiers indicate units of measurements for the United States and the International System respectively. Please note that sometimes applications will have different names in the Application and Licensing Management **Add App** or **App Info** lists depending on what units are active in the system. Factory configurations tailor a system for either SU or US units and the system displays the appropriate app name for that configuration. For example, when the device is configured for US units, the name of the app is "AGA-3 Measurement". When the device is configured for SU units, the name shows as "Gas Orifice SU". Names on the application lists may change once they display on the PCCU navigation tree after they are instantiated.

To view the most up-to-date RMC supported applications:

1. Connect the laptop or PC to one of the local ports on the RMC.
2. Launch PCCU and click **Entry** to connect with the controller in Entry mode.

- Click **Application/License Management>Credit/App Info**. Click **Help** for additional information.

Table 2-14: Applications available with RMC

Application	US	SU
System applications		
System	X	X
Display XSeries (LCD display)	X	X
Measurement Tube applications		
AGA-3 Measurement	X	
Gas Orifice SU		X
AGA-7 Measurement	X	
Gas Turbine SU		X
V-Cone Measurement	X	
V-Cone SU		X
Coriolis SU	X	X
API Liquid SU	X	X
Nozzle SU	X	X
NIST14 Gas SU	X	X
NIST14 Liquid SU	X	X
Wedge Gas SU	X	X
Advanced Control Applications		
Gas Lift	X	X
Oil Transfer Measurement	X	X
Pad Controller	X	X
PID Controller	X	X
Valve Control	X	X
Plunger Control	X	
Plunger SU		X
Shutdown System	X	X
Other applications		
Alarm System	X	X
Analysis Trend File	X	X
Batch Log	X	X
Host Interface	X	X
Holding Registers	X	X
Operations	X	X
Station	X	X
Units Conversion	X	X
I/O applications		
I/O Interface XSeries (I/O System)	X	X
Pulse Accumulator	X	X
Communication applications		
Communications	X	X

Application	US	SU
Coriolis Interface (Gas)	X	X
ENRON Interface	X	X
LevelMaster	X	X
Liquid Coriolis Interface	X	X
NGC Client	X	X
Pump Interface	X	X
Therms Master	X	X
Therms Slave	X	X
Wireless Remote I/O	X	X
XIO Interface	X	X
XMV Interface	X	X

2.3.2.2 Application licensing (credit key)

The RMC must have sufficient available licensing credits to add (instantiate) and activate new applications. Each application requires one or more credits of a specific type.

Add or remove applications from the licensed applications list as needed. Four (4) general credits are included in the RMC. Purchase additional license credits for additional applications as needed. These credits run the various applications available.



IMPORTANT NOTE: Click **Help** on the Application/License Management tab for additional information.

To determine if you must purchase additional credits:

1. Insert the credit key into your laptop's USB port.
2. Launch PCCU and click **Entry** to connect with the controller in Entry mode.
3. Click the top item on the navigation tree, then click **Application/License Management**. The Application/License Management tab displays.
4. Click **Credit/App Info** to display the Applications Credits Information screen. Locate the application on the list. Then view and take note of the required credit type for that application.
5. Click **Close**. The Application/Licensing Management tab displays again.
6. View available and surplus credits in the Device Credits window.
7. View available credits in the Key Credits window.



IMPORTANT NOTE: If the credits on the device or the key are insufficient or not of the required type, call **1-800-442-3097** and choose **Option 1** to purchase additional credits. Request the specific type of credit you need, and the number of credits. See the last page of this manual for contact information.

2.3.3 Configuration files

The configuration files contain the configuration or settings required for the operation of the RMC and its applications. Configuration files can include initial (factory-defined) or user-defined settings or parameters. The RMC contains the following configuration files:

- Factory configuration is the ABB default factory configuration, or a customer-specific configuration programmed into the factory folder during final assembly. The factory configuration is read-only and stored in persistent memory. It can only be updated at the factory.
- Startup (cold) configuration is used for a cold restart of the device or when a configuration package is sent to the device by the PCCU loader. The startup configuration is stored in the tfCold directory and can be modified or updated as needed.
- Running (warm) configuration is used by the device during normal operation. The running configuration is stored in the tfData directory and can be modified or updated as needed.

2.3.4 Customer data collection files

The data collection files contain all the measurement and calculation data the RMC generates. These data files are in the tfData directory with the running configuration files. The type and amount of collection data depend on the number and type of applications active on the controller.



IMPORTANT NOTE: The tfData directory also contains trend data for the applications and calibration files if the controller has been field-calibrated.

2.3.5 Log files

The event, change, alarm, and system logs are in the tfData directory with the running configuration data. These files provide status, errors or warning messages that help manage access and changes to the controller.

2.4 User interface

The PCCU32 software running in a Windows® environment is the main user interface to the controller. PCCU32 supports several view levels and can be configured to provide role-based secure access to the controller for the following tasks:

- Initial configuration and commissioning (setup)
- Monitoring the controller operation and performance
- Adding, configuring and optimizing applications (configuration)
- Calibration
- Data collection

2.5 Secure service access interface

The Secure Shell (SSH) and Secure File Transfer Protocol (SFTP) on the RMC allow secure login access and file transfer capability for advanced service access. SSH provides an encrypted communication channel, which requires private key authentication for access to the controller. Secure access is available for troubleshooting purposes only and is reserved for advanced users and ABB technical support or development personnel. See section [6 Configure security \(recommended\)](#) for additional details on secure access to the RMC.

3 Installation

This chapter provides information for RMC installation and setup. Follow all instructions and advisories for safe and trouble-free installation.



IMPORTANT NOTE: Read the installation chapter and review user drawings before beginning installation.



WARNING – Bodily injury. Although there might be alternate methods of installation and commissioning of the RMC, ABB recommends that technicians perform the procedures in the order presented: plan, install, wire, then apply power, verify power-on sequence, and configure.

3.1 Site planning and requirements

RMC installation requires that customer-supplied enclosures, power sources, wiring, and location comply with the specifications described in this section.



WARNING – Bodily injury. Carefully review the specifications in this section to select compliant equipment. Failure to comply with these specifications might create unsafe conditions, resulting in bodily injury and equipment damage.

3.1.1 Enclosure requirements

The RMC must be installed in an enclosure that complies with the following specifications:

- The enclosure protects the RMC-100 against shock and impact.
- For Class I, Division 2, or other outdoor installations, the RMC is installed in an enclosure rated at least Type 3R, according to the environment.
- For Class I, Zone 2 installations, the RMC is installed inside an enclosure tested for IP54 in accordance with IEC 60529 and IEC 60079-15.

3.1.2 Battery and charger requirements

Comply with the following specifications when powering the controller with a battery (battery mode).

Battery specifications:

- Nominal 12 Vdc Sealed Lead Acid
- RMC rating for ambient temperature with battery is $T_a = -40\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$ to $140\text{ }^{\circ}\text{F}$)

Battery charger specifications:

- Solar panel must be nominal 12 Vdc, 30 W or less, or
- Power source: 14.5 Vdc to 15.5 Vdc, 1.65 A

3.1.3 External power supply requirements

Comply with the following specifications when powering the controller with an external power source (external power mode):

External power mode operation is +9 Vdc to 30 Vdc, 5 A maximum.

RMC rating for ambient temperature without battery is $T_a = -40\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$ to $158\text{ }^{\circ}\text{F}$).



NOTICE – Equipment damage. A battery cannot be used when the RMC is in EXT PWR mode.

3.2 Location specifications and design

Install an RMC standalone on a DIN rail on an interior wall, in an Xcore enclosure, or in a customer-supplied enclosure. Xcore enclosures meet the requirements in section [3.1.1 Enclosure requirements](#). Verify that any non-Xcore customer-supplied enclosures also meet these requirements.

3.2.1 General requirements

The installation location should:

- Allow access to the enclosure, RMC, power sources, cables and connections
- Be at a distance that does not exceed the maximum or recommended field wiring lengths for connections to peripherals or external equipment. Field wiring requirements depend on the type of connection. See section [3.3 Wiring requirements](#).

If you use a solar panel to provide power, select where and how to install the solar panel outdoors. Do not place the solar panel where it is in shadow for any part of the day.

3.2.2 Mounting requirements

Mounting surfaces or walls require sufficient strength to support the hanging weight of the RMC (maximum of 1.816 pounds), the enclosure, and associated equipment to meet the requirements of IEC715.

3.3 Wiring requirements

Field wiring must meet the following requirements:

- All wiring connections and the screw terminals for power, input/output, and communications support 12 AWG to 22 AWG. Select the wire gauge according to the voltage and current requirements of the circuitry. The gauge differs for each application.
- Follow local electrical codes to select the appropriate wire gauge and type based on the load current, voltage, signal type, and indoor or outdoor environment.



NOTICE – Equipment damage. Field installation cable and conductors must be rated greater than 70 °C (158 °F) when installed in an ambient temperature greater than 60 °C (140 °F).

3.4 Unpack and inspect

The RMC and additional parts ship in a specially designed shipping carton with a Quick Start Guide, Safety and Compliance Sheet, and packing list.



IMPORTANT NOTE: If there is any damage to the shipping carton, keep it and the packing materials until the contents are inspected and found to be free of damage.

To unpack the RMC and inspect for damaged, missing, or incorrect parts:

- Inspect the shipping carton for damage.
- Carefully remove items from the carton.
- Keep all shipping materials to return any parts.
- Compare the packing list with the materials received. Check for any missing or incorrect parts.
- Inspect each item for damage: RMC exterior, LCD display, optional equipment if purchased.

If there are any missing, incorrect, damaged parts or noticeable defects, call the ABB main office number on the last page of this manual.

3.5 Basic hardware installation

This is an overview of a typical hardware installation. For different installations, call the ABB main office number on the last page of the manual.



NOTICE – Equipment damage. Perform all the procedures in the order presented in this section before powering the RMC.



DANGER – Serious damage to health / risk to life. Do not allow the RMC components to contact a non-insulated tool or be without a proper grounding device. This could create a static electric discharge resulting in bodily injury and damage to the electronic components. Use properly insulated tools and wear a grounding strap to eliminate static electricity when connecting or disconnecting wires.

3.5.1 Ground the controller

The RMC must be mounted on a grounded DIN rail to ground it.



NOTICE – Equipment damage. The DIN rail on which the controller is mounted must be bonded to an earthing terminal. The bonding conductor must have a cross sectional area of at least 4 mm² (12 AWG).

To ground the DIN rail:

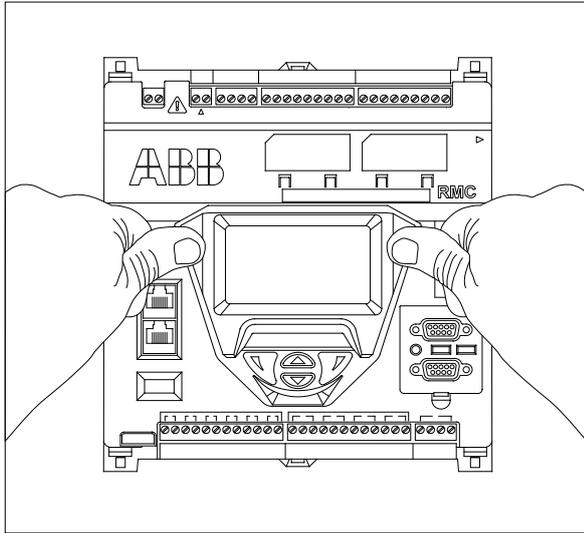
1. Screw the DIN rail onto the mounting surface.
2. Attach a grounding wire to the DIN rail.
3. Attach the other end of the wire to an electrical ground.

3.5.2 Standalone mounting

To mount the RMC:

1. Position the RMC on the DIN rail.
2. Push the RMC onto the DIN rail until it snaps into place ([Figure 3-1](#)).

Figure 3-1: Mount the RMC

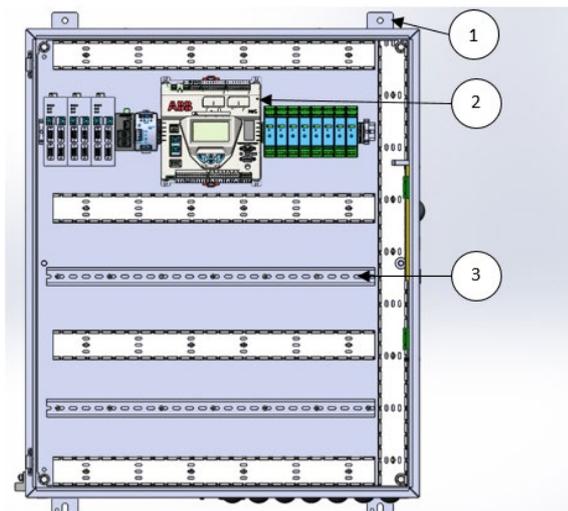


IMPORTANT NOTE: To remove the RMC, insert a slotted screwdriver into the access slot of the DIN rail and release the clip to loosen. See section [8.8.3 Remove the RMC from the DIN rail](#).

3.5.3 Mounting when using an enclosure

The Xcore enclosure has tags for wall-mounting ([Figure 3-2](#)). Mount the enclosure per field specifications. The RMC is usually already mounted on an internal DIN rail inside the enclosure. To use non-ABB enclosures, follow the vendor's mounting instructions.

Figure 3-2: Xcore enclosure top mounting tags and interior view



Legend for Figure 3-2: Xcore enclosure top mounting tags and interior view

ID	Name
1	Tag
2	RMC installed
3	DIN Rail

3.5.4 Wire serial communication ports

Wire the RMC serial communication (serial communication, COMM) ports to communicate with and power external devices. The type of serial interface the external device requires determines the wiring for communication. Wire for power if there is no external supply powering the external device.

This section provides wire length specifications per serial interface type, port pinouts and generic instructions for field wiring. There are also two scenarios of serial communication.

Table 3-1: Serial communications specifications

Communication type	Maximum wire length	Termination
RS-232	50 ft (15 m)	Terminal connector (9 POS), screw termination and pluggable COMM module Active when communication module is inserted
RS-485 or RS-422	4000 ft (1220 m)	

[Table 3-2](#) identifies the RS-232, RS-422, and RS-485 communication pinouts for COMM 1 and COMM 2.

Table 3-2: COMM 1 and COMM 2 serial communication port pinouts

PIN	RS-232	RS-422	RS-485
1	Voltage out (VOUT)	Voltage out (VOUT)	Voltage out (VOUT)
2	Ground (GND)	Ground (GND)	Ground (GND)
3	Switched voltage (Sw VOUT)	Switched voltage (Sw VOUT)	Switched voltage (Sw VOUT)
4	Operate (OPER)	Operate (OPER)	Operate (OPER)
5	Remote request to send (RTS)	Remote request to send (RTS)	Remote request to send (RTS)
6	Request to send (RTS)	Transmit Bus + (TBUS+)	Transmit/Receive (BUS+)
7	Transmit data (TX)	Transmit bus - (TBUS-)	Transmit/Receive (BUS-)
8	Request to send (RX)	Receive bus + (RBUS+)	Not Used
9	Clear to send (CTS)	Receive bus - (RBUS-)	Not Used

To wire the serial communication port:



IMPORTANT NOTE: RMC user drawings display COMM wiring details for specific external devices. See the [Additional information](#) section.



NOTICE – Equipment damage. Pin 1 (VOUT) or pin 3 (Sw VOUT) can power an external device on both COMM1 and COMM2. The external power supply connected to the CHARGER/EXT PWR port determines the output voltage at these pins.

Verify that the device is compatible with the input voltage at the CHARGER/EXT PWR port before connecting to these pins. Connection to an incompatible device can result in damage to the device.

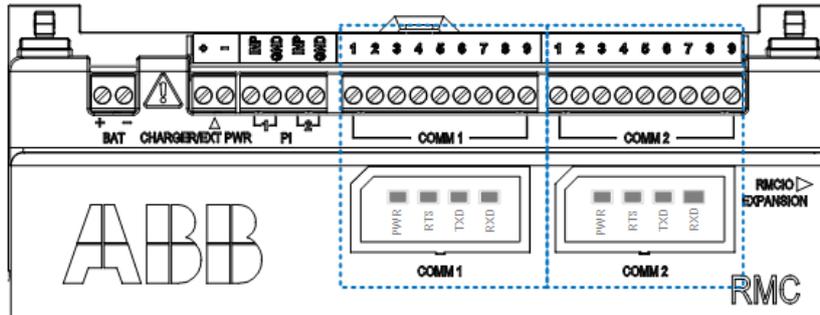
1. Pry the terminal connector off the electronic board with a slotted screwdriver.
2. Trim the wire covering back ¼ inch (0.635 cm) on each wire.
3. Loosen the terminal connector screws for the correct pin according to [Table 3-2](#) COMM 1 and COMM 2 serial communication port pinouts.
4. Insert the wires into the required pins if you power the device from the COMM port:
 - Use pin 1 (VOUT) and pin 2 (GND) to provide constant voltage.
 - Use pin 3 (Sw VOUT) and pin 2 (GND) to provide switched voltage
5. Tighten the terminal connector screws.



NOTICE – Equipment damage. Do not overtighten the terminal connector screws. This can damage the wire.

6. Insert the terminal connector back onto the COMM port if it was removed.
7. Insert the communication module in the appropriate slot ([Figure 3-3](#)). The communication module pushes the port cover downward when inserted.

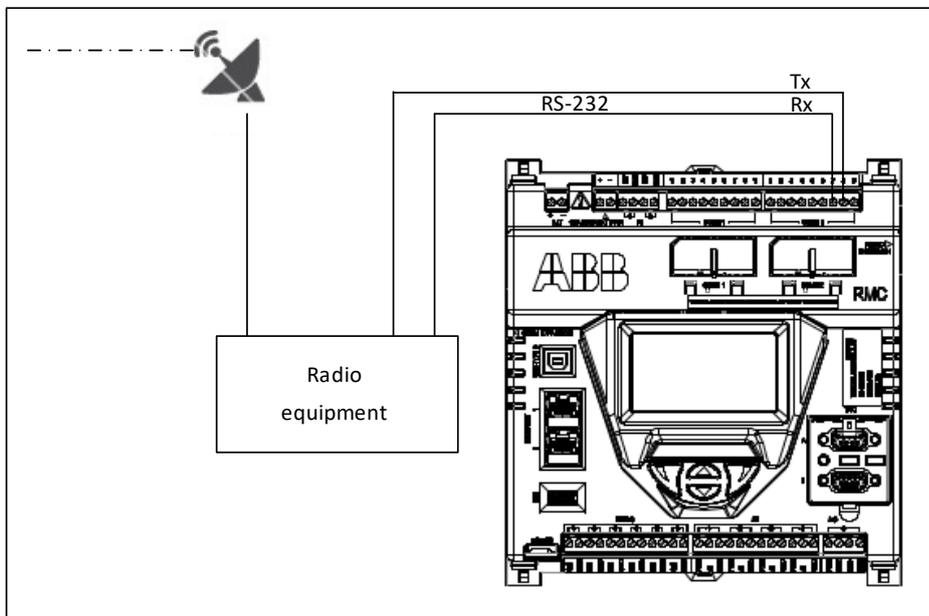
Figure 3-3: COMM terminals and modules



3.5.4.1 Wire remote communications equipment (radio)

The controller serial communication (COMM) ports can be wired with remote communication equipment, such as a radio. [Figure 3-4](#) shows the connection between radio equipment and one of the COMM ports. In this example, the COMM port is configured as an RS-232 port, which provides point-to-point communication.

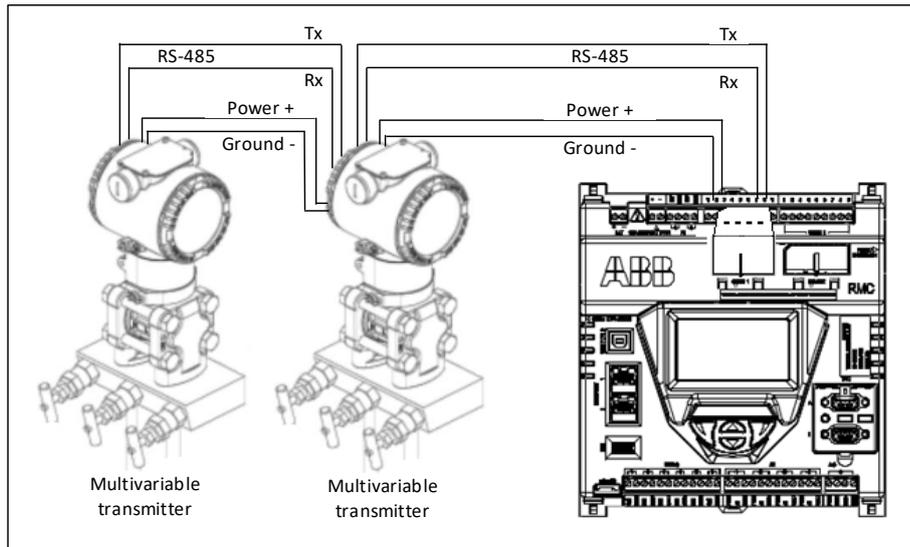
Figure 3-4: Serial communication with radio equipment



3.5.4.2 Wire multiple peripheral measurement devices

The controller serial communication (serial communication, COMM) ports can connect to peripheral measurement devices, such as multivariable transmitters. [Figure 3-5](#) shows the connection between one of the COMM ports and two multivariable transmitters. In this example, the COMM port is configured as an RS-485 port, which provides either point-to-point or multi-point communication. The example shows the two connected transmitters that connect to the controller for communication and power.

Figure 3-5: COMM 1 for RS-485 communication with multiple devices



3.5.5 Wire input and output

Wire the RMC I/O ports to monitor, control and power external devices. Wire for power if the external device has no external power supply.

To wire the I/O port:



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



NOTICE – Equipment damage. An external device can be powered from pin 1 (PWR) on any of the AIs ([Table 3-3](#)) or from the AO ([Table 3-4](#)). The output voltage at the PWR pin depends on the external power supply that connects to the CHARGER/EXT PWR port.

Before connecting to these pins, verify that the external device is compatible with the input voltage at the CHARGER/EXT PWR port. Connection to an incompatible device can result in damage to the device.

1. Pry the terminal connector off the electric board with a slotted screwdriver.
2. Trim the wire covering back ¼ inch (0.635 cm) on each wire.
3. Loosen the terminal connector screws for the correct pin according to I/O tables.
4. Insert the wires in the required pins. If powering the device from the AI or the AO:
 - Use pin 1 (PWR) and pin 3 (GND) for devices attached to the AI.
 - Use pin 1 (PWR) and pin 4 (GND) for devices attached to the AO.
 - Tighten the terminal connector screws.



NOTICE – Equipment damage. Do not overtighten the terminal connector screws. This can damage the wire.

5. Insert the terminal connector into the I/O if it was removed.

3.5.5.1 Analog input pinouts

[Table 3-3](#) and [Figure 3-6](#) identify the AI pinouts.

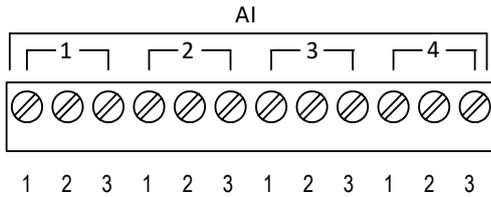


NOTICE – Equipment damage. Before connecting to pin 1 (PWR), ensure that the external device is compatible with the input voltage at the CHARGER/EXT PWR port. Connection to an incompatible device can result in damage to the device.

Table 3-3: Analog input pinouts

Input	Pin	Description	Input	Pin	Description
1	1	PWR-power	3	1	PWR-power
	2	A1-input signal		2	A3-input signal
	3	GND-input ground		3	GND-input ground
2	1	PWR-power	4	1	PWR-power
	2	A2-input signal		2	A4-input signal
	3	GND-input ground		3	GND-input ground

Figure 3-6: Analog input pinouts



3.5.5.2 Analog output pinouts

Table 3-4 and Figure 3-7 identify the AO pinouts.

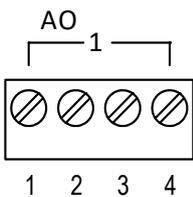


NOTICE – Equipment damage. Before connecting to pin 1 (PWR), verify that the external device is compatible with the input voltage at the CHARGER/EXT PWR port. Connection to an incompatible device can result in damage to the device.

Table 3-4: Analog output pinouts

Output	Pin	Description
1	1	PWR-loop power input
	2	SNK-current sink input
	3	SRC-current source output
	4	GND-ground

Figure 3-7: Analog output pinouts



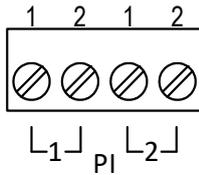
3.5.5.3 Pulse input pinouts

Table 3-5 and Figure 3-8 identify the PI pinouts

Table 3-5: Pulse input pinouts

PI	Pin	Description
1	1	INP-PI 1 input
	2	GND-ground
2	1	INP-PI 2 input
	2	GND-ground

Figure 3-8: Pulse input pinouts



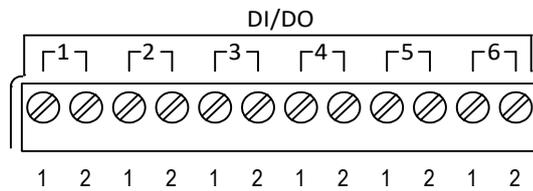
3.5.5.4 Digital input and output pinouts

Table 3-6 and Figure 3-9 identify the DI/DO pinouts.

Table 3-6: Digital I/O pinouts

DI/DO	PIN	Description	DI/DO	PIN	Description
1	1	SIG-Signal DI/DO 1	4	1	SIG-Signal DI/DO 4
	2	GND-ground		2	GND-ground
2	1	SIG-Signal DI/DO 2	5	1	SIG-Signal DI/DO 5
	2	GND-ground		2	GND-ground
3	1	SIG-Signal DI/DO 3	6	1	SIG-Signal DI/DO 6
	2	GND-ground		2	GND-ground

Figure 3-9: Digital I/O pinouts



3.6 Connect expansion modules

3.6.1 Connect additional devices with Ethernet

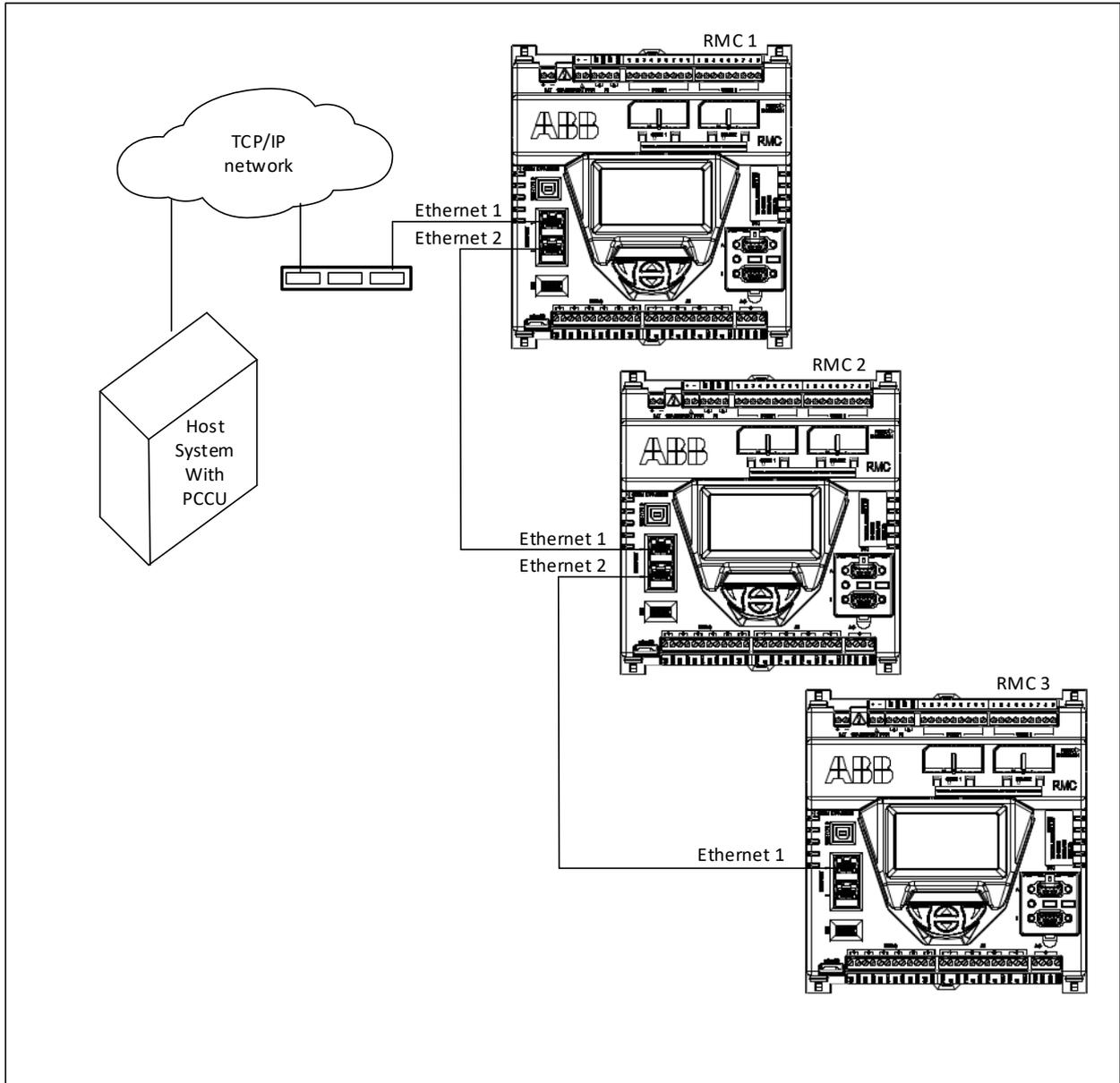
Multiple external devices such as an XFC, XRC, analyzer, or an additional RMC can connect to the RMC Ethernet port.



IMPORTANT NOTE: Each device that connects to an Ethernet port requires a valid IP address for TCP/IP communications. If the devices do not each have a valid IP address, they cannot communicate over the network. For additional information on Ethernet connection scenarios see section 10, Ethernet connectivity scenarios.

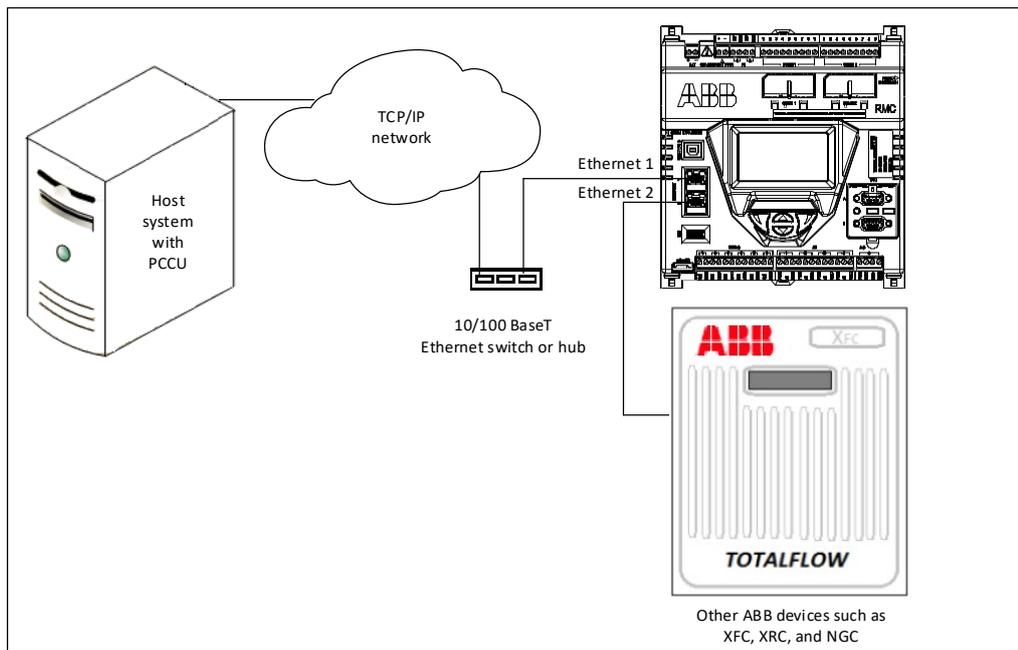
Figure 3-10 illustrates how Ethernet port 2 supports connecting to multiple RMCs.

Figure 3-10: Connecting multiple RMCs



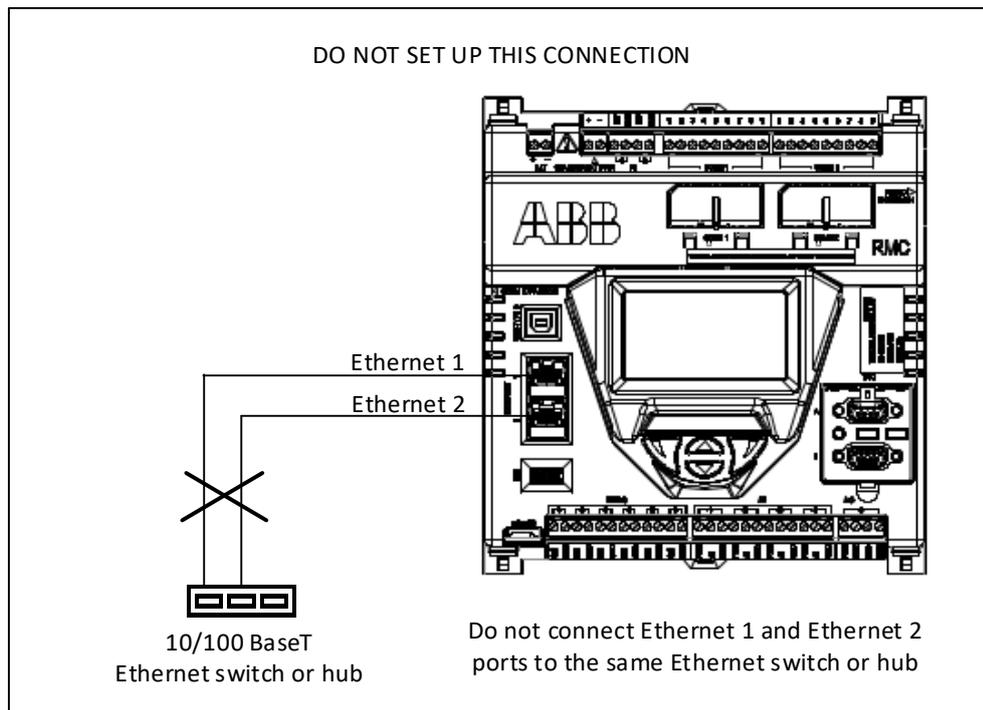
[Figure 3-11](#) illustrates how an Ethernet port supports connecting other ABB equipment.

Figure 3-11: Connect RMC to other ABB devices



Never connect Ethernet 1 and Ethernet 2 to the same Ethernet switch (Figure 3-12). Connecting both ports to the same switch disables both ports.

Figure 3-12: Wrong Ethernet connection



3.6.2 Connect TFIO modules

The RMC has two TFIO ports. Each port requires a TFIO installation kit that includes the cable to connect the TFIO modules to the RMC. For additional information, refer to the TFIO Module User Manual under Additional information.



NOTICE – Equipment damage. When the TFIO interface is disabled, the modules remain powered. Remove the power from the RMC before connecting or disconnecting additional TFIO modules or the TFIO cable. Failure to power down the RMC can result in damage to the module. The procedure in this section assumes the controller is powered off.

[Table 3-7](#) identifies the different module types available with the RMC that support 9 volts to 30 volts operation. The RMC does not support the TFIO CIM module, part number 2100421.

Table 3-7: TFIO modules

TFIO module	Part number	TFIO software version
Valve Control Combo I/O	2100412	2100576-007
4-20 mA Analog Output	2100415	2100715-006
Type II Analog Input	2100418	2100575-006
Combo Digital	2100543	2100563-009
Thermocouple Input	2100869	2101024-001
RTD Input	2101018	2101027-001



NOTICE – Equipment damage. The maximum voltage to operate legacy TFIO modules (not labeled as M2) is 12 Vdc. More than 12 Vdc damages legacy TFIO modules. Only the TFIO M2 modules support voltages higher than 12 Vdc.

To connect the TFIO module(s):



NOTICE – Equipment damage. The output voltage at the following pins depends on the external power supply connected to the CHARGER/EXT PWR port:

- J2-1, J4-1 and J4-3 (on the TFIO valve control interface module) and
- J1-1, J2-1, J3-1, J4-1 (on the TFIO analog output module)

Before connecting to these pins, verify that the external device is compatible with the input voltage at the CHARGER/EXT PWR port.

1. Attach the TFIO module to the DIN rail.
2. Attach the TFIO interface cable to the first TFIO module.
3. Attach the next TFIO module to the DIN rail.
4. Position it beside the previously attached module and snap them together.
5. Repeat steps 3 and 4 to attach the additional TFIO modules as required.



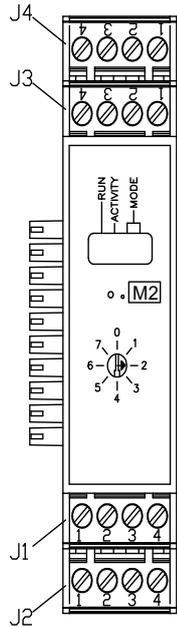
IMPORTANT NOTE: Each port supports a maximum of 22 modules. The TFIO A port does not have to be full before using TFIO B.

6. Attach the 9-pin connector of the TFIO interface cable to the TFIO A port on the RMC.
7. Using the second TFIO interface cable, repeat steps 1 through 5 for the TFIO B port.
8. Attach the 9-pin connector of the TFIO interface cable to the TFIO B port.
9. Loosen the terminal connector screws for the correct pin.
10. Insert the wires in the required TFIO pins.
11. Tighten the terminal connector screws.

To configure the TFIO, see section [4.10](#).

[Figure 3-13](#) shows the pinouts of a TFIO module. For additional information, refer to the TFIO Module User Manual listed under [Additional information](#).

Figure 3-13: TFIO module pins



3.6.3 Connect third-party serial modules

Third-party Ethernet-to-serial modules add serial communication ports to connect additional external devices such as XMVs and transmitters. For instructions about using MOXA® modules, the third-party modules used to expand serial capacity to the controller, see section [10 Serial port expansion with MOXA® modules](#).

3.7 Power the RMC

This section describes two modes for powering the controller. Select one mode:

- Battery mode: a 12 volt battery with a charger supplies power (see section [3.7.2](#)).
- External power mode: an external power source supplies power (see section [3.7.3](#)).

Follow the instructions for the appropriate power mode, then continue to section [3.8, Enable lithium battery backup](#).



NOTICE – Equipment damage. The maximum input voltage for legacy TFIO modules is 12 Vdc.



IMPORTANT NOTE: Externally fuse the power input for the load. This consists of the equipment, plus any external devices powered by the RMC. The wire gauge should be appropriate (in some applications a minimum of 16 AWG gauge is advisable).

3.7.1 Power-on sequence

The RMC power-on sequence initiates when power is connected. The LCD displays the following information as the controller completes its startup:

- ABB TOTALFLOW RMC-100 identifies the controller name and model
- BOOT 2105412-XXX indicates the version of the boot software
- OS 2105411-XXX indicates the version of the operating system
- Super CAP Charged indicates if the super capacitor is charged (see section [2.2.9](#))
- APP 2105457-XXX indicates the version of the flash



IMPORTANT NOTE: The displayed items scroll at varying durations. When the DATE/TIME displays, the power-on sequence is complete.

The RMC design has a super capacitor (Super CAP) that is a short-term power reservoir (see section [2.2.9](#) for more details). The first time the unit powers on, or if the RMC is left powered off for several hours or longer, the boot time is approximately two minutes to allow charging of the super capacitor. The boot time is considerably less once the capacitor is fully charged.

3.7.2 Power with battery and charger

This powering mode requires a 12 volt (SLA) battery and a charger to recharge the battery. The following instructions describe the typical installation of a battery and a solar panel system as the charger. Adapt these instructions to alternate installations.



IMPORTANT NOTE: Verify the battery and charger meet the specifications in section [3.1.2, Battery and charger requirements](#).

3.7.2.1 Connect the battery (dc power)

This procedure describes the connection of the battery to the BAT port or terminal. Remove the BAT terminal connector to wire the battery cable before connecting the battery to the board.

The hardware required for a battery installation is:

- One 12 volt SLA battery
- One battery cable (included with ABB-approved batteries)

Before installation, inspect the battery cable and connectors for breakage where they terminate on the battery.

To install and connect the battery:

1. Install and secure the battery at the appropriate location.



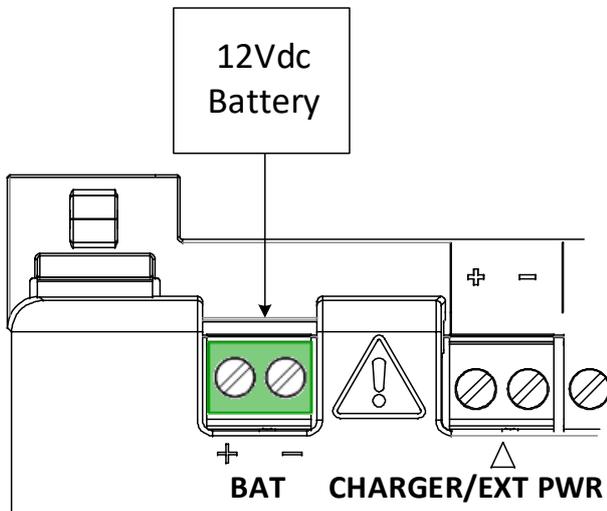
WARNING – Bodily injury. Bodily injury and property damage. Do not allow the battery terminals to contact any metal surface. When the positive and negative battery terminals contact a conductive material, it creates a short circuit that could result in sparks, property damage, and possible explosion.

2. Pry the BAT port removable terminal connector (green connector) off the electronic board with a slotted screwdriver.
3. Trim back the covering on the battery cable wires ¼ inch (0.635 cm) on each wire.
4. Loosen the terminal connector screws.
5. Insert the wires into the required pins ([Figure 3-14](#)). Observe the polarity (+ and -).



WARNING – Bodily injury. Bodily injury and property damage. Complete all wiring of peripheral or external devices to the controller before applying power (connecting the battery).
Connect the battery before connecting the charger cable.

Figure 3-14: Connect a 12 Vdc SLA battery



6. Connect the other end of the battery cable to the battery terminals. Observe the polarity (+ and -).
7. Insert the wired terminal connector back into the BAT port.
8. Observe the power-on sequence information on the LCD to confirm that the battery is supplying power to the RMC (see details in section [3.7.1](#)). When the DATE/TIME displays, the sequence is complete.
9. Press **Reset** if the power-on sequence fails to initiate or complete.

3.7.2.2 Connect the solar panel

The RMC uses a 10 or 20 Watt solar panel with nominal 12 Vdc output voltage. Mount the solar panel on a two-inch pipe, or on the top or side of a meter house.

Remove the CHARGER/EXT PWR terminal connector to wire the charger cable before connecting the charger to the board.

IMPORTANT NOTE: Call the ABB main office number on the last page of this manual for information about mounting the solar panel on the top or side of a building.



Exercise caution when handling the solar panel to avoid damaging it.

Do not place the solar panel where it is in shadows for any part of the day.

Mount the solar panel facing up from the horizon at a 50° angle. For northern hemispheres, position the solar panel facing south. For southern hemispheres, position the solar panel facing north.

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

The hardware required to connect the solar panel to the RMC is:

- One solar panel with an integrated cable
- One solar panel mounting kit



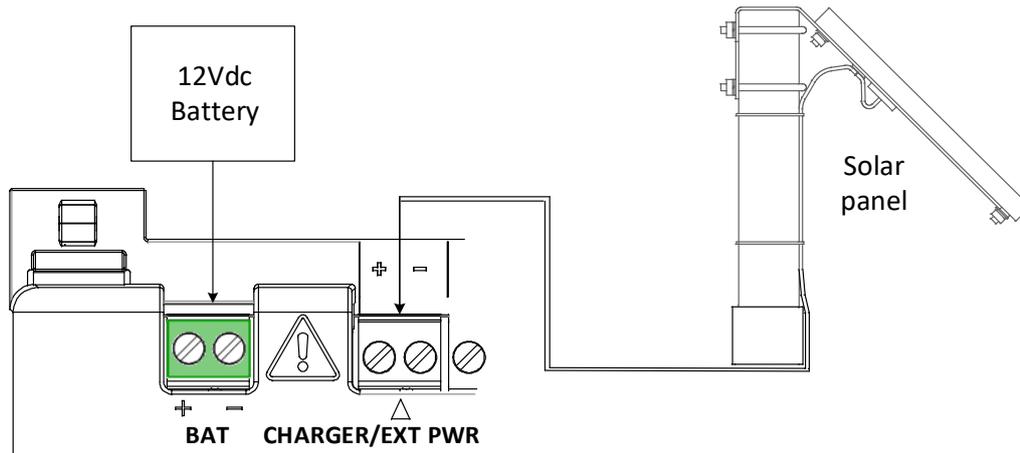
NOTICE – Equipment damage. Always connect the battery to the BAT port before you connect the solar panel or alternate charger cable to the RMC.

To connect the solar panel charger:

1. Verify that the solar panel is operating properly before installation:

- a. Verify the solar panel's polarity and output voltage with a digital voltmeter. Voltage varies depending on the amount of sun and angle to sun.
 - b. Continue with the installation if the measured output voltage is within the manufacturer's specification, per the specification sheet supplied with the panel.
 - c. Call the ABB main office number on the last page of the manual if the measured voltage is out of specification.
2. Pry the CHARGER/EXT PWR port removable terminal connector off the electronic board with a slotted screwdriver.
 3. Trim back the covering on the end of the charger cable that connects to the controller ¼ inch (0.635 cm) on each wire.
 4. Loosen the terminal connector screws.
 5. Insert the wires in the required pins. Observe the polarity (+ and -).
 6. Insert the wired terminal connector back into the CHARGER/EXT PWR port ([Figure 3-15](#)).

Figure 3-15: Connect the charger (solar panel)



Continue to section [3.8](#), Enable lithium battery backup, to continue the installation.

3.7.3 Power with external power source

The controller can receive power from an external power supply (9 to 30 Vdc). Remove the CHARGER/EXT PWR terminal connector to wire the power cable before connecting the power supply to the board.



WARNING – Bodily injury. To prevent injury only permit a licensed electrician to install Vac wiring.



IMPORTANT NOTE: The external power supply must meet the specifications in section [3.1.3](#). All wiring must comply with national and local electrical codes and applicable ABB certification drawings to maintain system certification.

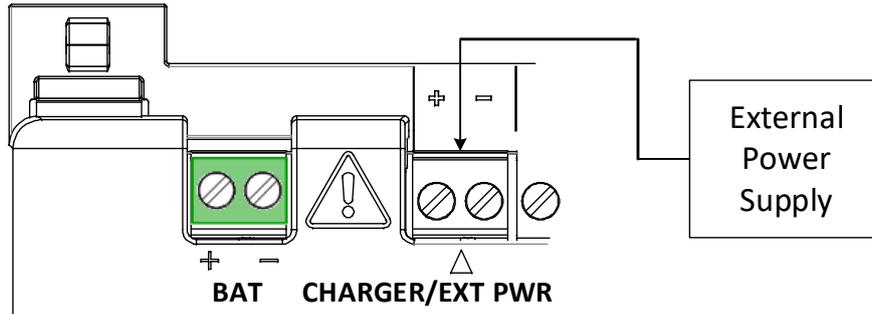


NOTICE – Equipment damage. A battery cannot be used when the controller is in EXT PWR mode.

To wire an external power source to the RMC:

1. Follow the manufacturer's instructions supplied with the external power supply to install and connect the power source.
2. Pry the CHARGER/EXT PWR port removable terminal connector off the electronic board with a slotted screwdriver.
3. Trim back the covering on the end of the power cable that connects to the controller ¼ inch (0.635 cm) on each wire.
4. Loosen the terminal connector screws.
5. Insert the wires in the required pins. Observe the polarity (+ and -).
6. Insert the wired terminal connector back into the CHARGER/EXT port ([Figure 3-16](#)).

Figure 3-16: Connect the external power supply



7. Apply power to the external power supply.
8. Observe the power-on sequence information scrolling on the LCD to verify that the RMC is receiving power. See details in section [3.7.1](#). When the DATE/TIME displays, the sequence is complete.
9. Press **Reset** if the power-on sequence fails to initiate or complete.
10. Proceed to section [3.8](#) to continue the installation.

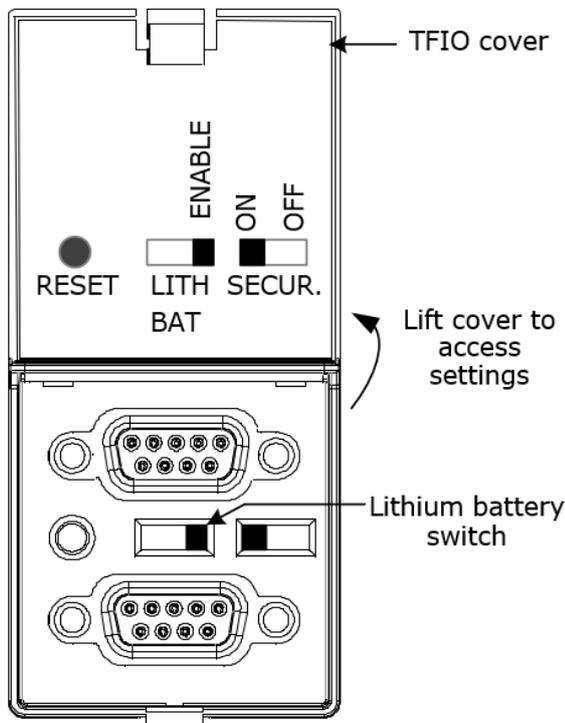
3.8 Enable lithium battery backup

The lithium battery retains operation of the real time clock. The lithium battery backup switch is located between the TFIO ports and is accessible through a slot in the housing. Lift the cover over the TFIO ports to view the switch settings. The two settings are:

- Enable: The switch is on. The lithium battery backs up the real time clock. If power is lost or disconnected, the real time clock continues to operate until the lithium battery is depleted.
- Disable: The switch is off. The lithium battery does not back up the real time clock.

To enable the lithium battery, insert a small screwdriver into the slot and move the switch to the ENABLE position ([Figure 3-17](#)).

Figure 3-17: Lithium battery setting



4 Startup

This chapter describes the setup and configuration procedures to activate a newly installed RMC system. Complete the RMC configurations through the Windows®-based interface software PCCU32.



IMPORTANT NOTE: Click **Help** on any of the screens used for configuration. Online help topics are available for each PCCU screen.

4.1 Configure the RMC using PCCU32

4.1.1 Install the PCCU32 interface



IMPORTANT NOTE: The RMC equipment requires PCCU32 version 7.57 or newer. Previous versions of PCCU32 are not compatible. PCCU32 must be installed in the PC or laptop used to configure the RMC.

PCCU32 software operates in a Windows® environment.

To install with a PCCU32 installation file downloaded from the ABB website:

1. Locate the downloaded file on the PC or laptop. The file downloaded is compressed.
2. Un-compress the downloaded file.
3. Display File Explorer, then locate and open the PCCU32 folder.
4. Double-click setup.exe to run the installation program. Follow the screen prompts during installation.
5. Click **Finish** when installation completes.

4.2 Establish local communication

Connect the laptop to the USB, Ethernet, or MMI ports to establish local communication with the controller. These ports are configured at the factory for local operator access. Configure PCCU to use any of these ports. To configure the controller, connect to the preferred port, establish a connection to the controller with PCCU, and proceed to section [4.3](#).



IMPORTANT NOTE: External weatherproof local communication connectors (USB, Ethernet or MMI) are available on Xcore enclosures, if purchased. Use external ports to connect locally if the RMC is inside an enclosure. If the RMC is a standalone device, use the USB or Ethernet ports. The MMI port has a proprietary connector requiring a cable adapter not shipped with the standalone unit.

Do not use external enclosure connectors for permanent field connections. These connectors are only for local access during configuration or maintenance.

4.2.1 Using the USB port

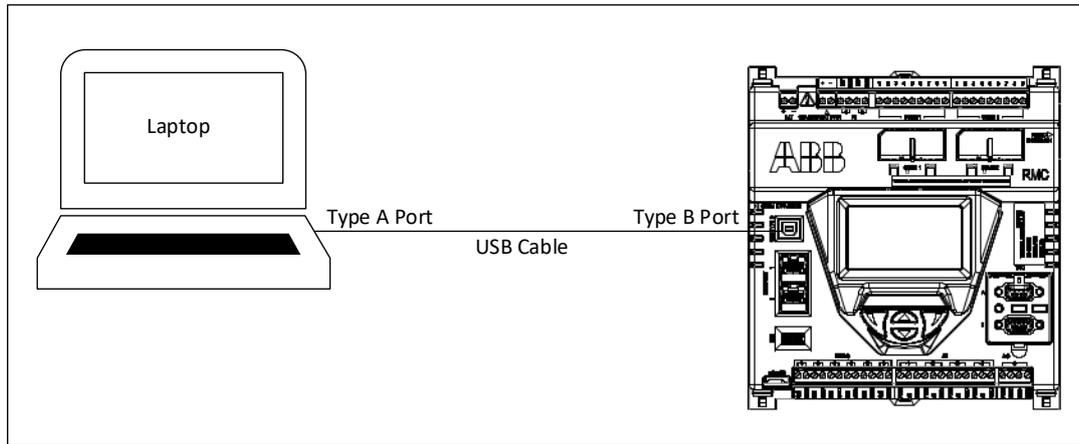
The following instructions apply to USB port connections. [Table 4-1](#) provides cabling details to connect to the USB port.

Table 4-1: USB cabling

Host system interface type	Required cabling termination (connectors) or adaptors	ABB part number
USB 2.0 Type A receptacle	USB 2.0 Type B plug to USB 2.0 Type A plug cable (referred as USB PCCU32 cable)	1801800-xxx

[Figure 4-1](#) illustrates USB communication between a host system and the RMC through direct connection.

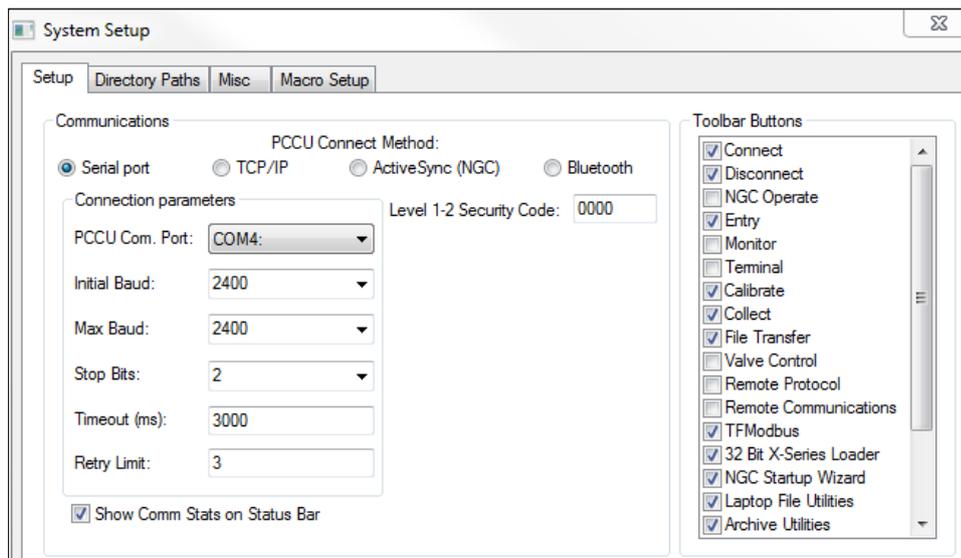
Figure 4-1: USB port for local operator access



To set up communication using the USB port:

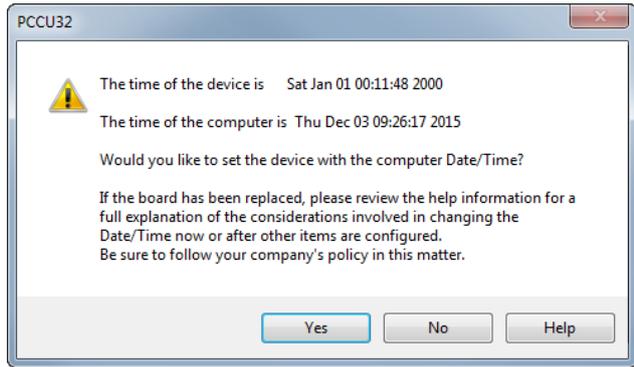
1. Power on the RMC and the laptop or PC.
2. Connect the USB cable. An annunciator in the LCD displays a lower case "u" for local USB connection.
3. Launch PCCU.
4. Click **Setup** on the PCCU32 toolbar menu. The System Setup window displays ([Figure 4-2](#)).

Figure 4-2: PCCU system setup (USB communication)



5. Select **Serial port** under PCCU Connect Method.
6. Select the computer USB port that the cable connects to from the PCCU Com. Port drop down list.
7. Click **Close**.
8. Click **Entry** on the PCCU32 toolbar to connect to the device. When the connection is successful, the PCCU32 Entry screen displays. If the RMC calendar clock does not match the laptop's date and time, a message displays to synchronize the date and time ([Figure 4-3](#)).

Figure 4-3: Synchronize date and time



9. Click Yes. The RMC calendar clock synchronizes with the laptop date and time.
10. Configure the RMC.
 - To use Ethernet, complete steps in the following section.
 - To use USB, remain on the current USB connection and proceed to section [4.3.1 Configure the station](#).

4.2.2 Using the Ethernet ports

The startup configuration of the RMC requires first-time local communication. Establish a connection between a PC or laptop and the device over Ethernet after installation and power-on sequence is complete.

The Ethernet ports auto-configure to adapt to the Ethernet cable type. [Table 4-2](#) displays the cabling specifications for Ethernet ports.

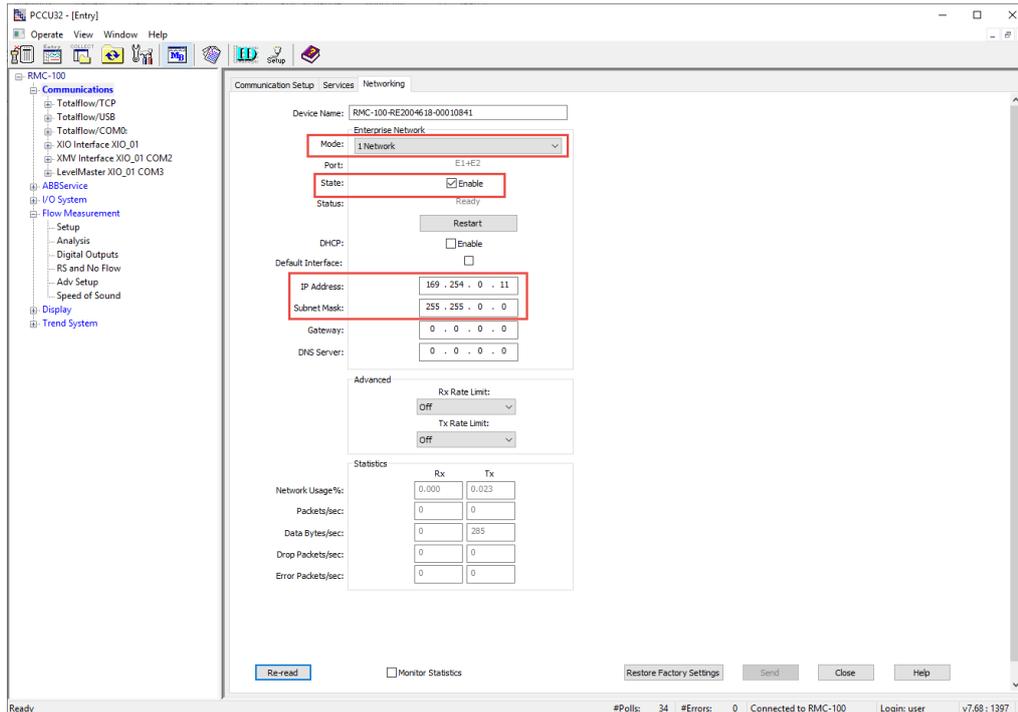
Table 4-2: Ethernet cabling

Supported device (with Ethernet 10/100 BaseT ports)	Required cabling termination (connectors) or adaptors	ABB part number
Host system (operator laptop or computer)		1681011
Network device (Ethernet hub, switch or router)	Straight-through Ethernet CAT 5 cable with RJ-45 connectors at both ends.	Maximum distance:
Other Totalflow devices: additional RMCs, flow computers, and analyzers		100 meters (328 feet)

Local TCP/IP communication over Ethernet requires correct IP configuration and addressing. The RMC Ethernet factory default configuration supports initial connection with pre-configured IP parameters for convenience.

The RMC is configured as a 2-port Ethernet switch from the factory. [Figure 4-4](#) shows the default Ethernet mode as viewed from PCCU. Ethernet is configured in 1 Network mode, therefore devices connected to either port communicate on the same subnet. A single default IP address (169.254.0.11) is ready for initial local communication using either of the 2 ports. To use either port, set the Ethernet State to **Enable**.

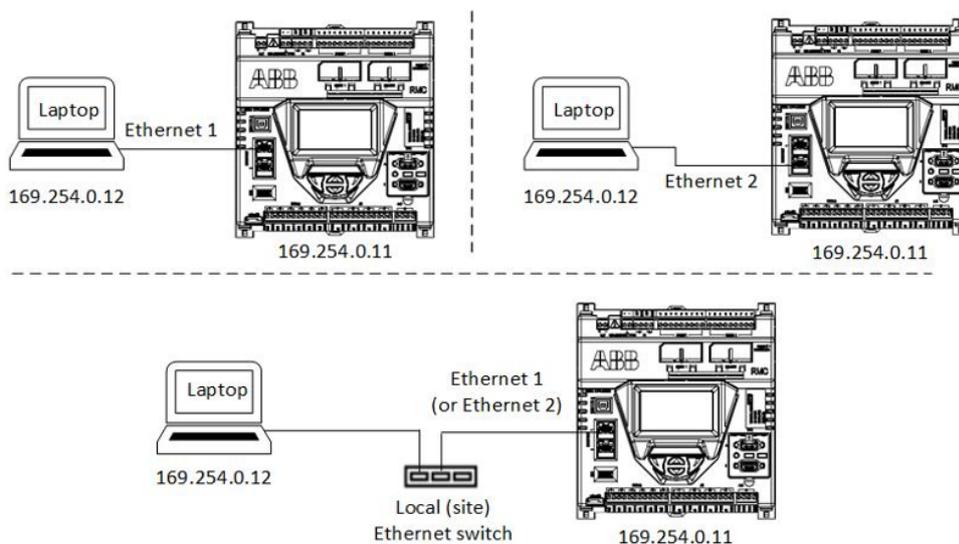
Figure 4-4: Factory default Ethernet configuration (PCCU Networking tab)



IMPORTANT NOTE: Initial communication with the RMC assumes that the factory default configuration of the device is still intact. If unable to establish connection with Ethernet at first-time connection, verify that Ethernet is enabled. To enable or verify the Ethernet configuration see section [4.2.2.1](#).

[Figure 4-5](#) illustrates Ethernet connections between a host system and the RMC. For first-time communication, connect directly to any of the Ethernet ports or to the local network switch if one is used. The example shows the RMC’s default IP address (168.254.0.11). The laptop shows an example of a compatible IP address. Use the default RMC IP address as the target address for connection setup using PCCU.

Figure 4-5: First-time local connection with RMC-100 using Ethernet (2-port switch mode)





IMPORTANT NOTE: If the device is configured for network communication (connected to the corporate network or the field network), a valid IP configuration for the field network must replace the factory IP configuration default. Local access to devices on a network is still supported after the default configuration is replaced, but the operator laptop must have an IP configuration compatible with the non-default addresses assigned to the devices. See section [4.5 Configure Ethernet network communication](#).

4.2.2.1 Enable Ethernet

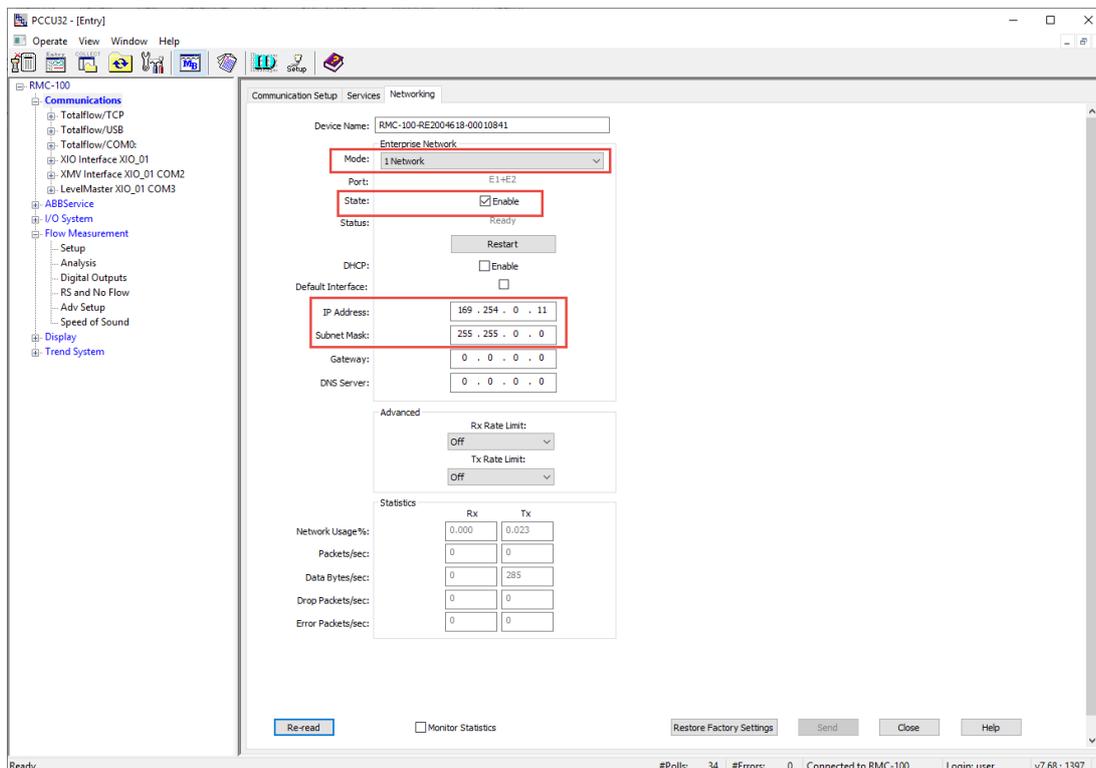
Ethernet ports should be enabled if they are the preferred local connection option.

This procedure requires local connection with the RMC using either the USB or MMI ports. Establish a connection per section [4.2.1 Using the USB port](#), before you start this procedure. Skip this procedure if the Ethernet ports are already enabled.

To enable Ethernet:

1. Launch PCCU and click **Entry**. The navigation tree displays.
2. Click **View** > **Expert** to display PCCU in Expert Mode.
3. Click **Communications**>**Networking**.
4. Select the State **Enable** checkbox ([Figure 4-6](#)).
5. Click **Send**.
6. Click **Restart**. Click **Yes** to confirm restart.

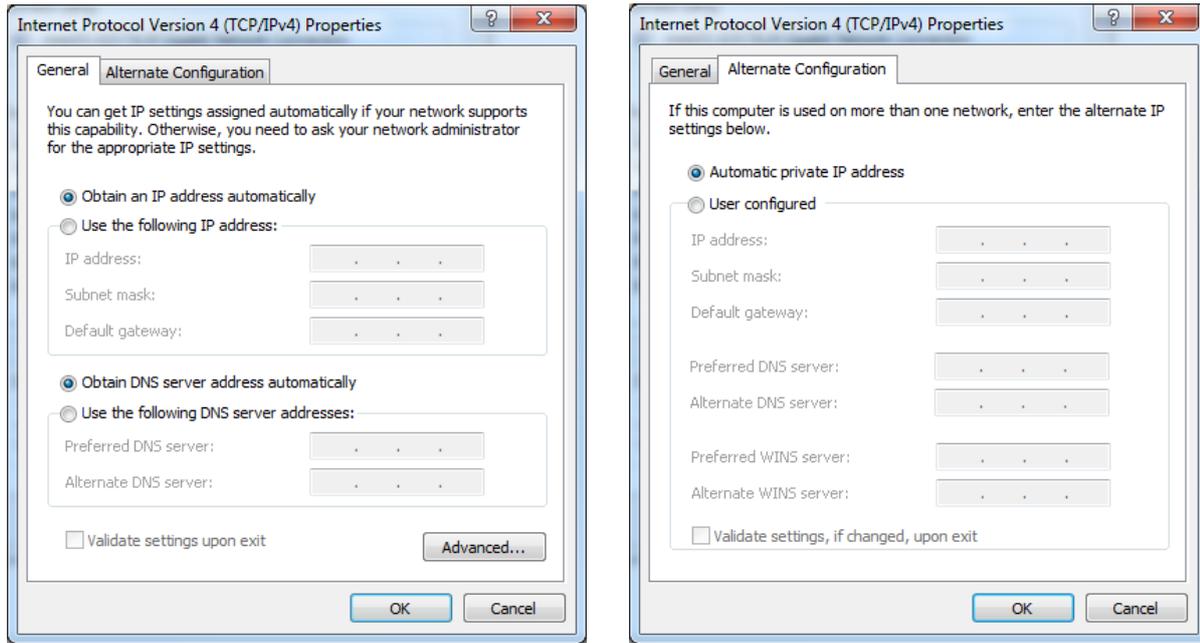
Figure 4-6: Enable Ethernet for local communication using default IP configuration



4.2.2.2 Configure the host system

If the laptop is configured to automatically obtain the IP address, do not change the TCP/IP configuration. If the laptop has a static TCP/IP configuration, configure it for dynamic IP addressing and private addressing ([Figure 4-7](#)). See [Figure 4-8](#) for Windows® 7 system examples.

Figure 4-7: IP for host system

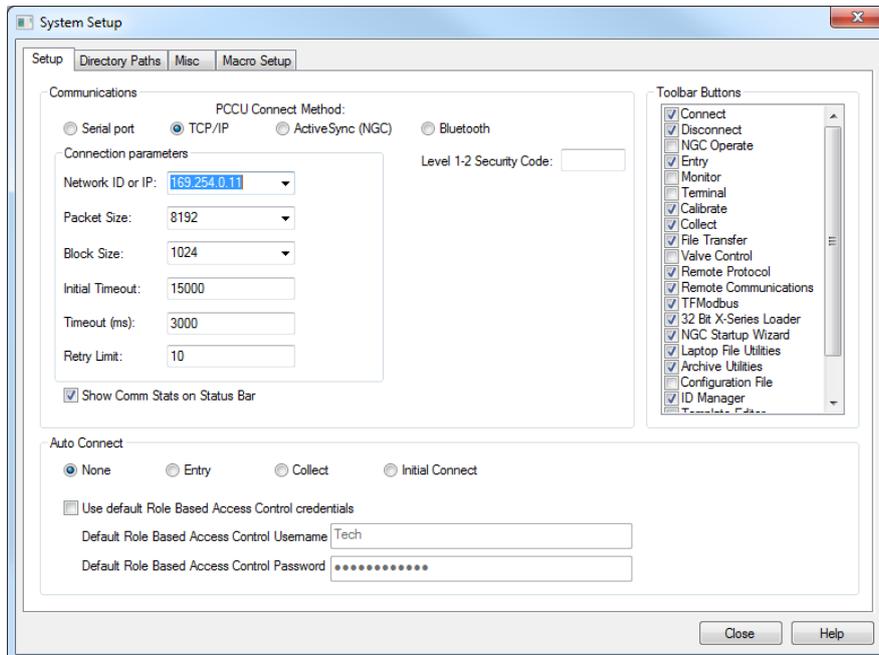


4.2.2.3 Set up PCCU32 and connect

To configure PCCU32 for TCP/IP communication:

1. Power on the RMC and the laptop or PC.
2. Connect the Ethernet cable.
3. Launch PCCU.
4. Click **Setup** on the PCCU32 toolbar menu. The System Setup window displays.
5. Click **TCP/IP**.
6. Type the default IP address (169.254.0.11) into Network ID or IP under Connection Parameters (Figure 4-8).

Figure 4-8: PCCU setup for local Ethernet communication



7. Click **Close**.
8. Click **Entry** on the PCCU32 menu bar to connect to the device. The device's Entry screen displays when a connection is successful.
9. Configure the controller according to section 4.3.1.

4.2.3 Using the MMI port (when using enclosures)



IMPORTANT NOTE: A circular military (MIL-C-26482) weatherproof connector is available on the Xcore enclosure only. Use the external MMI connector for local communication. Use either the USB or Ethernet port for direct connection if the RMC has been installed standalone.

Use the USB port and a RS-232-to-USB adapter for laptops without legacy DB-9 RS-232 ports. ABB recommends and sells the Digi® Edgeport®/1 converter (part number 1801382-001). Contact technical support to order or for more details.

[Table 4-3](#) provides the cabling specifications for the MMI port.

Table 4-3: MMI cabling specifications

Host system serial port type	Required cabling termination (connectors) or adaptors	ABB part number
Legacy serial (RS-232) interface, DB-9 (9-PIN, male connector)	Serial DB-9 (9 POS, female connector) to circular military cable (referred to as PCCU32 Cable)	2015240

To set up communication using the MMI port:

1. Power on the RMC and the laptop.
2. Connect the MMI cable. An annunciator in the LCD displays an uppercase "L" for MMI connection.
3. Launch PCCU.
4. Click **Setup** on the PCCU32 toolbar. The System Setup window displays.
5. Click **Serial port** under Communications>PCCU Connect Method.
6. Select the port from the PCCU Com. Port drop-down list.
7. Click **Close**.
8. Click **Entry** on the PCCU32 toolbar to connect to the device. The PCCU32 Entry screen displays when the connection is successful. If the RMC calendar clock does not match the laptop's date and time, a message displays to synchronize the date and time.
9. Click **Yes**. The RMC calendar clock synchronizes with the laptop date and time.
10. Configure the RMC.
 - To use Ethernet, complete steps in section [4.2.2 Using the Ethernet ports](#).
 - To use USB, remain on the current MMI connection and proceed to section [4.3.1 Configure the station](#).

4.3 Configure basic parameters

This section covers basic setup and configuration of the RMC after the local connection is established.

4.3.1 Configure the station

To configure the station:

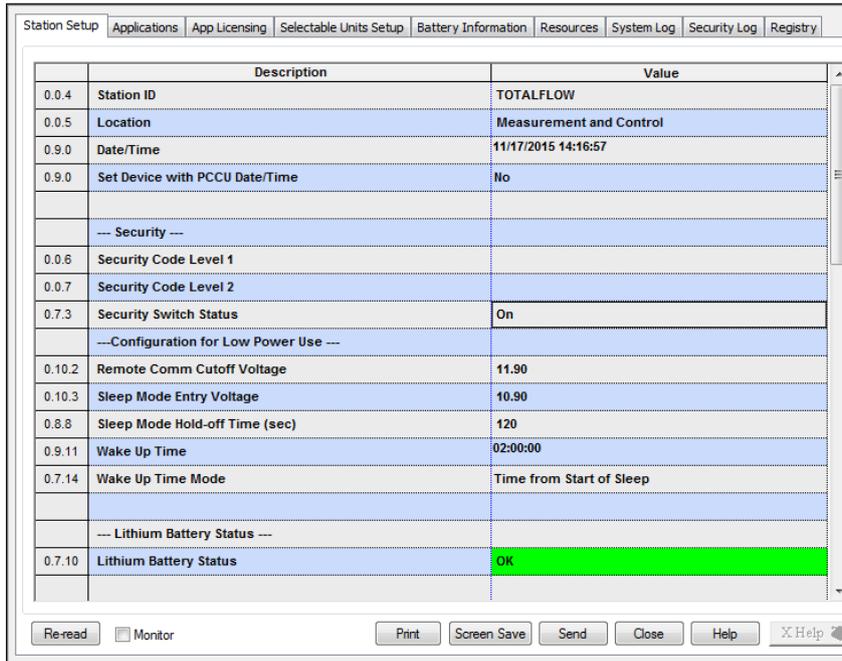
1. Click Entry to display the Entry screen.
2. Click the station ID at the top of the navigation tree. The Station Setup tab displays.
3. Set up the basic settings identified in [Table 4-4](#).

Table 4-4: Required station setup

Required entry	Format	Description
Station ID	10-digit alphanumeric	The station identifier code uniquely identifies each station. The station ID is the same for all tubes on a multiple tube station. If it is blank on a single tube device, the station ID is the same as the device ID.
Device ID/ Application ID	10-digit alphanumeric	The identifier uniquely identifies each device. For a single tube device, the ID identifies the device and is the same ID as the Station ID.
Location	24-digit alphanumeric	The identifier describes the location, such as the county name or road number.
Date/Time	MM/DD/YYYY HH:MM:SS (24-hour clock)	Date and time must agree with the collection equipment if measurement tubes are instantiated.

4. Verify that the Lithium Battery Status displays OK ([Figure 4-9](#)). If the status is Low Voltage or Not Connected, the field has a red bar.

Figure 4-9: Station Setup screen



- Change any other settings in the Station Setup tab as necessary. Leave PCCU open to the Station Setup tab.



IMPORTANT NOTE: Additional fields in WinCCU uniquely identify the meter, including fields for the lease holder, producer, operator, and buyer. Edit these fields on the host computer in the ID manager, not on the RMC.

4.3.2 Change the LCD display

The factory configuration has a default date and time display format. The display configuration is backward-compatible with the XSeriesG4 and XSeriesG5.

To change the display to preferred settings on the Station Setup tab:

- Scroll down to the LCD Display Date/Time Format ([Figure 4-10](#)).

Figure 4-10: LCD display date and time format

--- LCD Display Date/Time Format ---	
0.7.15	Date/Time Format mmddyymmss
0.7.16	Date Separator Slash /
0.7.17	Time Separator Colon hh:mm:ss

- Select a Date/Time Format (mmddyymmss or yymmdd) from the drop-down list.
- Select a Date Separator (slash, dash, or period).
- Select a Time Separator (colon or period).
- Click **Send** to save the station settings.

4.4 Configure serial communications

4.4.1 Configure serial communication ports

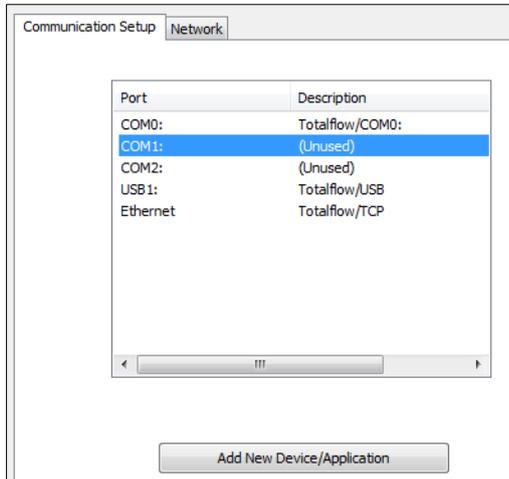
Configure COM 1 and COM 2 communication ports to connect one or more peripheral serial devices. These ports are software-configurable to support RS-232, RS-422, and RS-485.

To configure the port:

- Verify that the power LED on the COM module is on (green).

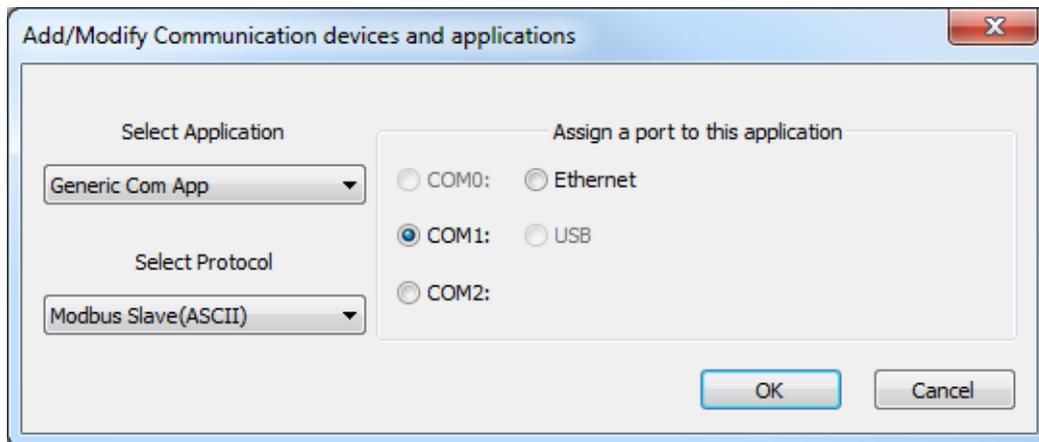
2. Click **Communications** on the PCCU navigation tree. The Communications Setup tab displays (Figure 4-11).
3. View the list of ports and identify a COM port. In first-time installations, both COM ports display as unused. Neither port has a default factory configuration.
4. Add communication application to a COM port (Figure 4-11):
 - a. Select the COM port. If both ports are wired to external devices require configuration, select the correct port for each. The attached external device type determines the configuration.
 - b. Click **Add New Device/Application**.

Figure 4-11: Add application to COMM port configuration



The Add/Modify Communication device and applications window displays (Figure 4-12).

Figure 4-12: Add/Modify Communication devices and applications



5. Click a port (**COM1** or **COM2**).
6. Select the appropriate application from the Select Application drop-down list.



IMPORTANT NOTE: The applications are for specific products. If the external device is not an ABB product, select **Generic Com App**.

7. Select the appropriate protocol from the Select Protocol drop-down list.



IMPORTANT NOTE: The protocol for radio or modem communication is Totalflow Remote.

8. Click **OK**. The port settings display.
9. Type a description of the port into Port Description.
10. Configure the Serial port settings to match the settings of the external device.



IMPORTANT NOTE: The interface setting for a modem is RS-232 Modem.

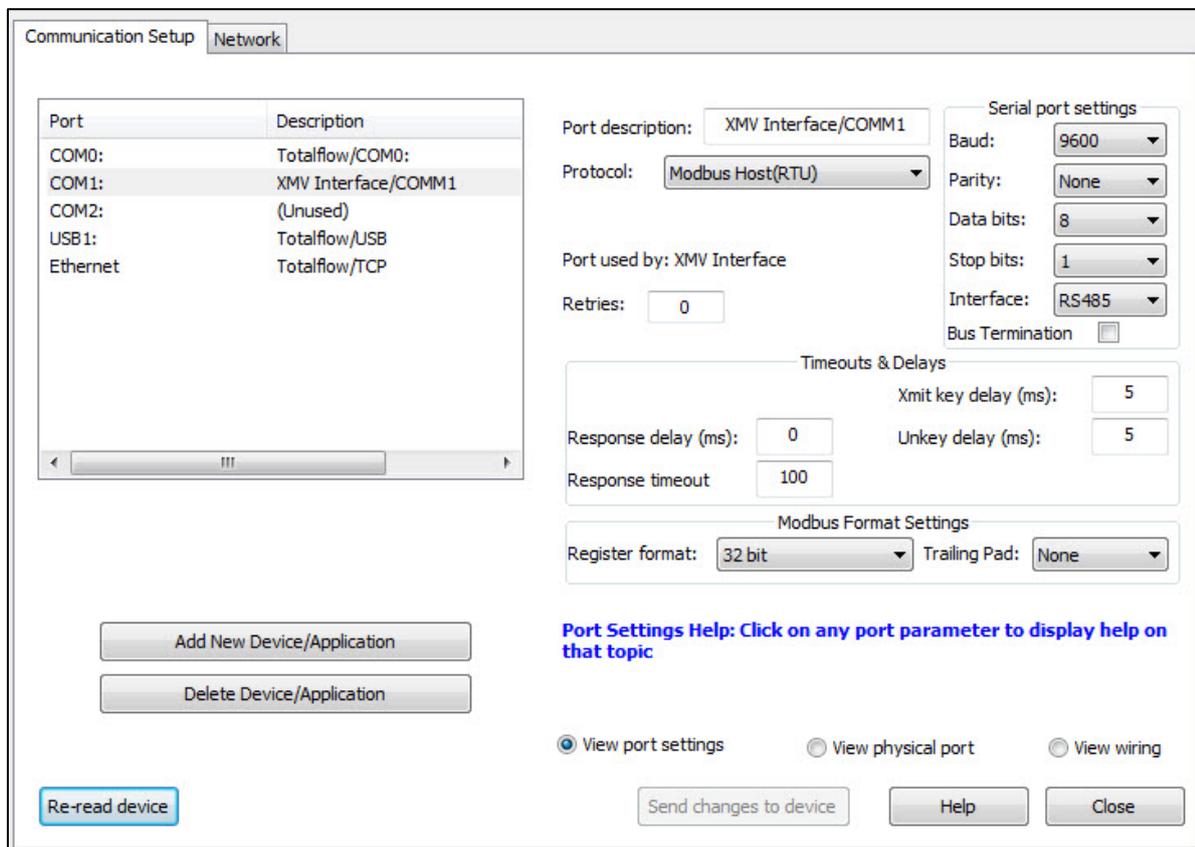
Select the appropriate register format if the protocol in the Add/Modify Communication device and applications window is MODBUS®.

11. Select the **Bus Termination** checkbox if the RMC is the last device on the RS-422 or RS-485 communication bus.
12. Change the default values for timeouts and delays as needed. Review the communication equipment specifications before changing the settings.
13. Click **Send** to send changes to device. The new port name displays under Communication on the navigation tree.

The four LED lights are PWR, RTS, TXD, and RXD. The LED lights on the top of the communication module indicate that data is transmitting to (TXD) and received by (RXD) the RMC. The PWR LED light is on if the RMC is powered on.

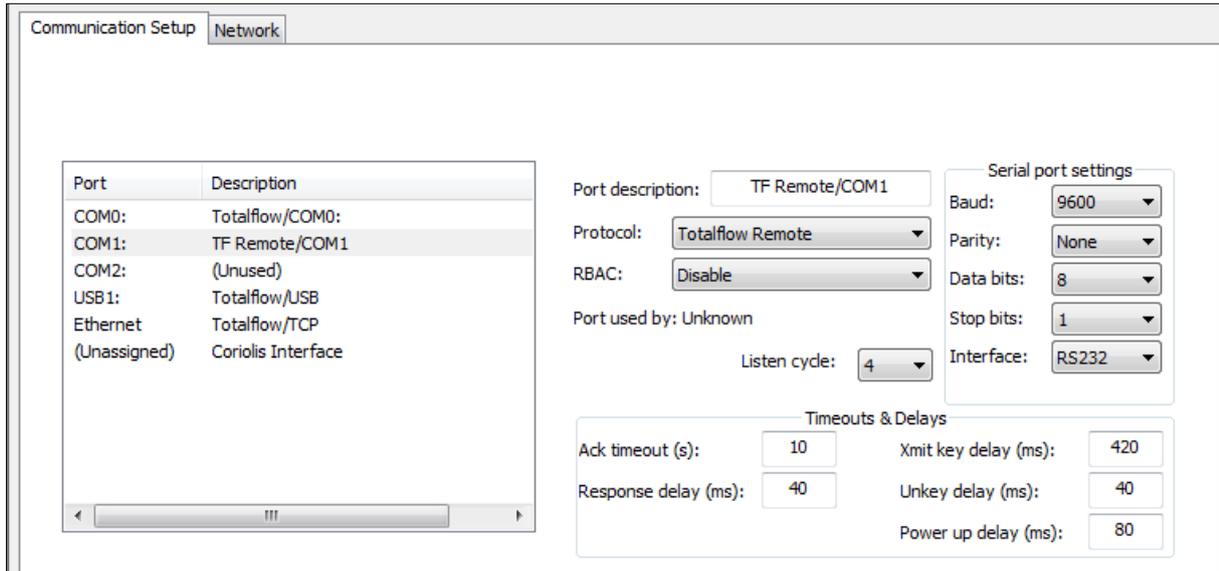
[Figure 4-13](#) provides a communication configuration example to connect an ABB Totalflow product, such as a multivariable transmitter or XMV. The XMV interface application supports this type of connection.

Figure 4-13: Serial communication port configuration to connect XMVs



[Figure 4-14](#) provides a communication configuration example to connect equipment for remote communication such as a radio. Generic Com App supports this type of connection.

Figure 4-14: Serial port configuration for remote communication



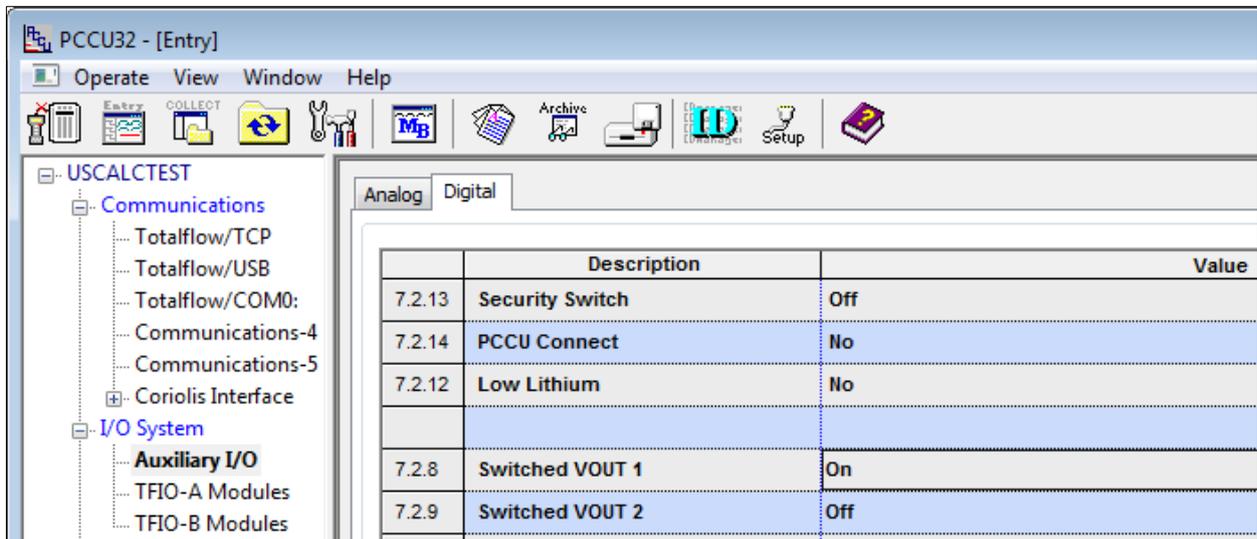
4.4.2 Enable serial port switched output power

When powering external devices from the communication ports, use switched power to supply voltage to those devices only when needed. Wire the external devices to the Sw VOUT pins to support this feature.

To enable switched power:

1. Click **I/O System** on the navigation tree.
2. Click **Auxiliary I/O** on the navigation tree.
3. Click **Digital** (Figure 4-15). The Digital tab displays.

Figure 4-15: Enable communication switched power



4. Click the Value cell on the Switched VOUT line to **On** for the correct port.
 - Switched VOUT 1 for COMM 1
 - Switched VOUT 2 for COMM 2
5. Click **Send**.

4.5 Configure Ethernet network communication

To configure the RMC for network communication, determine the required network topology first. If the RMC is used in conjunction with an XIO, review additional configuration options and connection scenarios in the Network Communication Guide (See [Additional information](#) for a link to this guide).



IMPORTANT NOTE: Plan Ethernet connections carefully to protect your device and peripherals from unauthorized or malicious access. The device should only connect to a firewall-protected private network, never directly to the Internet. For security guidelines and recommendations, see section [6 Configure security \(recommended\)](#). Follow your company policies and guidelines for cybersecurity.



IMPORTANT NOTE: Never use an external port for permanent connections, such as to peripherals or additional equipment. The external port on an RMC enclosure is reserved for local communication (configuration or maintenance only). Connect additional equipment to the RMC internally following required guidelines for cable length and cable routing/management. The illustrations in this section show the RMC as a standalone device. Adapt instructions for connections when enclosures are involved.

4.5.1 Network modes

The embedded Ethernet switch on the RMC can be configured to support a single network or two networks. In 1 Network mode, both Ethernet ports are assigned to one network. In 2 Network mode, each Ethernet port is assigned to a separate network. Consider the following:

- In 1 Network mode, you can use one Ethernet port for the uplink connection to the corporate WAN (through a local or field network switch), and the other port to connect additional devices on the field network (in daisy-chain fashion). This configuration forms a logical LAN where a network switch, an RMC, and an additional device communicate on a single network. Each of the devices on this network must have a unique and valid IP address with the same subnet number. The network traffic on one port is visible on the other. To manage devices remotely, establish a remote TCP/IP connection with the RMC and, through the RMC, to the attached device(s). The RMC switches between the network and the device. See section [4.6 Configure the RMC for 1 Network mode \(2-port switch\)](#).
- In 2 Network mode, you can define two networks. These networks are separate and therefore traffic on one is not visible on the other. If one port is used to connect to the corporate WAN, and the other port to a field network, the field network traffic is isolated from the corporate network traffic. Remote access to the RMC will require the IP address assigned to the Ethernet interface used to connect to the WAN. Remote access to the devices directly connected to the RMC will not be possible without an external router at the field. The external router is required for communication between the two separate networks. See section [4.7 Configure the RMC for 2 Network mode](#).



IMPORTANT NOTE: If the RMC is inside an XCore enclosure, then only Ethernet port 1 is accessible on the outside of the enclosure (the outside Ethernet connector is connected to the onboard Ethernet port 1 from the factory). Access to Ethernet port 2 requires internal access to the enclosure.

If Ethernet port 1 must be available for local communication, plan the use of the Ethernet port 2 carefully if you connect to a network and additional equipment. Never connect both ports to an external Ethernet switch at the same time ([Figure 4-16](#)). When two ports connect to the same switch they are both disabled, and any existing Ethernet connections to the device are lost.

4.5.2 IP addressing

Enabling network communication between the RMC and other field devices requires unique IP addresses for each device. The default IP addresses from the factory are not unique and should not be used if the Ethernet interfaces are configured for network connection. The RMC Ethernet interface supports static (manual) or dynamic (DHCP) IP addressing. Static addressing is recommended.

Configure the RMC with a valid public IP address or an address from the well-known private address ranges reserved by Internet authorities. If conserving IP addresses, a private address can be used if port forwarding is available on the node with the uplink to the customer WAN. A router or an XIO in port-forwarding mode can perform this function.

The number of IP addresses required for the RMC depends on the Ethernet mode:

- 1 Network mode requires only one IP address.
- 2 Network mode requires two IP addresses if both interfaces will be in use.

For full configuration, follow the procedure that applies to the required topology and Ethernet mode. See sections [4.6 Configure the RMC for 1 Network mode \(2-port switch\)](#) or [4.7 Configure the RMC for 2 Network mode](#).



IMPORTANT NOTE: The RMC default Ethernet mode is 1 Network (2-port switch mode). The Ethernet ports are disabled by default.



IMPORTANT NOTE: If you are connected to one of the Ethernet ports to configure the RMC-100, changing the Ethernet configuration and restarting the interface will cause you to lose connection. Make sure to configure your laptop with an IP address compatible with the new IP address assigned to the RMC. Re-establish connection using the new RMC IP address after the device restarts.

4.6 Configure the RMC for 1 Network mode (2-port switch)

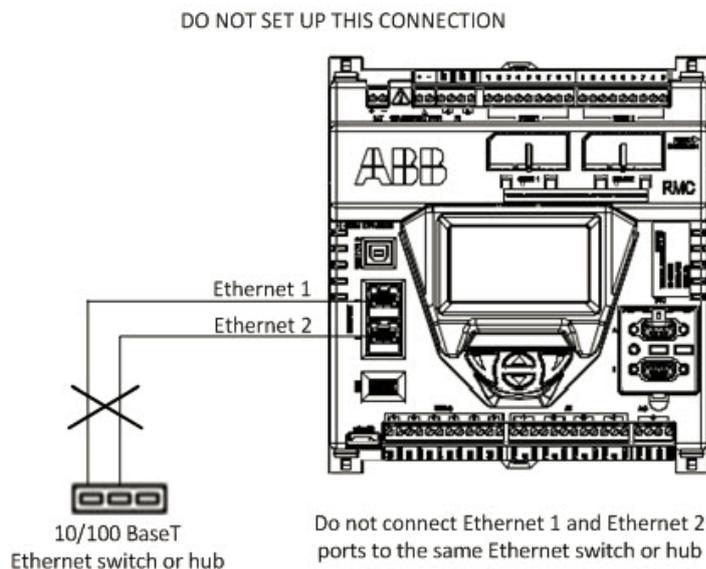
The RMC supports switching capability and can behave as a 2-port switch. This mode of operation is the factory default and is displayed as: 1 Network, in the Mode field on the PCCU Networking tab screen.

The 1-Network mode simplifies IP parameter configuration, especially in installations with multiple ABB devices. The local field LAN switch, the RMC-100, and any additional devices, can be configured for and communicate through a single subnet. This mode supports remote and local access to both the RMC and attached devices without the need of additional routing equipment on the field.



IMPORTANT NOTE: When the RMC is in 1 Network mode (2-port switch), never connect the Ethernet ports to an external Ethernet switch at the same time ([Figure 4-16](#)). Connecting to the same switch in this mode causes loss of connections to the device. Connect only one port to the switch.

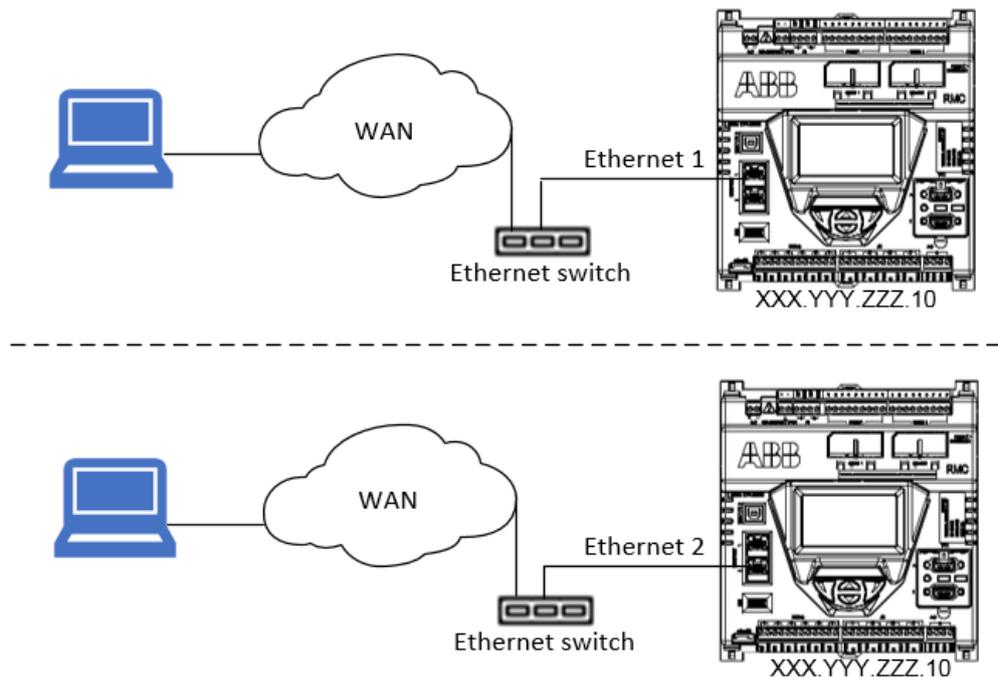
Figure 4-16: Incorrect connection of RMC (in 2-port switch mode) to a network switch



4.6.1 Remote access to RMC by host (connections)

[Figure 4-17](#) shows remote access through the customer wide area network. Use either Ethernet port to connect the RMC to the field network switch. The RMC's IP address is a non-default generic number as an example. The subnet address the RMC is configured for is represented by "ZZZ". The address remains the same whether the RMC is connecting using Ethernet port 1 or 2.

Figure 4-17: Remote access by host to an RMC-100 in 2-port switch mode



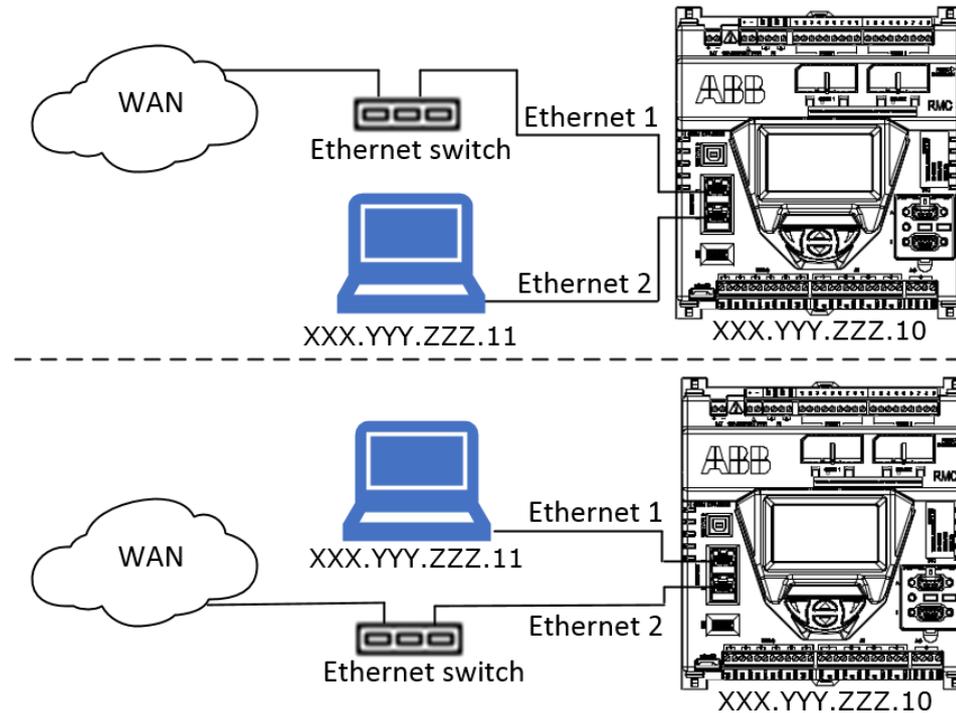
4.6.2 Local access to RMC by host (connections)

[Figure 4-18](#) shows local access with an RMC that has been configured for connection to the customer wide area network. Local access to the RMC using Ethernet does not require disconnecting the RMC from the network. You can connect to the unused Ethernet port while leaving the connection to the network intact.



IMPORTANT NOTE: When the RMC is configured for network connection, the default IP address is no longer available. The laptop must have an IP address compatible with the new non-default address assigned to the RMC.

Figure 4-18: Local access to an RMC-100 with non-default IP address



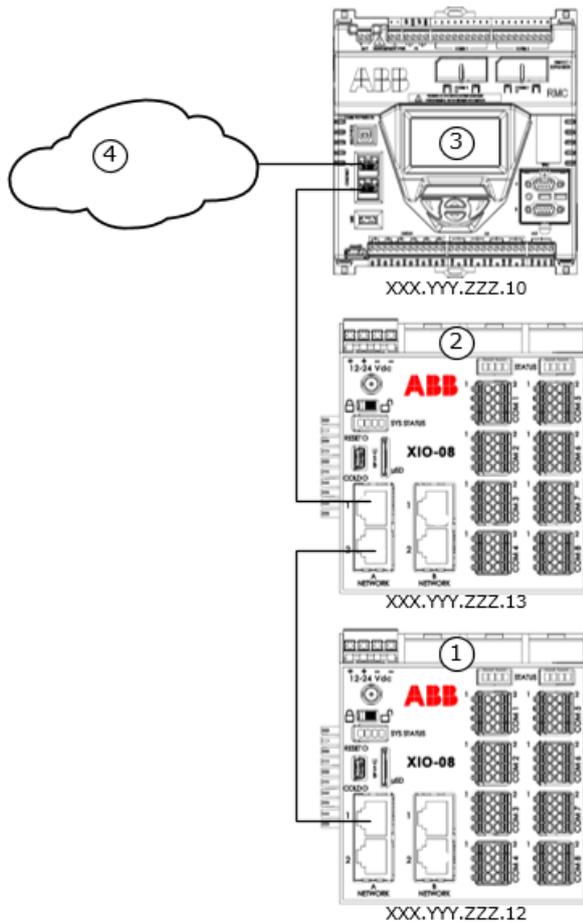
4.6.3 Daisy-chain connection support for other devices

The RMC in 1 Network (2-port switch) mode supports daisy-chain connections with other devices.

Additional devices in the field can connect to a local network switch (star topology) or to the RMC for the uplink to the wide area customer network (daisy-chain topology). [Figure 4-19](#) shows an example of a daisy-chain of multiple XIOs and an RMC. Because the XIOs have multiple ports, they can also support additional devices. To simplify device management and configuration, daisy chained XIOs are also in switched mode. Ethernet interfaces connected through the chain are combined into a single network; their assigned IP addresses have the same common subnet (in the example the generic subnet is represented by "ZZZ", and each device has a unique IP address on that subnet).

An RMC in 1 Network mode forwards traffic between the network and daisy-chained devices transparently. [Figure 4-19](#) shows an example of daisy-chain connection support with two XIOs. The local network switch is not shown (The local switch may have a limited number of ports and support only the RMC and the uplink connection). RMC port E1 connects to the customer network and port E2 daisy-chains to the XIOs (in 4-port switch mode for this example).

Figure 4-19: RMC-100 daisy-chain connection support for additional devices (example: XIOs)



Legend for Figure 4-19: RMC-100 daisy-chain connection support for additional devices (example: XIOs)

1	XIO (4-port switch mode)	3	RMC: 1 Network Mode (2-port switch)
2	XIO (4-port switch mode)	4	Customer wide area network (WAN)



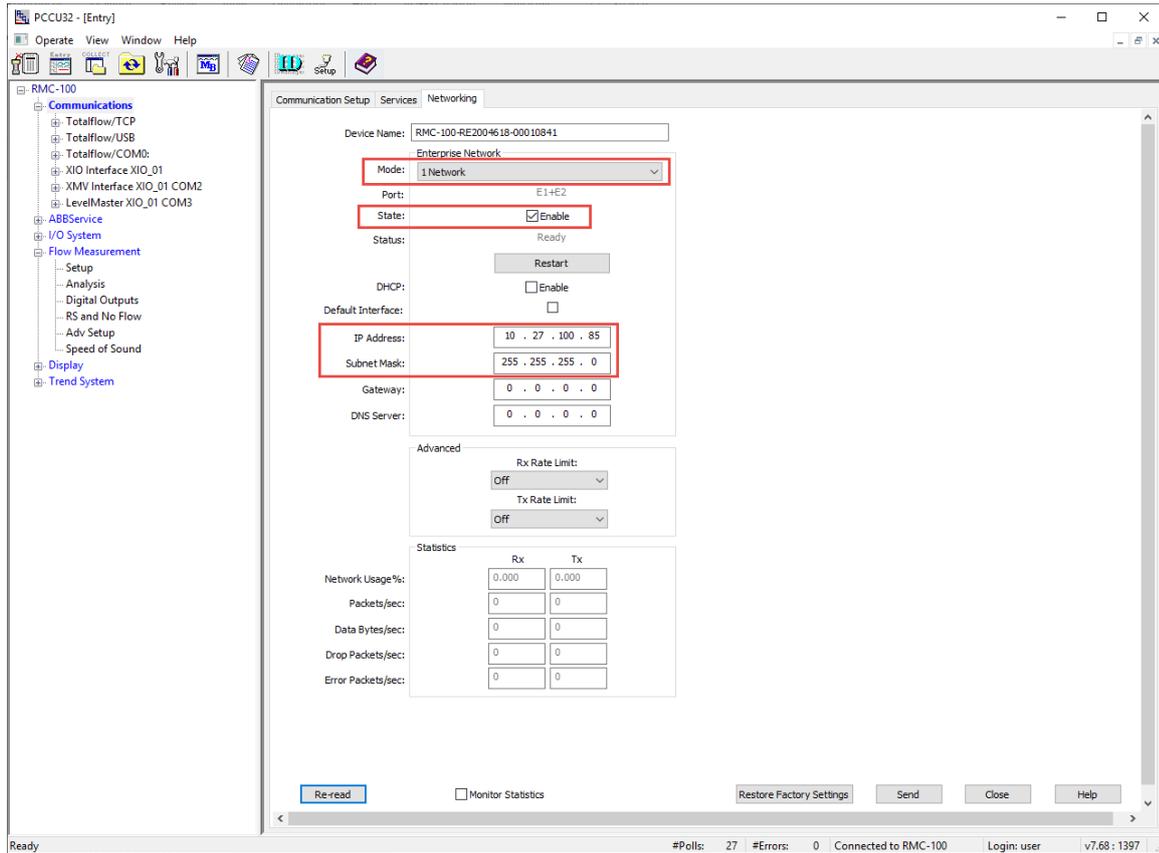
IMPORTANT NOTE: The RMC supports connection with single-port devices, but the daisy-chain is limited to two devices as the single-port device does not have additional ports to connect other devices. With multi-port devices such as other RMCs or XIOs, the daisy-chain can include more than 2 devices.

4.6.4 Procedure to configure 1 Network mode

To configure the RMC-100 as a 2-port switch (1 Network mode):

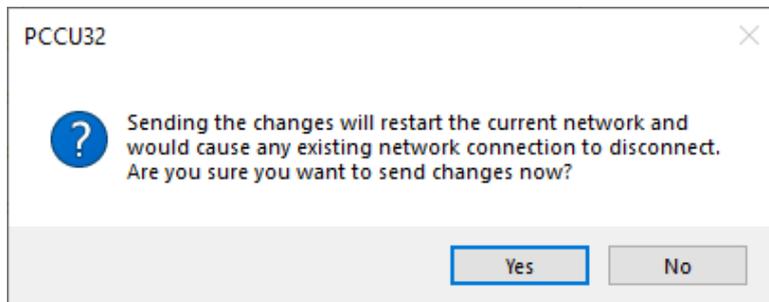
1. Connect the Ethernet cable from the RMC to the network communication equipment (hub, switch, router, etc.).
2. Verify the Ethernet port LED is green (the network Ethernet link is on).
3. Start PCCU on the laptop.
4. Configure the network parameters:
 - a. Select **Communications** on the PCCU navigation tree. The Communications Setup tab displays.
 - b. Select the **Networking** tab ([Figure 4-20](#)).
 - c. Verify that the Ethernet Mode is set to **1 Network** (default).
 - d. Verify that the Ethernet interface State is set to **Enable**.
 - e. If using DHCP for dynamic addressing, set DHCP to **Enable**.
 - f. If using static addresses (recommended), type each of the parameters: IP Address, Default Gateway, and Subnet Mask.

Figure 4-20: Network communication setup for 1 Network mode



5. Click **Send**. The device saves the updated configuration.
6. Click **Restart**. A warning displays to confirm.

Figure 4-21: Warning before interface restart



7. Click **Yes**.
8. Click **OK**.
9. Verify that the configuration is correct. If DHCP is enabled, ensure the RMC has obtained its required IP parameters (the IP parameter fields must be automatically populated after the restart).
10. Ping the device from the WAN or field network. The RMC should reply to the ping from the network.
11. If connecting another device to the RMC-100 in daisy chain fashion, configure the device with a unique IP address in the same subnet as the IP address configured on the RMC.
12. Verify that you can reach the connected device by pinging its IP address.

4.7 Configure the RMC for 2 Network mode

The RMC in 2 Network mode separates the two Ethernet interfaces into two logical networks (VLANs). This mode of operation is displayed as: 2 Networks, in the Mode field on the PCCU Networking tab screen.

The 2-Network mode isolates traffic on each of the RMC Ethernet ports. Isolating or routing traffic depends on your field requirements and available network equipment. Obtain valid IP parameters for configuration.



IMPORTANT NOTE: The configuration to support routing between the networks is not detailed in this manual. If an external router is used, ensure its IP address is also configured (Gateway parameter). The examples shown in this section assume no external routing between subnets.

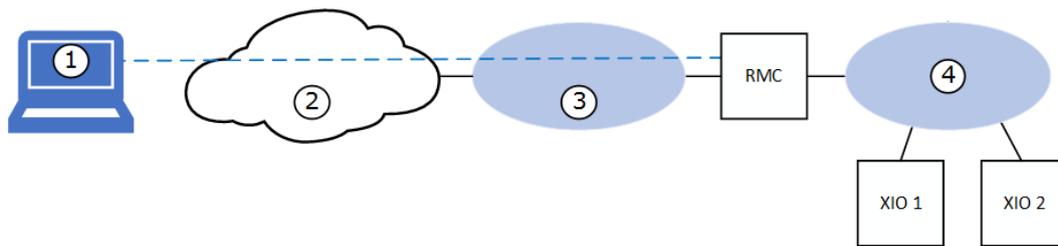
If there are any XIOs at the field site, consider using an XIO in port forwarding mode. This function allows isolation of the field network from the WAN connection, while allowing the traffic to specific TCP ports on field devices to flow from the WAN. For more information on the XIO port forwarding feature, see the XIO User Manual or the Network Communication Guide. (Links to documents provided in [Additional information.](#))

4.7.1 Remote access to RMC by host (logical diagram)

The 2 Network mode supports remote access to the RMC (through the port used for the network uplink) but does not support access to any devices attached to the other port. Attached devices remain isolated unless an external router is installed to provide communication between the two subnets.

[Figure 4-22](#) shows the two logical subnets resulting from the 2 Network mode: E1-LAN and E2-LAN. Establish a remote connection to the RMC using the IP address assigned to the Ethernet port used for the corporate network uplink (in this example, E1). Additional ABB devices (in this example, XIO 1 and XIO 2) are daisy-chained to the RMC through port E2. The host cannot access those devices since the RMC isolates these devices from the WAN. IP addresses assigned to the XIOs are not reachable from the host.

Figure 4-22: Remote access to RMC in 2 Network mode



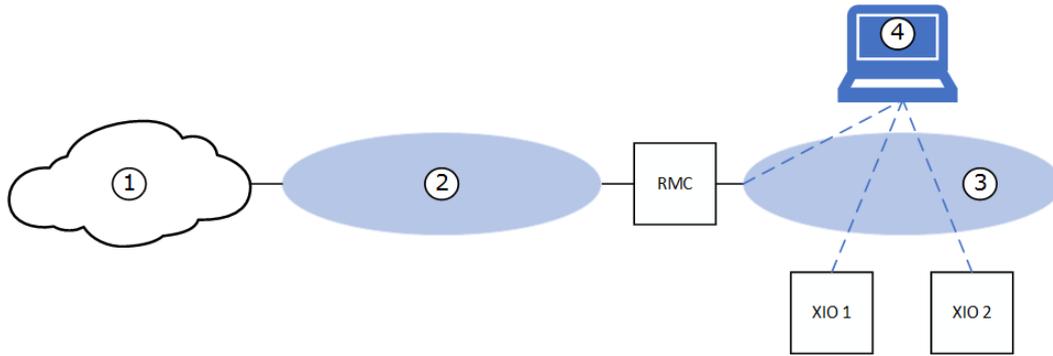
Legend for Figure 4-22: Remote access to RMC in 2 Network mode

1	Host system with PCCU
2	Customer Wide Area Network (WAN)
3	RMC (2 Networks mode): E1-LAN
4	RMC (2 Networks mode): E2-LAN

4.7.2 Local access to RMC/daisy chained devices (logical diagram)

[Figure 4-23](#) shows access to the RMC and daisy-chained devices. Connect to the RMC and daisy-chained devices through the subnet associated with port E2 (E2-LAN).

Figure 4-23: Local access to RMC and daisy chained devices



Legend for Figure 4-23: Local access to RMC and daisy chained devices

1	Customer Wide Area Network (WAN)
2	RMC (2 Networks mode): E1-LAN
3	RMC (2 Networks mode): E2-LAN
4	Operator laptop

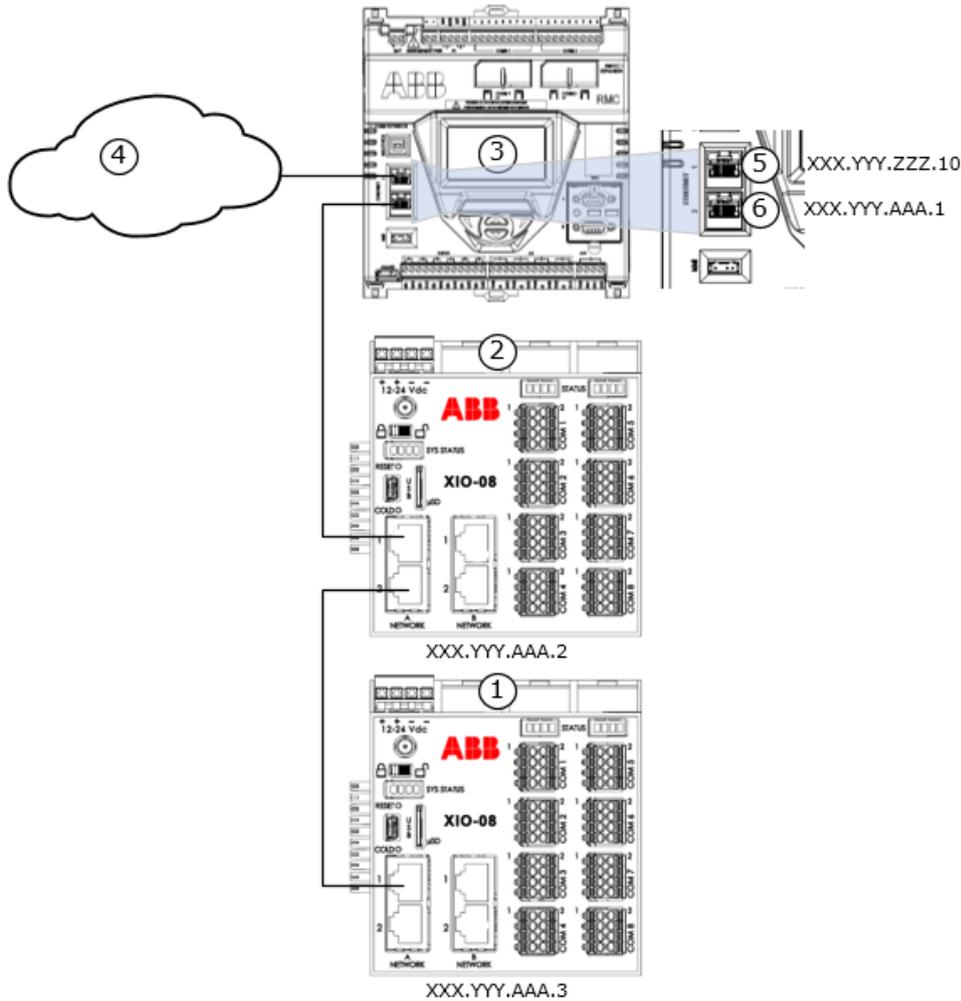
4.7.3 Procedure to configure 2-Networks mode

Figure 4-24 shows an RMC supporting daisy-chain connection to a couple of XIOs. While physical connections are the same as for 1 Network mode, the logical networks resulting from this mode are not the same. Port E1 and E2 are each associated with a different network [E1 LAN (5) and E2 LAN (6) in the callout]. The XIOs connected on RMC port E2 are no longer part of the network associated with RMC port E1. Each of the RMC Ethernet interfaces requires an IP address on a different subnet. The figure shows generic IP addresses for each of the RMC Ethernet interfaces in two different subnets ("ZZZ" for E1 and "AAA" for E2).



IMPORTANT NOTE: The XIOs daisy-chained to RMC-E2 (6) are in 4-port switch mode and therefore each require a single IP address on the same subnet ("AAA"). For additional information on configuration for different XIO modes, refer to the Network Communications Guide or the XIO User manual. See [Additional information](#) for links to these documents.

Figure 4-24: RMC daisy-chain connection support (2-Networks mode)



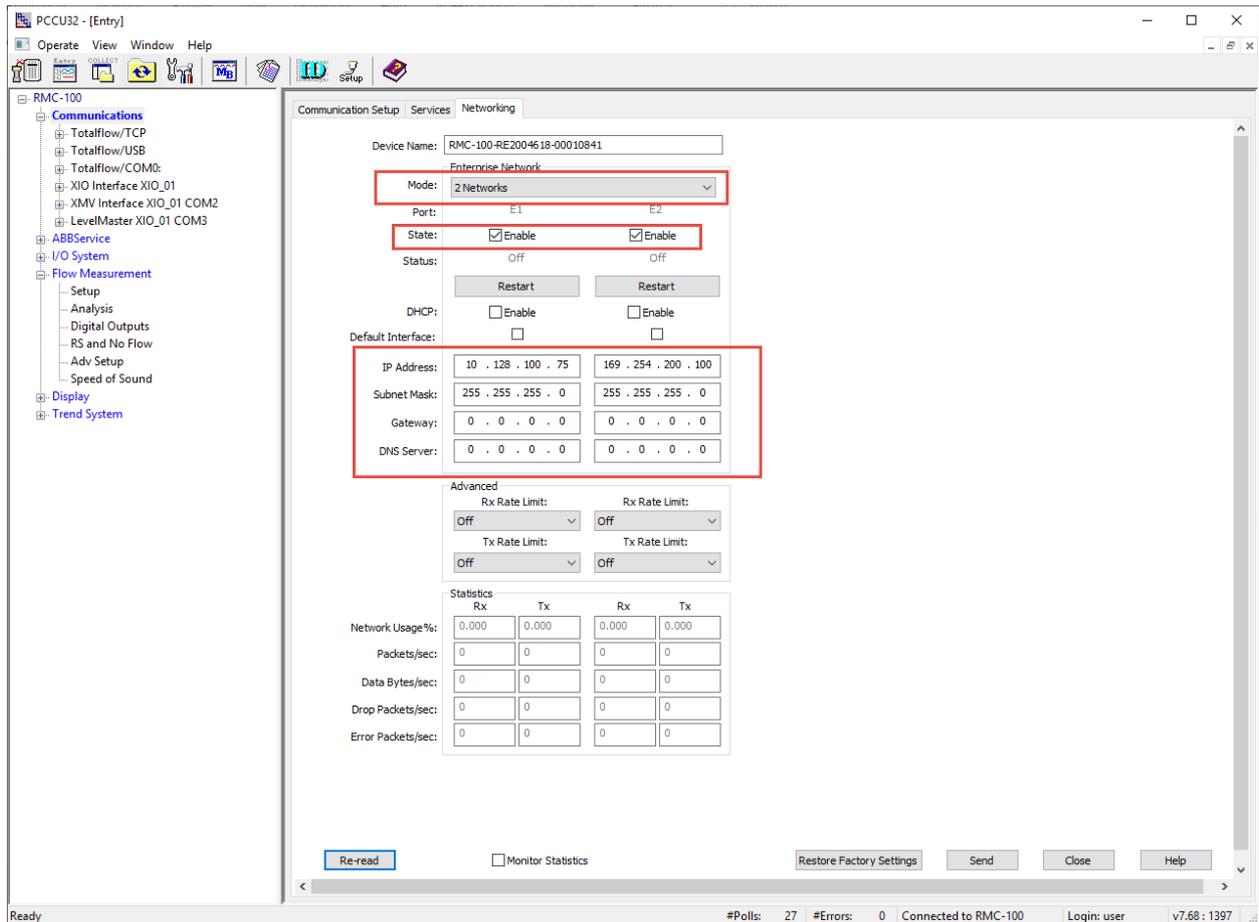
Legend for Figure 4-24: RMC daisy-chain connection support (2-Networks mode)

1	XIO (4-port switch mode)	4	Customer Wide Area Network (WAN)
2	XIO (4-port switch mode)	5	RMC-E1 (LAN E1)
3	RMC (2 Network Mode)	6	RMC-E2 (LAN E2)

To configure the RMC for 2 Network mode:

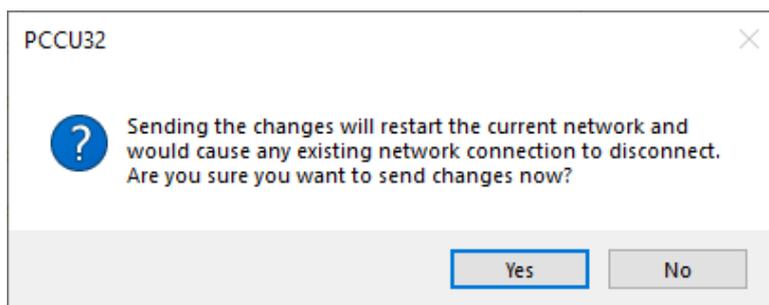
1. Connect the Ethernet cable from the RMC to the network communication equipment (hub, switch, router, etc.).
2. Verify the Ethernet port LED is green (the network Ethernet link is on).
3. Configure the Ethernet mode.
 - a. Select Communications on the PCCU navigation tree. The Communications Setup tab displays.
 - b. Select the Networking tab ([Figure 4-25](#)).
 - c. Verify that the Ethernet Mode is set to 2 Networks. The screen displays parameter fields for two interfaces since each port will be assigned to a separate network.
4. Configure Ethernet interfaces for the appropriate subnet. For each interface:
 - a. Verify that the Ethernet interface State is set to: **Enable**.
 - b. If using DHCP for dynamic addressing, set DHCP to: **Enable**.
 - c. If using static addresses, type each of the parameters: **IP Address**, **Default Gateway**, and **Subnet Mask**.

Figure 4-25: Network communication setup for 2 Network mode



5. Click **Send**. A message advises you to warm-start or reset the device for the changes to take effect.
6. Click **Restart**. A warning displays to confirm.

Figure 4-26: Warning before interface restart



7. Click **Yes**.
8. Click **OK**.
9. Verify that the configuration is correct. If DHCP is enabled, ensure the RMC has obtained its required IP parameters (the IP parameter fields must be automatically populated after the restart).
10. Ping the device from the WAN or field network. The RMC should reply to the ping from the network.
11. If connecting another device to the RMC-100 in daisy chain fashion, configure the device with a unique IP address in the same subnet as the IP address configured on the RMC.
12. Verify that you can reach the connected device by pinging its IP address.



IMPORTANT NOTE: Any TCP/IP connection is lost when the RMC IP address changes and the interface restarts. Reconfigure the laptop or PC with an IP address compatible with the new RMC IP address to reestablish connection.

4.8 Expand serial communication capacity

The RMC supports serial communication expansion through ABB XIOs or third-party Ethernet-to-Serial devices. Connection with this type of equipment requires networking communication over Ethernet. Ensure all devices have valid and unique IP addresses. Static IP addressing for devices is recommended. See section [4.5 Configure Ethernet network communication](#).

4.8.1 Expand with ABB's XIO

The RMC supports serial port expansion through ABB's Extendible IO devices (XIOs). The RMC-XIO combination provides an integrated solution designed to transparently handle devices on XIO remote ports as if they were local ports on the RMC. The RMC can obtain measurement data from peripherals, such as measurement transmitters, connected to XIO COM ports. The following applications are used to increment serial port capacity:

- The XIO Interface Application on an RMC: Supports RMC application access to serial communication applications interfacing with remote devices connected to an XIO. Applications on the XIO are exported to the RMC and are visible from there as if local to the RMC.
- The Ethernet-Serial Passthrough Application on an XIO: Supports transparent Ethernet-serial communication conversion or TCP Gateway functions. The XIO behaves as converter/tunnel for serial communication over TCP connections.

XIOs can be co-located with an RMC on the same cabinet or be in their own enclosure at a distance from the RMC in the same field. RMC-XIO communication is over Ethernet. For additional details, refer to the **XIO User Manual**, or the individual guides for each application: The **XIO Interface** or **Ethernet-Serial Passthrough** Application Guides. See [Additional information](#) for the links to these documents.



IMPORTANT NOTE: The two configuration options for connection with the XIO (XIO Interface and Ethernet-serial passthrough) provide complete and integrated statistics for monitoring and troubleshooting. The XIO supports PCCU as the configuration interface for a fully integrated and seamless solution.

4.8.2 Expand with third-party Ethernet-serial devices

The RMC also supports serial port expansion through third party Ethernet-serial devices. The RMC can obtain measurement data from peripheral devices such as measurement transmitters connected to the third-party devices performing Ethernet-serial passthrough. For an example of connection to a third-party converter see section [10 Serial port expansion with MOXA® modules](#).



IMPORTANT NOTE: Using a third-party Ethernet-serial device does not provide any integrated monitoring or troubleshooting capabilities as is provided when using ABB's XIOs. The configuration of the device requires the vendor's user interface which is separate from ABB's PCCU. In addition to Ethernet-Serial conversion, the XIO also provides full controller capabilities, which third-party converters may not support. The XIO is recommended when seamless integration and flexibility is required.

4.9 Configure input and output

Configure I/O settings in PCCU32 Expert view mode. Select I/O System on the navigation tree.

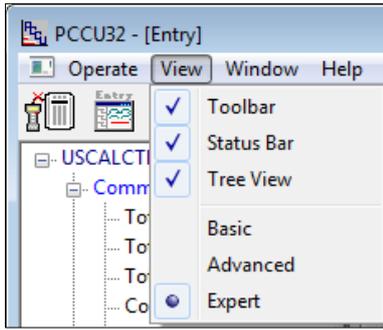
4.9.1 Change the view option

The default view is Advanced. Change from Advanced to Expert view to configure the I/O.

To change the view option:

1. Click **View** on the menu bar and select **Expert** from the drop-down list. ([Figure 4-27](#)).

Figure 4-27: PCCU32 Expert view



4.9.2 Analog input configuration

To configure the analog input:

1. Click **I/O System** on the navigation tree. The Analog Inputs tab displays ([Figure 4-28](#)).

Figure 4-28: Analog input configuration

Analog Inputs							
Analog Output							
Digital I/Os							
Pulse Inputs							
	Description	Value	Signal	Calibration	Bias	Engr Low	Engr High
7.4.0	AI 1	0.020	0-30Volt	Factory	0.000	0.000	100.000
7.4.1	AI 2	0.020	0-30Volt	Factory	0.000	0.000	100.000
7.4.2	AI 3	0.020	0-30Volt	Factory	0.000	0.000	100.000
7.4.3	AI 4	0.020	0-30Volt	Factory	0.000	0.000	100.000

2. Click the **Signal** field and select 0-30 Volt or 4-20 mA from the drop-down list.
3. Click **Send**.

4.9.3 Analog output configuration

This configuration defines the AO value as a percentage of the full scale, or in engineering units. The engineering units depend on the type of external device that connects to the AO.

Calibrate the AO before defining non-default engineering units for the first time. Define engineering units from the AO Calibration screen after calibration is complete. These defined engineering units automatically display on the Analog Output tab ([Figure 4-29](#)).

Figure 4-29: Analog output configuration

Analog Inputs		
Analog Output		
Digital I/Os		
Pulse Inputs		
	Description	Value
7.3.200	AO % of Full Scale	0
7.3.204	AO Engineering Units	4

See section [7.2](#) Analog output calibration.

4.9.4 Digital input and output configuration

The six (6) DI/DO ports support configurable input or output modes of operation.

Configure input thresholds in input mode for an input voltage range of 0 to 30 Vdc. Configure the built-in pull-up resistor to read signals from devices with dry contact and open collector/drain output types.

In output mode, a MOSFET Open Drain (OD) type output can sink up to 2 amps (direct current).

To configure each digital input or output:

1. Click **I/O System** on the navigation tree.
2. Click the **Digital I/Os** tab ([Figure 4-30](#)).

Figure 4-30: Digital input and output configuration

Analog Inputs Analog Output Digital I/Os Pulse Inputs					
	Description	Type	Value	State	Initial Value
7.2.36	Digital I/O 1	Digital Input (Voltage)	0	Open	
7.2.37	Digital I/O 2	Digital Input (Voltage)	0	Open	
7.2.38	Digital I/O 3	Digital Input (Voltage)	0	Open	
7.2.39	Digital I/O 4	Digital Input (Voltage)	0	Open	
7.2.40	Digital I/O 5	Digital Input (Voltage)	0	Open	
7.2.41	Digital I/O 6	Digital Input (Voltage)	0	Open	

3. Select the Type from the drop-down list (Digital Input is the default).
4. Configure each Digital I/O:
 - Digital input mode: select the low and high threshold voltage.
 - Digital output mode: select the current value and the initial value.
5. Click **Send**.

4.9.5 Pulse input configuration

Each pulse input has a debounce filter. Without debounce, the PI operates at a frequency range of 0 to 20 kHz. With debounce the frequency range is 1 to 550 Hz.

To configure the pulse input:

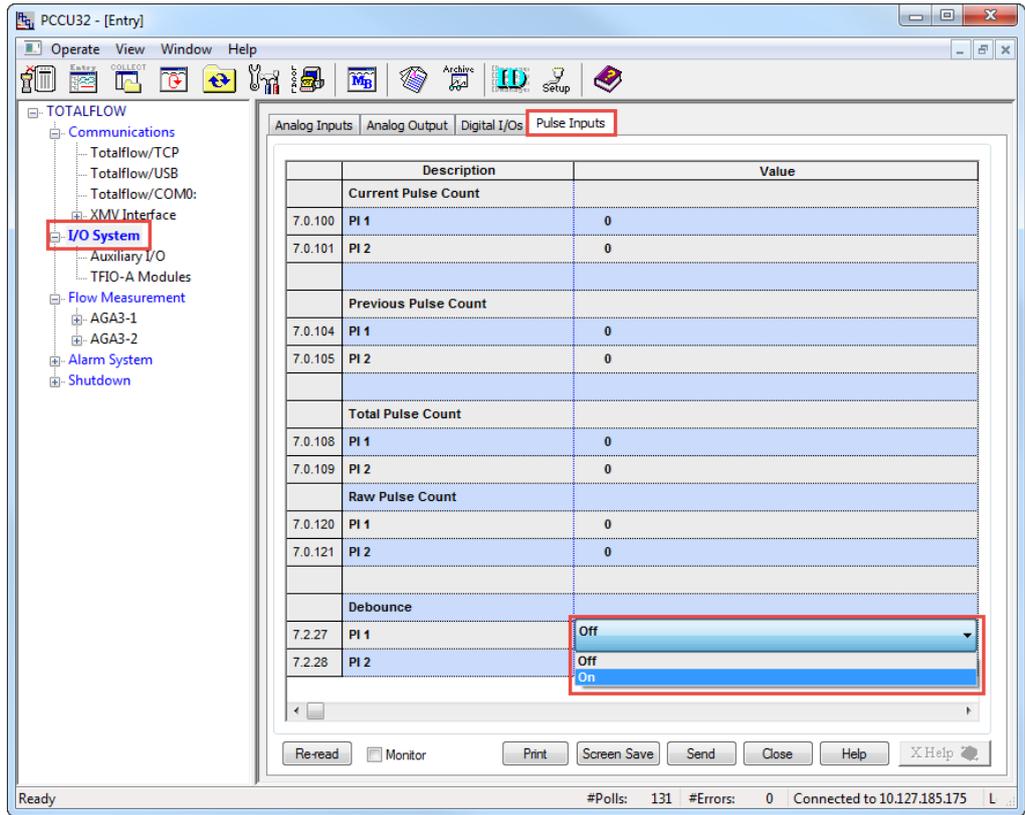
1. Click **I/O System** on the navigation tree.
2. Click **Pulse Inputs** ([Figure 4-31](#)).

Figure 4-31: Pulse input configuration

Analog Inputs Analog Output Digital I/Os Pulse Inputs		
	Description	Value
Current Pulse Count		
7.0.100	PI 1	0
7.0.101	PI 2	0
Previous Pulse Count		
7.0.104	PI 1	0
7.0.105	PI 2	0
Total Pulse Count		
7.0.108	PI 1	0
7.0.109	PI 2	0
Raw Pulse Count		
7.0.120	PI 1	0
7.0.121	PI 2	0
Debounce		
7.2.27	PI 1	Off
7.2.28	PI 2	Off

3. Click the Value field for PI 1 or PI 2 under Debounce and select **On** from the drop-down list.

Figure 4-32: Value field



4. Repeat this process for each PI port that requires debounce.
5. Click **Send**.

4.9.6 Expand I/O capacity with the ABB XIO

The RMC supports I/O expansion through ABB’s Extensible IO devices (XIO). The RMC can poll and write from/to peripherals connected to TFIO Modules installed on the XIO. The RMC’s XIO Interface application is designed to handle communication transparently with the TFIO modules as if the modules were directly connected to the RMC.

XIOs, and directly attached TFIO modules, can be co-located with an RMC on the same cabinet or be in their own enclosure at a distance from the RMC in the same field. RMC-XIO communication is over Ethernet. For additional details, refer to the XIO user manual and the I/O Interface Application guide. See [Additional information](#) for links to the documents.

4.10 Configure directly attached TFIO interfaces

To scan and transmit data using the TFIO modules, the RMC TFIO interfaces must be enabled. Connected TFIO modules are detected only when the interfaces are enabled. This procedure describes how to enable the TFIO interfaces on the RMC.

Refer to the I/O Interface application guide for additional details to configure and troubleshoot communication with TFIO modules. See the [Additional information](#) for a link to the guide.



IMPORTANT NOTE: The TFIO-A interface is enabled by default. The TFIO-B interface is disabled by default.

PCCU32 version 7.68 and later support TFIO module hot swap. Additional configuration and troubleshooting options are not available on earlier versions of PCCU.

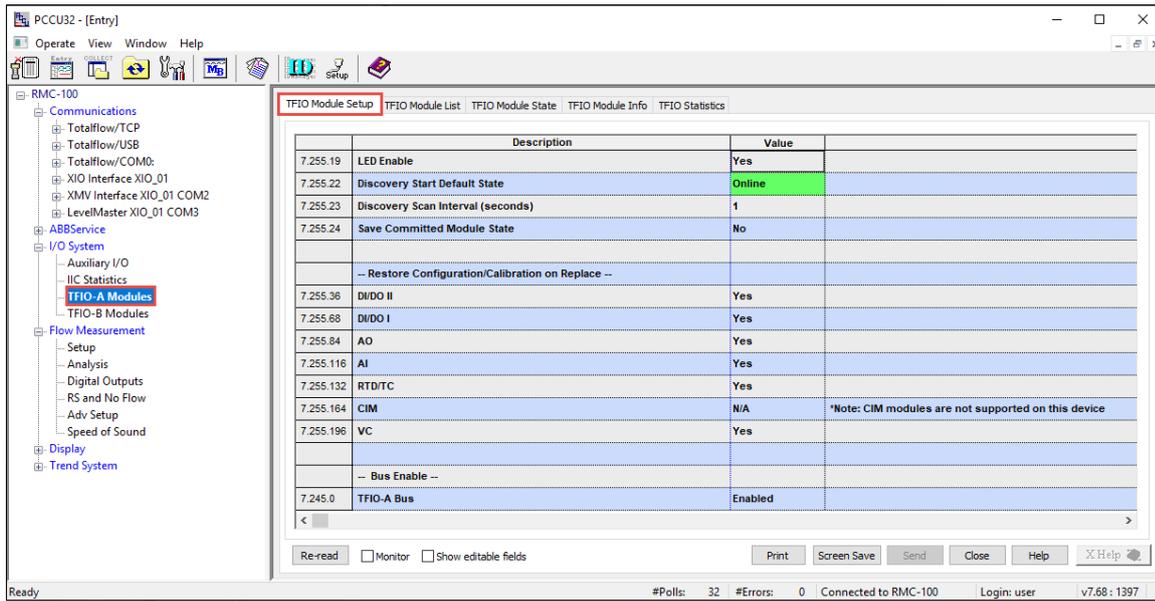


NOTICE – Equipment damage. When the TFIO interface is disabled, the modules remain powered. Remove power from the RMC before connecting or disconnecting the TFIO modules or the TFIO cable. Power down the RMC to avoid damage to the modules.

To verify or enable communication with TFIO modules:

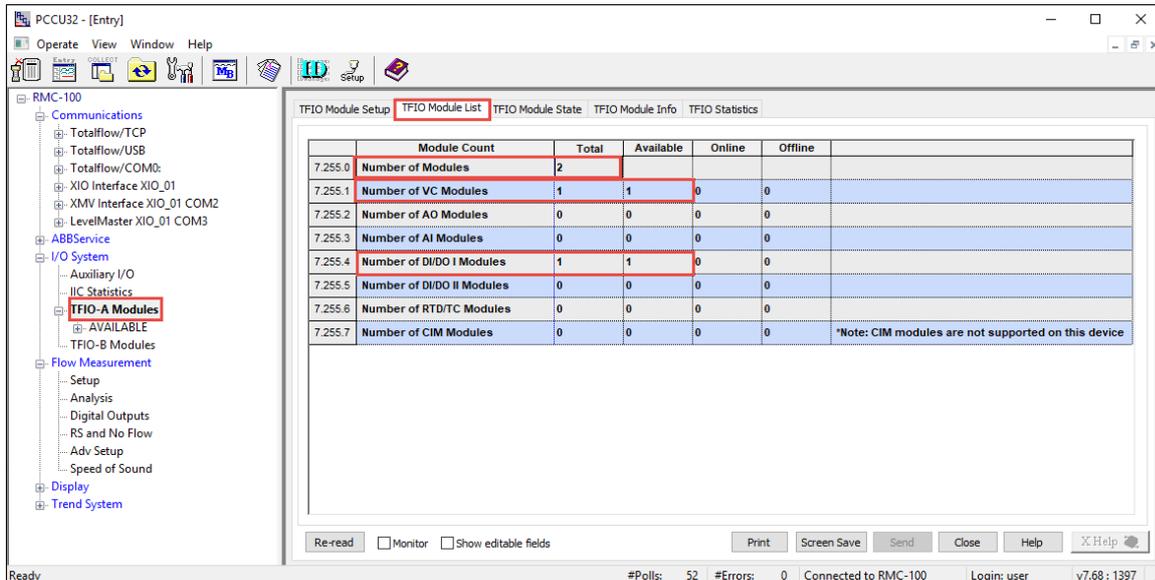
1. If modules were installed in TFIO-A, select TFIO-A Modules on the navigation tree. The TFIO Module Setup tab displays (Figure 4-33).

Figure 4-33: TFIO-A Modules Setup



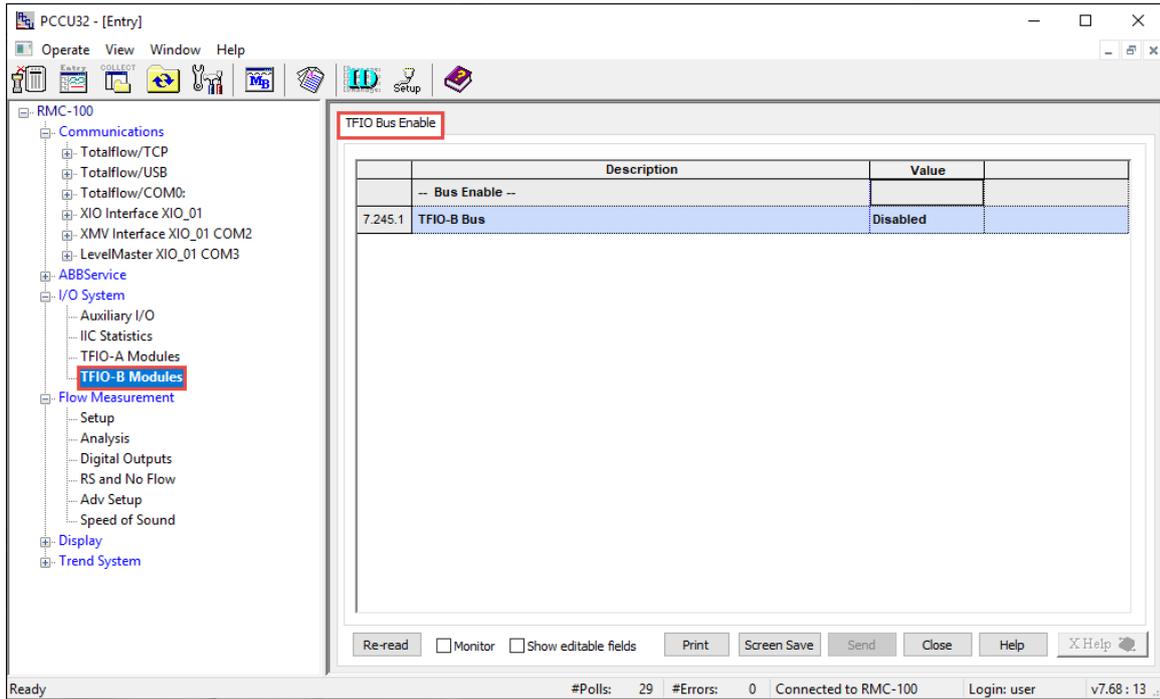
2. Click the TFIO Module List tab (Figure 4-34):
3. Verify all TFIO modules are connected and their type listed.

Figure 4-34: TFIO-A Module List



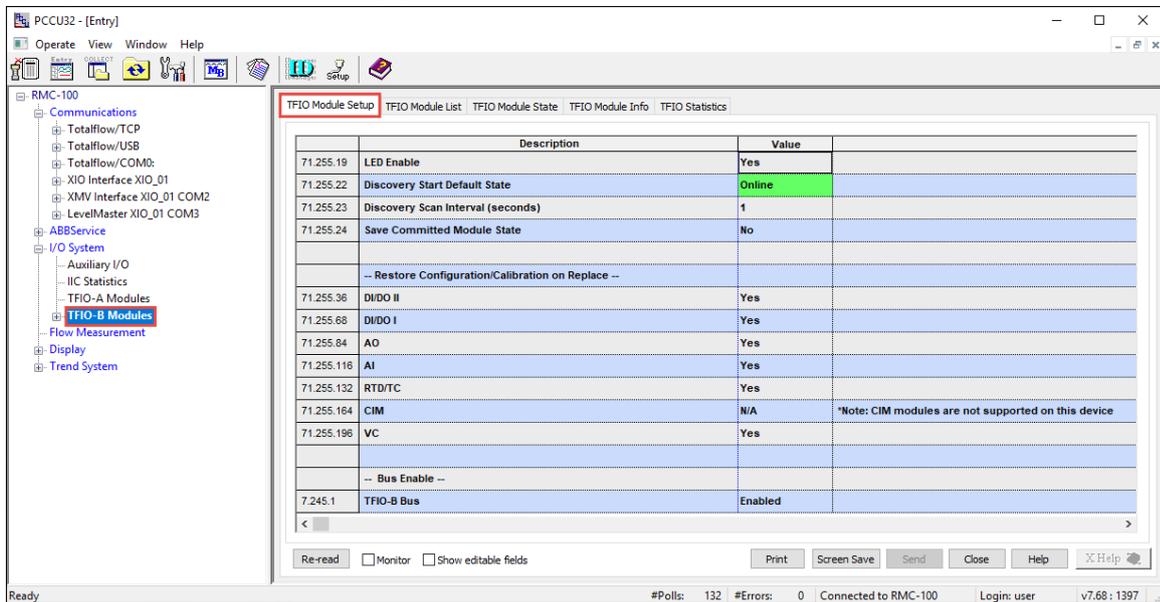
4. If modules were installed in TFIO-B, select TFIO-B Modules on the navigation tree. The TFIO Bus Enable tab displays (Figure 4-35).

Figure 4-35: TFIO-B Bus Enable tab (bus disabled by default)



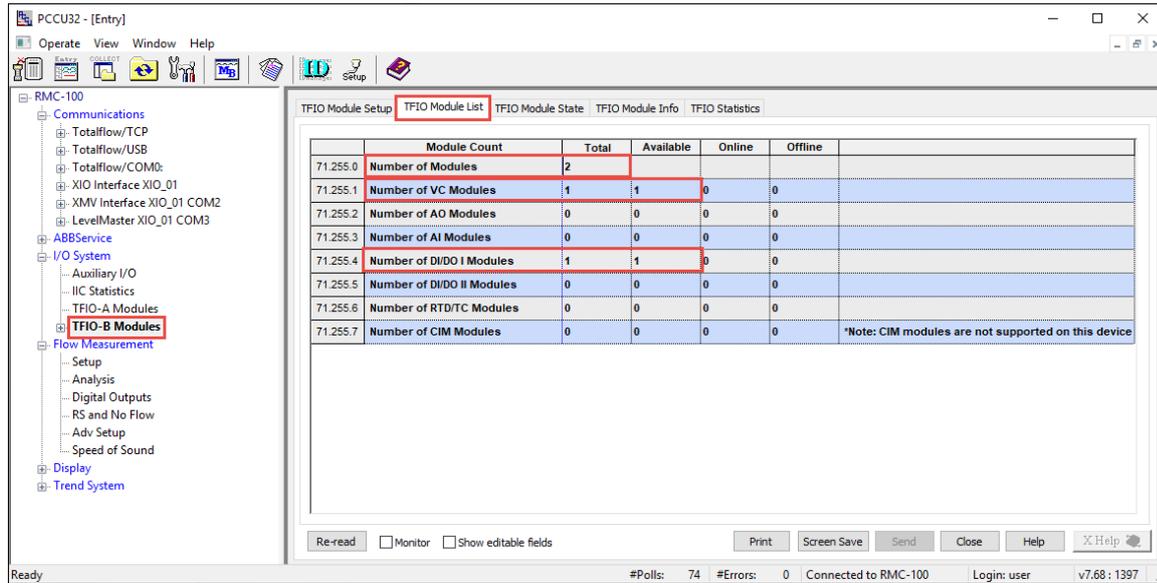
5. Select the **TFIO-B Bus** field to change to **Enabled**.
6. Click **Send**. The TFIO Bus Enabled screen clears and the navigation tree refreshes.
7. Select TFIO-B Modules from the navigation tree. The TFIO Module Setup tab displays ([Figure 4-36](#)).

Figure 4-36: TFIO-B Module Setup



8. Click the TFIO Module List tab.
9. Verify all TFIO modules are connected and their type listed ([Figure 4-37](#)).

Figure 4-37: TFIO-B Module List



- For specific module setup, expand either TFIO-A Modules or TFIO-B Modules on the navigation tree and select the desired modules for further configuration.



IMPORTANT NOTE: Click **Help** on specific TFIO module screens for additional information and parameter description. The I/O Interface has online topics that explain configuration options available on the PCCU screens.

5 Advanced setup

Customize the RMC to meet individual site needs. Complete these steps in PCCU Expert view. Click **View** on the PCCU32 menu and select **Expert** from the drop-down list.

5.1 Configure the LCD backlight

The RMC LCD backlight is configurable. Change default settings ([Figure 5-1](#)) on the Station Setup tab:

- Select one or more triggers that enable the backlight.
- Select the trigger that turns the backlight on.
- Define the number of seconds per timeout. The backlight remains on for display activity during the timeout period.

LCD Backlight Status is a read-only field that shows whether the backlight is off or on. The backlight is always off if it is disabled.

To set up the backlight:

- On the Station Setup screen, scroll down to LCD Backlight ([Figure 5-1](#)). Click **Help** for additional information about the Station Setup tab.

Figure 5-1: LCD backlight default settings

--- LCD Backlight ---	
0.7.37	LCD Backlight Status Off
0.7.36	LCD Backlight Enable Off
0.7.38	LCD Backlight Trigger Off
0.8.16	LCD Backlight timeout (seconds) 60

- Select Off or On from the LCD Backlight Enable drop-down list.
- Select an option from the LCD Backlight Trigger drop-down list: On, Off, Always On, On for Local Connections, or On for Push Buttons.

4. Type into LCD Backlight timeout the number of seconds the backlight remains lit during inactivity before it turns off.
5. Click **Send** to save the station settings.

5.2 Configure low power use

This procedure defines RMC sleep mode settings. The RMC goes into sleep mode when the power source drops below a specified voltage for a specified period of time. This prevents the battery from becoming so depleted that the RMC does not function properly. Sleep mode preserves the historical data the RMC collected before going to sleep. The RMC does not calculate new flow measurements during sleep mode.



IMPORTANT NOTE: Launch PCCU and connect to the RMC to wake it up from sleep mode. The RMC stays awake while PCCU is connected. If the battery voltage is below the specified voltage when PCCU closes, the RMC returns to sleep mode after the time specified in Sleep Mode Hold-off Time (sec).

To define low power use settings:

1. Display the Station Setup screen and scroll down to Configuration for Low Power Use ([Figure 5-2](#)).
2. Type the voltage that initiates communication cut-off into Remote Comm Cutoff Voltage.

Figure 5-2: Low power use default settings

---Configuration for Low Power Use ---		
0.10.2	Remote Comm Cutoff Voltage	11.90
0.10.3	Sleep Mode Entry Voltage	10.90
0.8.8	Sleep Mode Hold-off Time (sec)	120
0.9.11	Wake Up Time	02:00:00
0.7.14	Wake Up Time Mode	Time from Start of Sleep

IMPORTANT NOTE: The RMC uses a specified voltage to shut down the communication ports and communication equipment (radio) that it powers. This reduces power consumption, so the battery can recover.



Except for the remote communications, the RMC still functions when the RMC power level stays at the specified voltage.

Leave RMCs with a 12-volt SLA battery at the default Remote Comm Cutoff Voltage setting of 11.9 volts. RMCs powered with higher voltages, for example with a 24-volt power supply, can have a higher cutoff voltage.

Communication resumes when the voltage level returns to or exceeds the specified shut-down voltage.

3. Type the voltage for the RMC to enter sleep mode into Sleep Mode Entry Voltage.

IMPORTANT NOTE: The RMC uses a specified voltage to enter sleep mode.



Leave the default Sleep Mode Entry Voltage setting of 10.9 volts for RMCs with a 12-volt SLA battery. RMCs powered with higher voltages, for example with a 24-volt power supply, can have a higher sleep mode voltage setting.

In sleep mode, the RMC no longer functions. It only saves the last data values.

The RMC resumes function after a specified time.

4. Type the number of seconds the RMC has low power before it enters sleep mode into Sleep Mode Hold-off Time (sec).
5. Type into Wake Up Time the hours, minutes and seconds of delay before the RMC reactivates. Or, click the up and down arrows to increase or decrease the time.
6. Click **Wake Up Time Mode** and select an option (**Time from Start of Sleep** or **Time of Day**) to end sleep mode.

Display item	Default format	Description	Notes
FLOWRATE	NNNNNN.N SCF/HR	Current Flow Rate	Programmable SCF or MCF or MMCF
ACCUM VOL	NNNNNN.NN MCF	Total Accumulated Volume	Programmable SCF or MCF or MMCF
BATTERY	NN.N VOLTS	Battery Voltage	Volts
DIFF PRESS	NNN.N IN. H2O	Differential Pressure	Inches H2O
PRESSURE	NNN.N PSIA	Static Pressure Absolute	PSIA
FLOW TEMP	NN.N DEG. F	Flowing Temperature	°F
YEST VOL	NNNN.N MCF	Yesterday's Volume	Programmable SCFM or MCF or MMCF
PERIOD VOL	NNNN.N SCF	Previous Period Volume	Last volume calculation period
CHARGER	NN.N VOLTS	Charger Voltage	Volts
Orifice Dia.	NNNN.NNNN INCHES	Orifice Diameter	Inches

The RMC has a factory default display group. Create and define additional groups as necessary. Program the display groups and display items per [Table 5-1](#).

By default, each display item remains on the display for five seconds. Change the display duration to any value from 1 to 255 seconds, or zero (0) so the item does not display. Also change the engineering units and data format for the display, if necessary.

The annunciators are programmable. Assign the annunciator to an application to display specific alarms on the LCD ([Table 5-2](#)).

Table 5-2: Annunciator indicators

Indicator	Description
System	
(Blank LCD)	No annunciators display. There is no power to the RMC.
^L L	Low lithium battery alarm. When LL (low lithium) displays, the lithium battery voltage is below 2.5 Vdc. A new lithium battery measures approximately 3.6 Vdc.
^L C	Low Charger displays if the RMC battery charging voltage is (+) 0.4 Vdc, or is less than or equal to battery voltage
?	Exception Alarm Processing
Display Application	
1	The number that represents the Display Group.
↑	The value above the Data High Limit value on the Display Item Setup screen.
↓	The value below the Data Low Limit value specified on the Display Item Setup screen.
Communication Protocols	
→	Transmitting Data: sending a response
←	Receiving Data: processing a response
!	Nak: Negative acknowledgement with packet list
+	Positive acknowledge of receipt of request
⏸	Waiting for Acknowledgement: waiting for response after transmission
⏶	ID Recognized. The ID is recognized but is awaiting sync.
⏷	Listen Cycle flashes when the remote port is active and running Totalflow Remote Protocol. Flashes are in sync with the listening cycle that occurs at 1, 2 or 4 second intervals.
R	LevelMaster Protocol: LevelMaster protocol is the port assigned to this annunciator.
L	This displays when the device is connected to an MMI port.
U	This displays when the device is connected to a USB port.
¥	The Totalflow Packet Protocol selected on this port.
MODBUS®	
M	The MODBUS® ASCII protocol for the port assigned to this annunciator.
Valve Control	
V	The Valve Control option is on Expanded I/O board (plug-in RTU). Other valve control symbols do not apply.
+	The request was received.
=	The valve control option is installed. Process value (Process value, PV) is within the user-assigned dead band.
┌	The valve is in full open position.
└	The valve is in full closed position.

Indicator	Description
↑	The valve is opening. (The open signal is going to the valve actuator.)
↓	The valve is closing. (The close signal is going to the valve actuator.)
Ö	The valve RMC override conditions are met (DP/SP override set point or Low Battery).
⌚	Local Lock-out is initiated.
Measurement Application	
H	This displays when the HOLD flag is active. It also displays when: PCCU32 is being calibrated. The A to D converter cannot be read.
Z	Zero Flow Condition. This is only visible when Flow Rate displays.
A	Alarm Condition: View the alarm. Compare the application limits to current values to determine where the alarm condition is.
AD	A to D Failure. This displays if A to D Converter Absolute Differential Pressure, Absolute Static Pressure or temperature readings exceed maximum counts or are less than minimum counts.
BF	Back Flow Condition. This is visible only when a DP variable displays.
Pump Control	
F	Pump control, MODBUS® fault
P	Pump control disabled
R	Pump control Run
S	Pump control Stop
X	Pump control, External Control
Other Protocols	
C	Local console protocol
T	Local terminal protocol or TESORO® tank gauge
a	ADP protocol
b	Bluetooth® listen
n	Network listen
s	ScaData protocol
x	X-Frame host annunciator

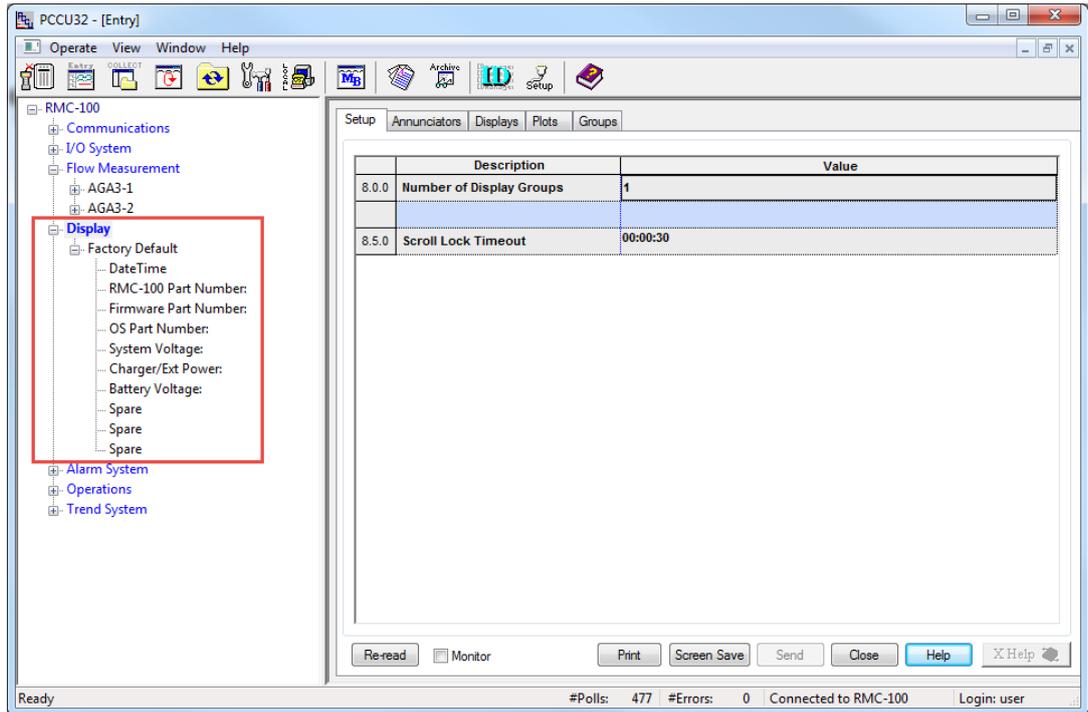
5.4.1 Configure the number of display groups

This procedure configures the number of display groups for the LCD.

A display group defines a group of variables. The RMC displays them on its LCD so they are viewable without using PCCU.

The RMC ships with a standard or a custom configuration. Either configuration might include a factory default display group for basic station parameters display. [Figure 5-5](#) shows an RMC with a single display group configured. In this example, the default display group is named Factory Default (other configurations use Station as the group's name). This group shows 7 display items with specific assignments. The LCD displays the values of these parameters. Three Spare items are unassigned, but configurable. The LCD only displays a value for these items when they are defined.

Figure 5-5: Factory default Display setup (Advanced view)

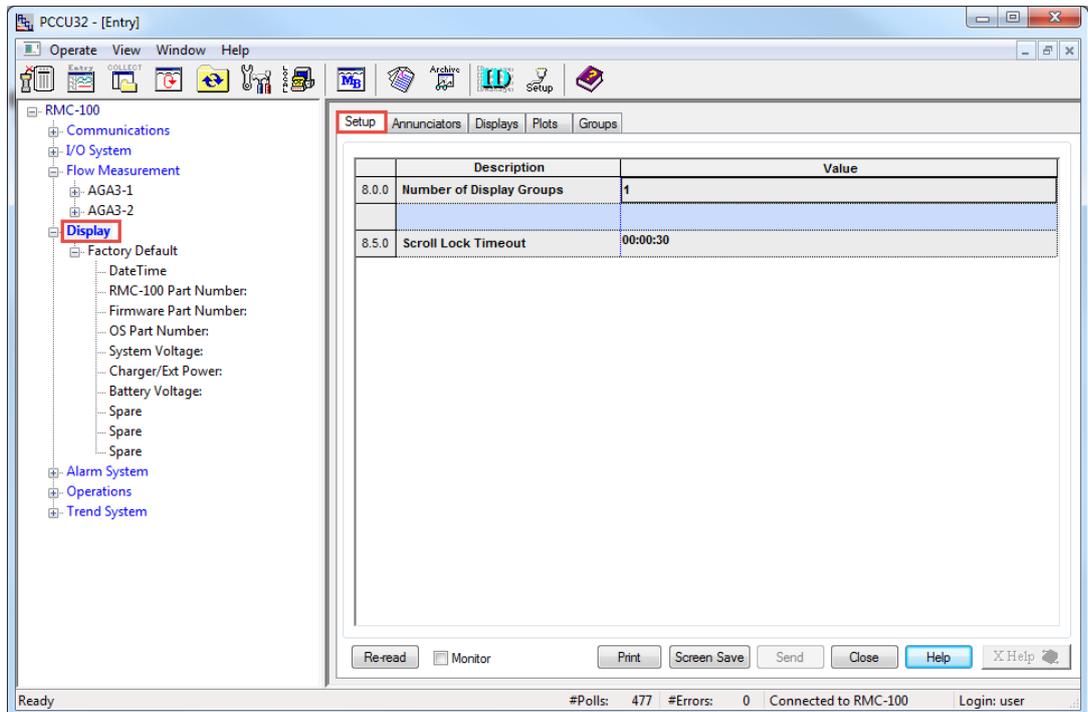


IMPORTANT NOTE: This procedure changes the number of display groups to two. The factory default group is intact. A new display group is configured to display application-specific values in section 5.4.3 Configure a display group. Configure additional display groups for your scenario as required.

To establish the number of display groups:

1. Click **Display** on the navigation tree to display the Setup tab.

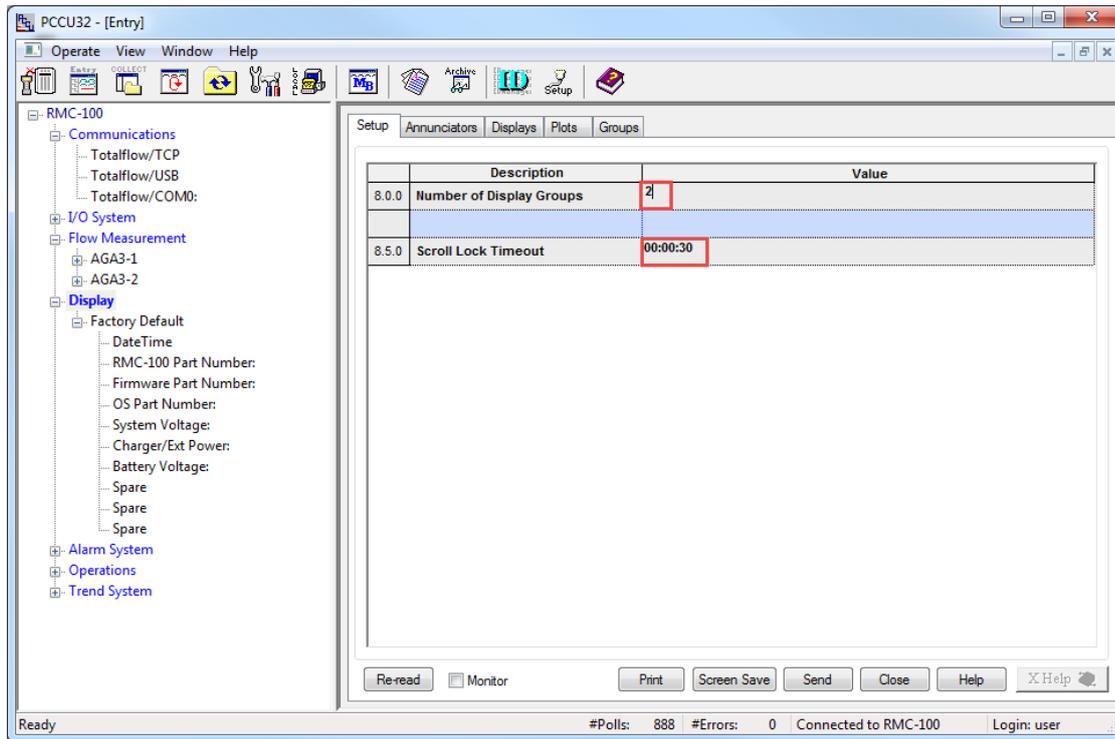
Figure 5-6: Default Display setup



2. Type into Number of Display Groups the number of the groups to scroll and display on the LCD. In this example, type **2** into the field (Figure 5-7).

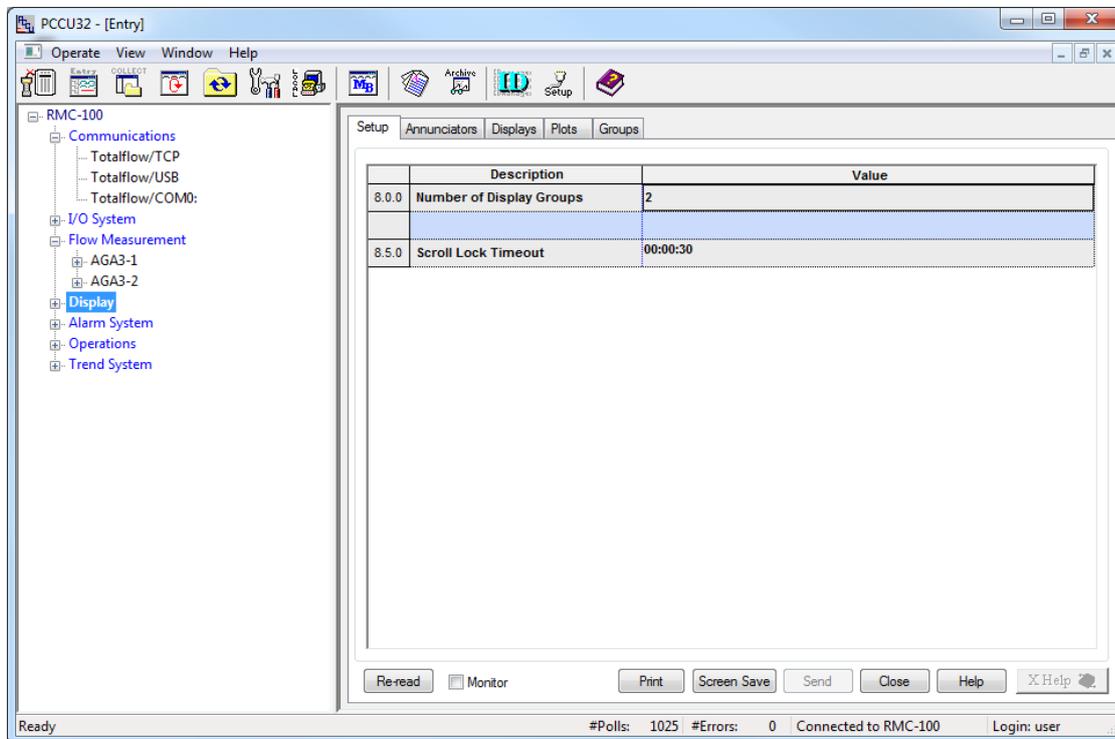
- Click the two-digit time group (hours, minutes, or seconds) in Scroll Lock Timeout and type the time. Or click the up and down arrows to set the scroll lock time.

Figure 5-7: Change default Display Setup



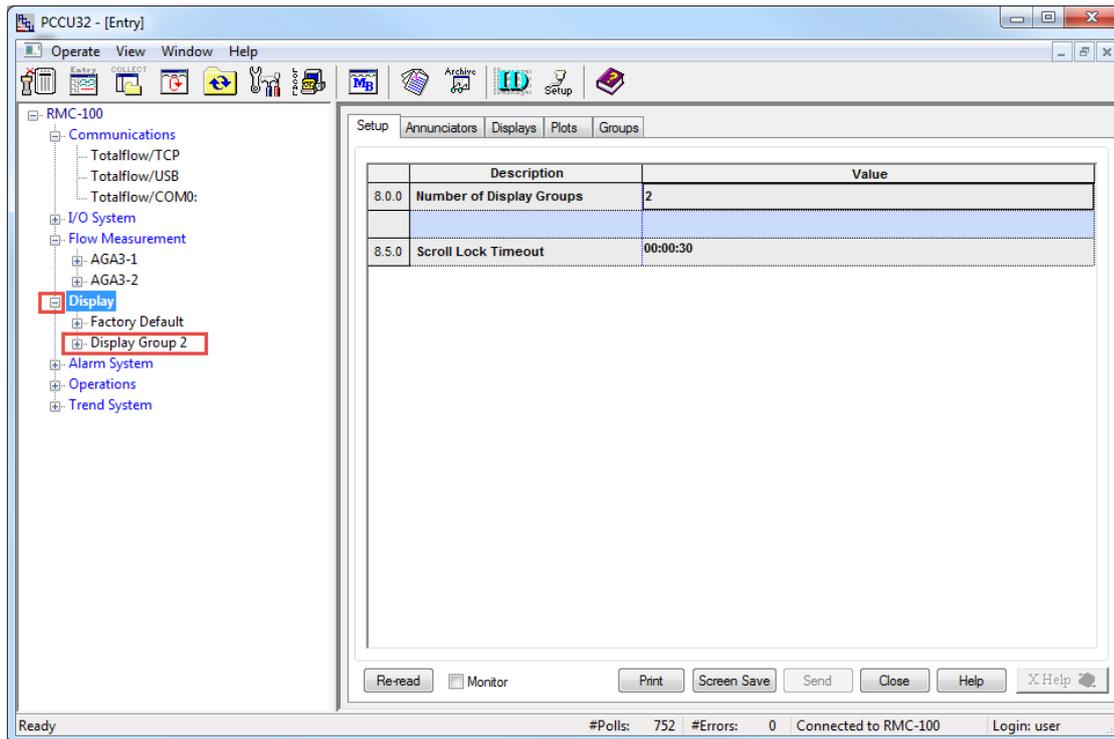
- Click **Send** to save the changes. The Setup screen displays the new number of display groups (Figure 5-8).

Figure 5-8: Display setup for two display groups



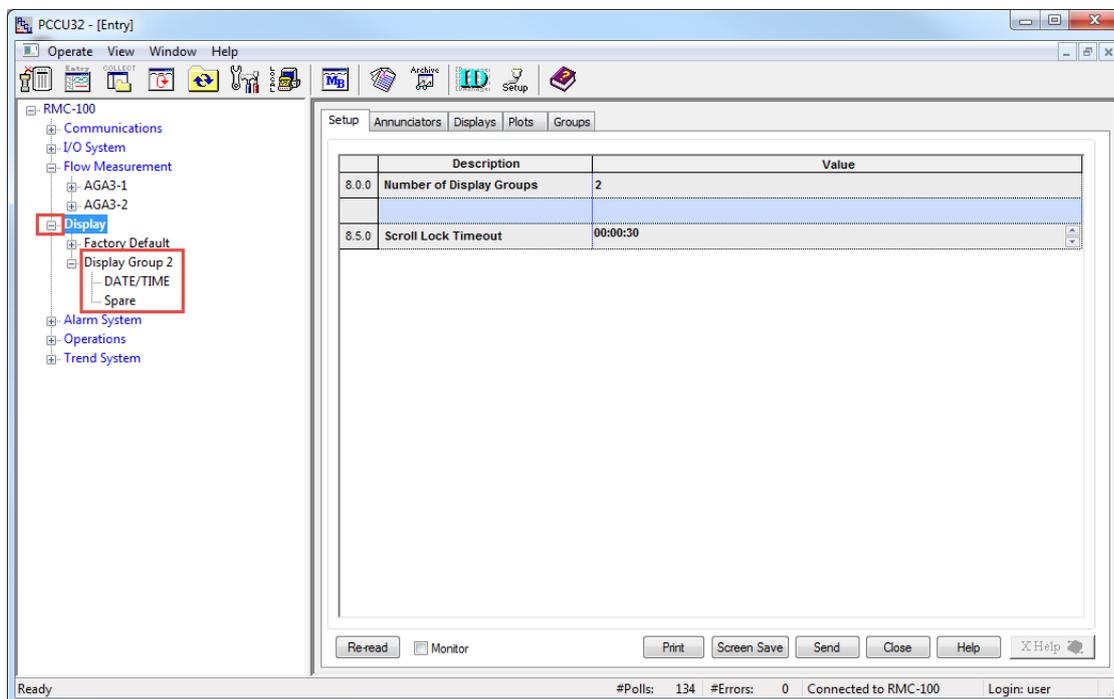
- Expand Display on the navigation tree. The navigation tree displays the new group with a default name: Display Group 2 (Figure 5-9).

Figure 5-9: New display group - default name



- Expand **Display Group 2**. The group displays two default display items: DATE/TIME and Spare ([Figure 5-10](#)). DATE/TIME displays the RMC current date and time. Spare is undefined.

Figure 5-10: Default display group and items



- Configure the new group in section [5.4.3 Configure a display group](#). For more information, click **Help**.

5.4.2 Assign annunciators

An annunciator is a display item on the LCD that indicates the status of a variable. Assign an annunciator to an instantiated application on the RMC. The default display configuration might already have annunciators assigned, as in [Figure 5-11](#). The LCD displays the indicators that apply to the

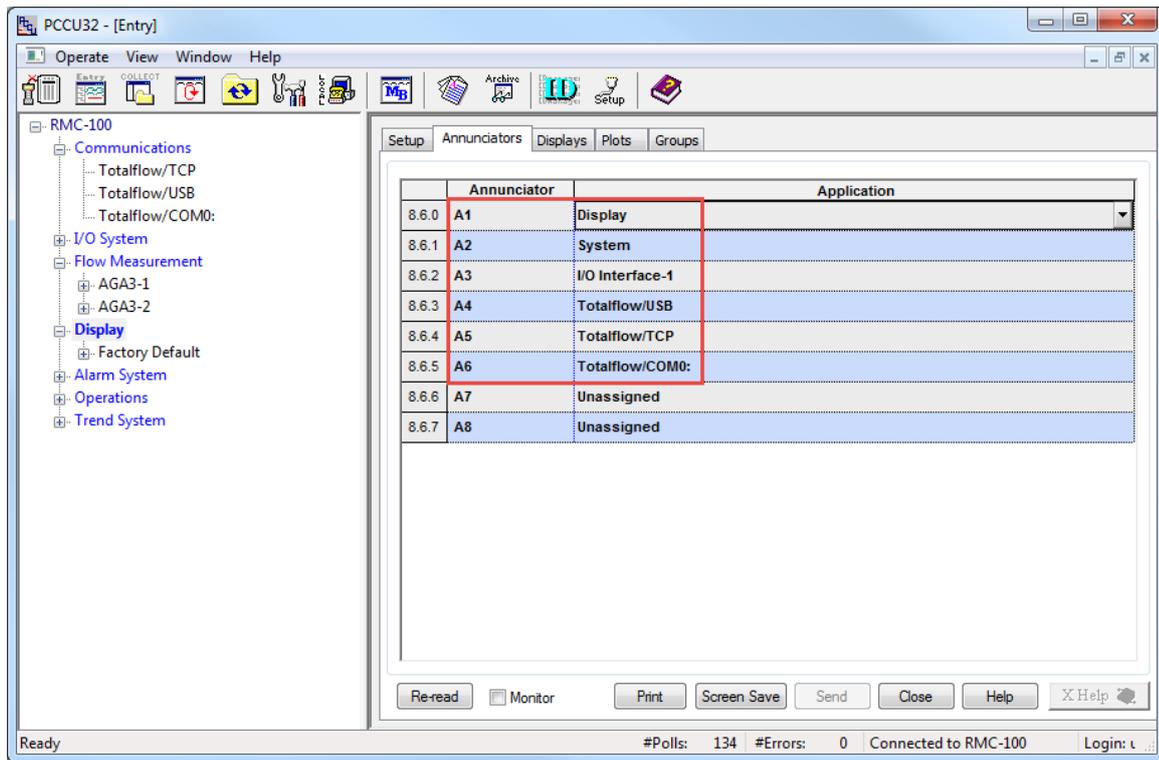
applications, as in [Table 5-2](#). Keep or change those assignments; or use unassigned annunciators to add other applications.

This procedure assigns one of the unassigned annunciators to one of the measurement applications instances, AGA3-1.



IMPORTANT NOTE: Assign up to eight annunciators to the applications. An application must be instantiated before assignment. If there are not enough available annunciators, reassign default ones, as necessary.

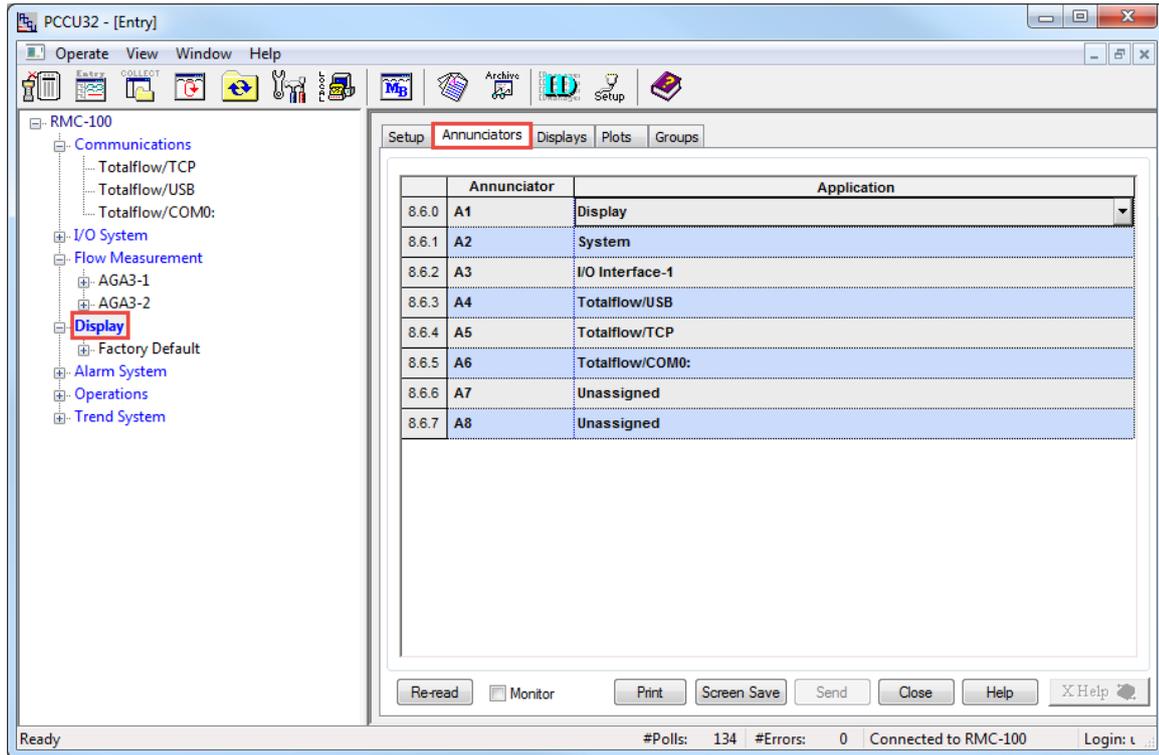
Figure 5-11: Default annunciator assignments



To assign the applications to an annunciator:

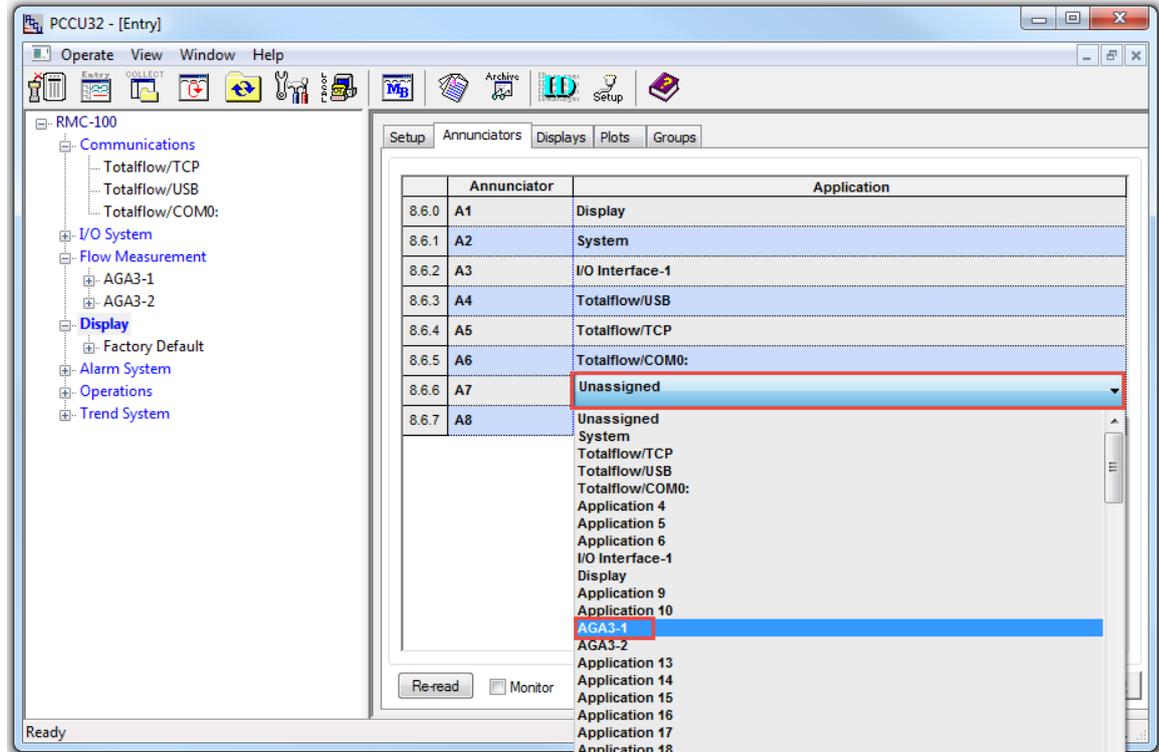
1. Click **Display** on the navigation tree.
2. Click **Annunciators**. The current annunciator assignments display ([Figure 5-12](#)).

Figure 5-12: Annunciator assignments



3. Click the Application field for an unassigned annunciator and select an application from the dropdown list. Repeat this step until you complete all necessary annunciator assignments.

Figure 5-13: Assign annunciator to application



4. Click **Send** to save the changes.
5. Observe annunciators on the LCD. An annunciator provides status or an alarm information. For more information, click **Help**.



IMPORTANT NOTE: Assign only necessary applications. The system requires more storage for more applications, groups and items.

5.4.3 Configure a display group

This procedure describes how to configure a non-default name for a display group, define the number of group display items, and enable the group display on the LCD.

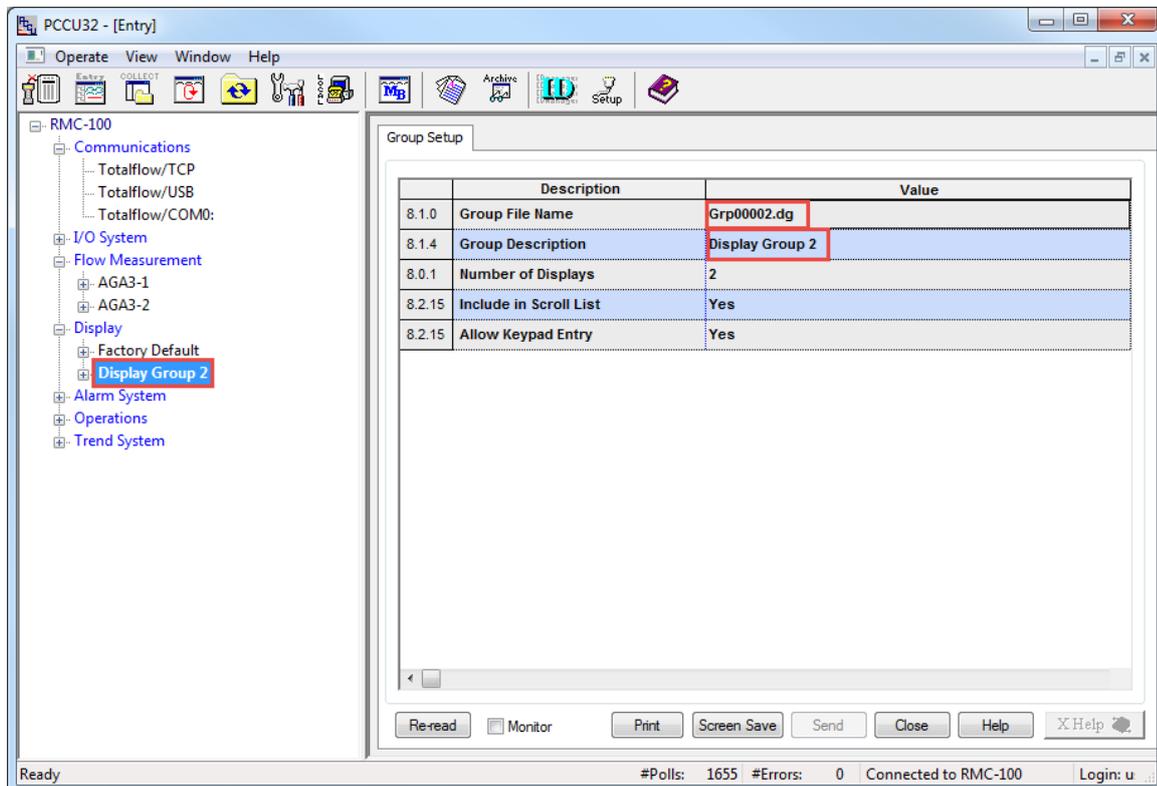


IMPORTANT NOTE: This procedure describes the configuration of the new group created in section [5.4.1 Configure the number of display groups](#). The existing factory default group is intact.

The RMC stores the display group setup in a file, identified as the Group File Name ([Figure 5-14](#)). This file name is Grp0000n.dg, where n is the number of the group. This number increases incrementally for each additional group.

[Figure 5-14](#) shows a display group created after the default group. The group file name is Grp00002.dg and the default group description is Display Group 2. Change this to reflect the types of values under that group. The group description identifies the group on the navigation tree.

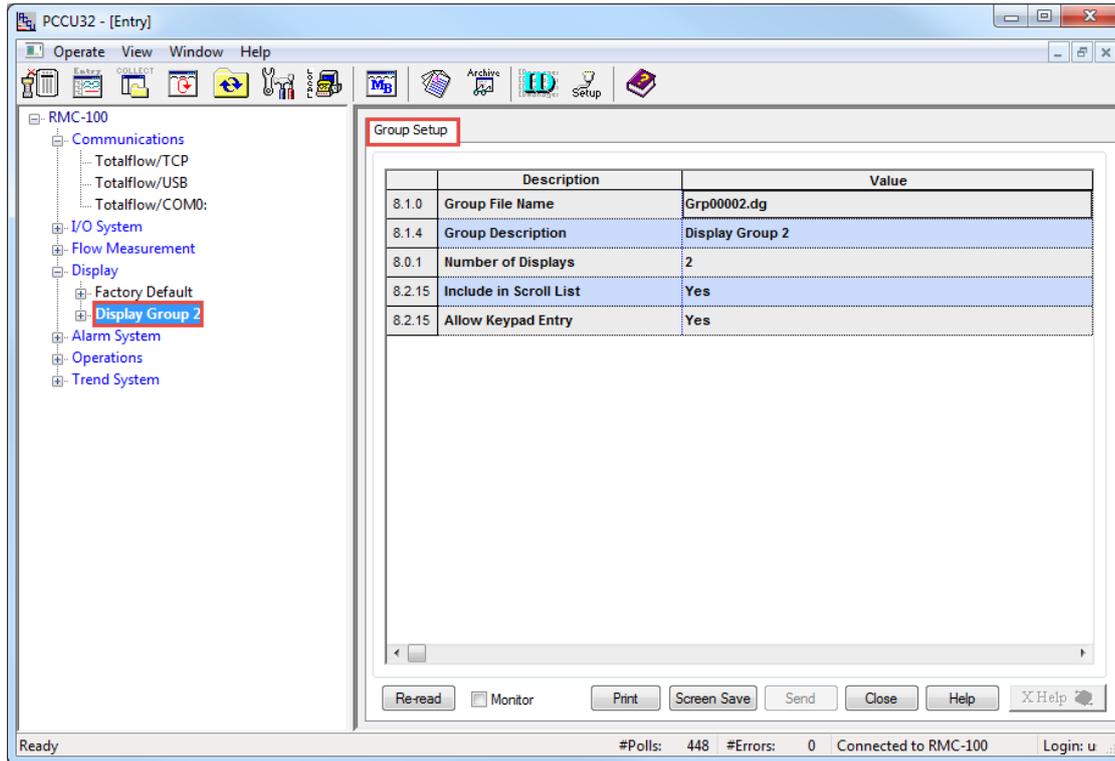
Figure 5-14: Default Group setup



To change the new group's default configuration:

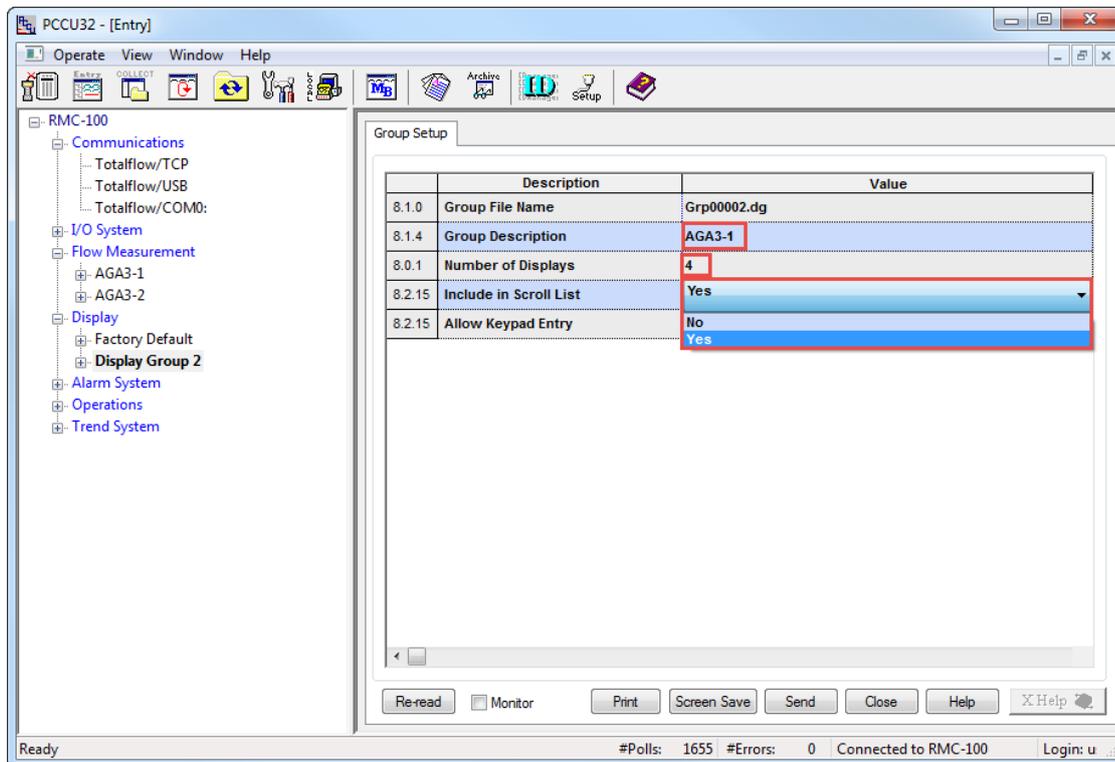
1. Click the Display Group number on the navigation tree to display the Group Setup tab. The default configuration for the groups displays ([Figure 5-15](#)).

Figure 5-15: Display Group Setup tab



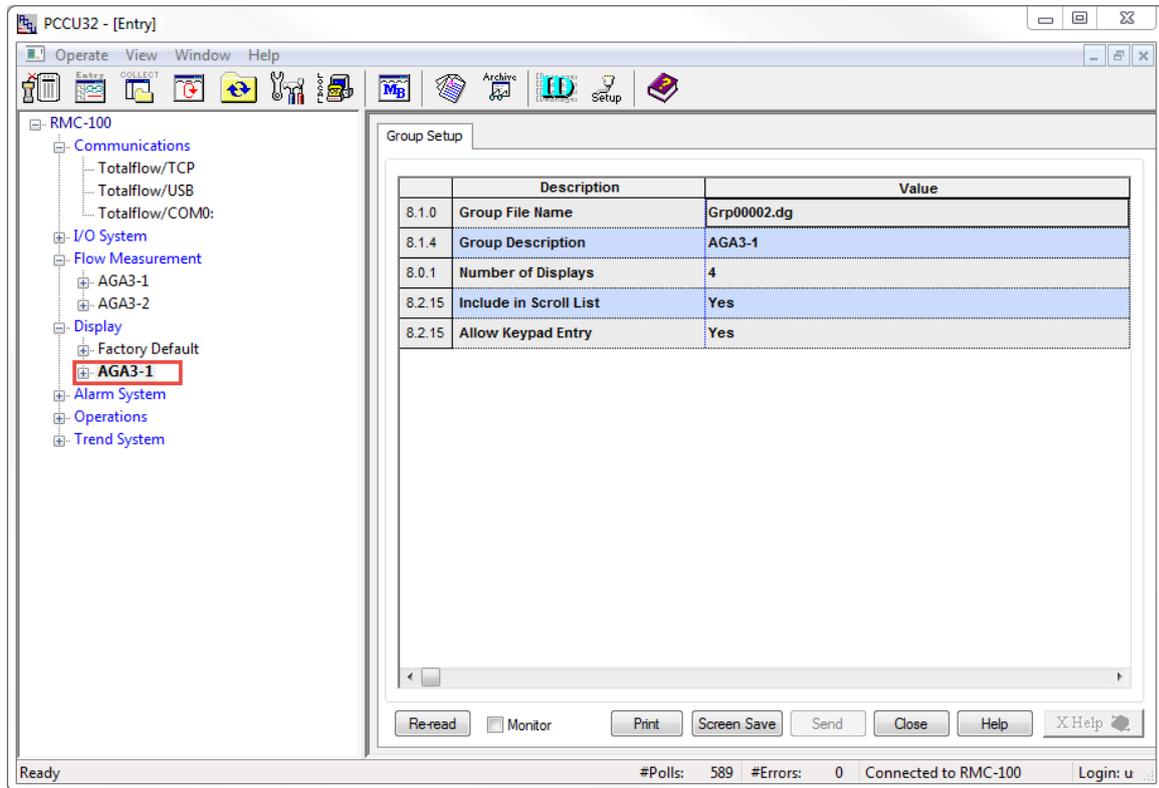
2. Type a description of the group into Group Description ([Figure 5-16](#)). In this example, the new description uses the name of one of the RMC’s measurement application instances AGA3-1 to display values from that application.
3. Type the number of items to display for the group into Number of Displays ([Figure 5-16](#)). In this example, the number is 4, which adds two additional displays to the default 2.
4. Click **Include in Scroll List** and select **Yes** to include the group in the scroll list ([Figure 5-16](#)).

Figure 5-16: Change default group setup



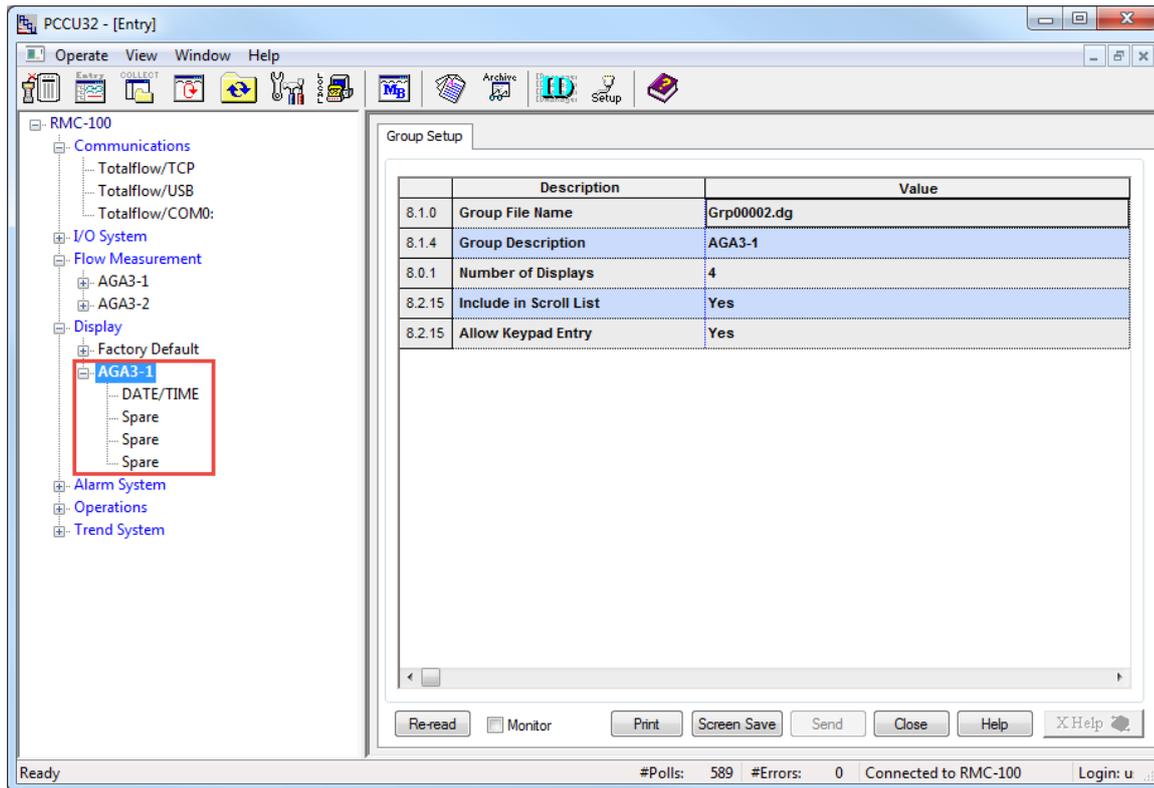
5. Click **Send**.
6. Expand Display on the navigation tree. The new group displays with the new name ([Figure 5-17](#)).

Figure 5-17: Display group with user-defined name



7. Click the new display group on the navigation tree to expand the folder. The items defined for the group display on the navigation tree ([Figure 5-18](#)). In this example four items display. Configure the Spare items as necessary.

Figure 5-18: Number of group display items



8. Configure each item per section [5.4.4](#).
For more information, click **Help**.

5.4.4 Configure group display items

This procedure describes how to configure group display items.

Basic item configuration defines the name of the item, the register number to obtain the value of the item, and its display interval. This procedure accepts the default values for all other parameters.



IMPORTANT NOTE: This procedure configures a spare item in the display group created in section [5.4.3](#).

The display item name can be an application variable, constant or parameter name. Determine the RMC register address that stores the value for that parameter. The Display application obtains the value from that register and displays it on the LCD. Match item names with actual application parameter names provided the number of characters does not exceed the maximum supported by the LCD. Shorten parameter names as necessary.



IMPORTANT NOTE: Each item uses two lines on the LCD display. The first line is the item name. The second line is the value and unit of measurement.

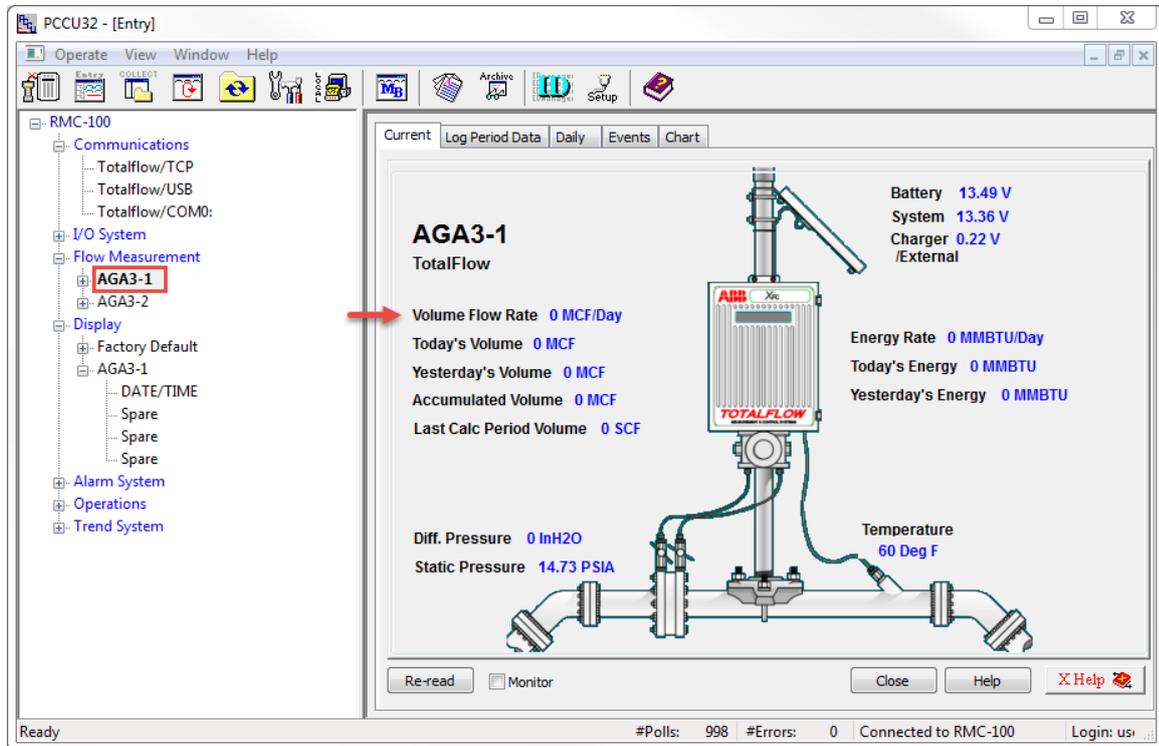
To configure each display item:

1. Decide which parameter to assign to the spare item.
 - a. Click the application assigned to the display group on the navigation tree. In this example, click AGA3-1 under Flow Measurement. The Current screen displays ([Figure 5-19](#)).
 - b. Determine the parameter required. This example uses Volume Flow Rate for AGA3-1 to configure the spare display item.



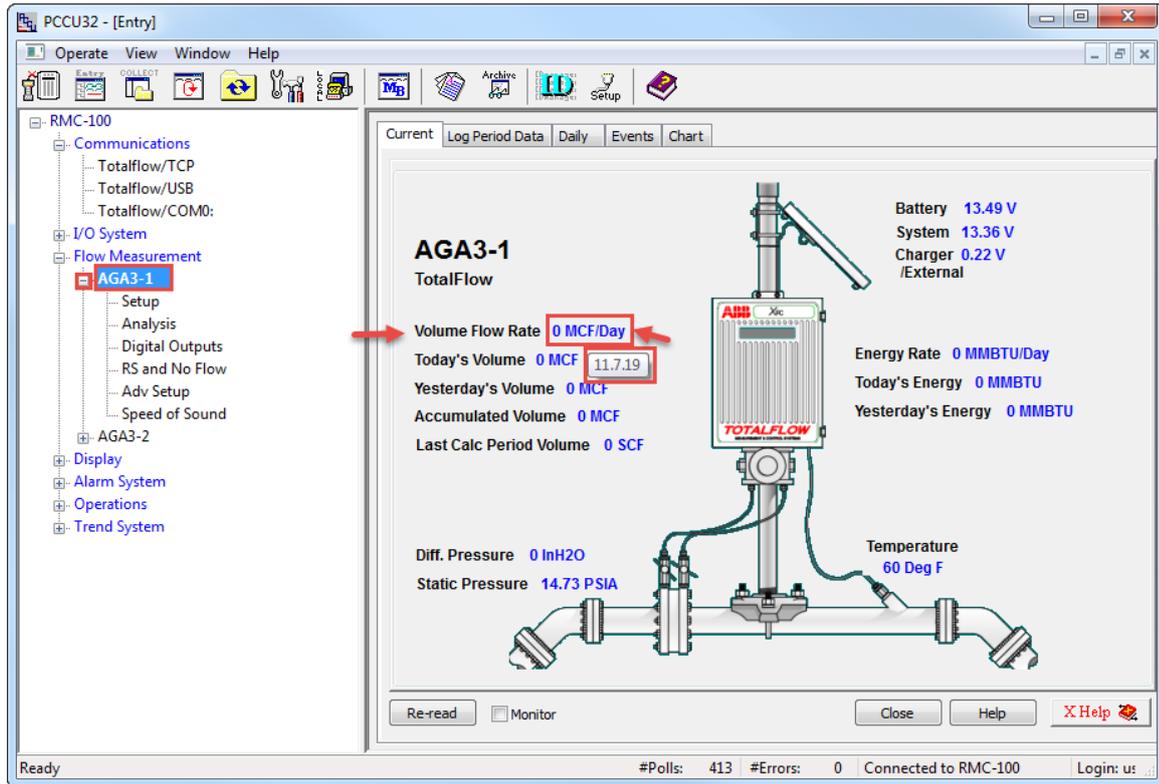
IMPORTANT NOTE: This example determines the parameter to display from the Current screen. You can select any parameter from this screen or other screens for the application. All application screens display the register address for each parameter on that screen.

Figure 5-19: Determine application parameter and value to display



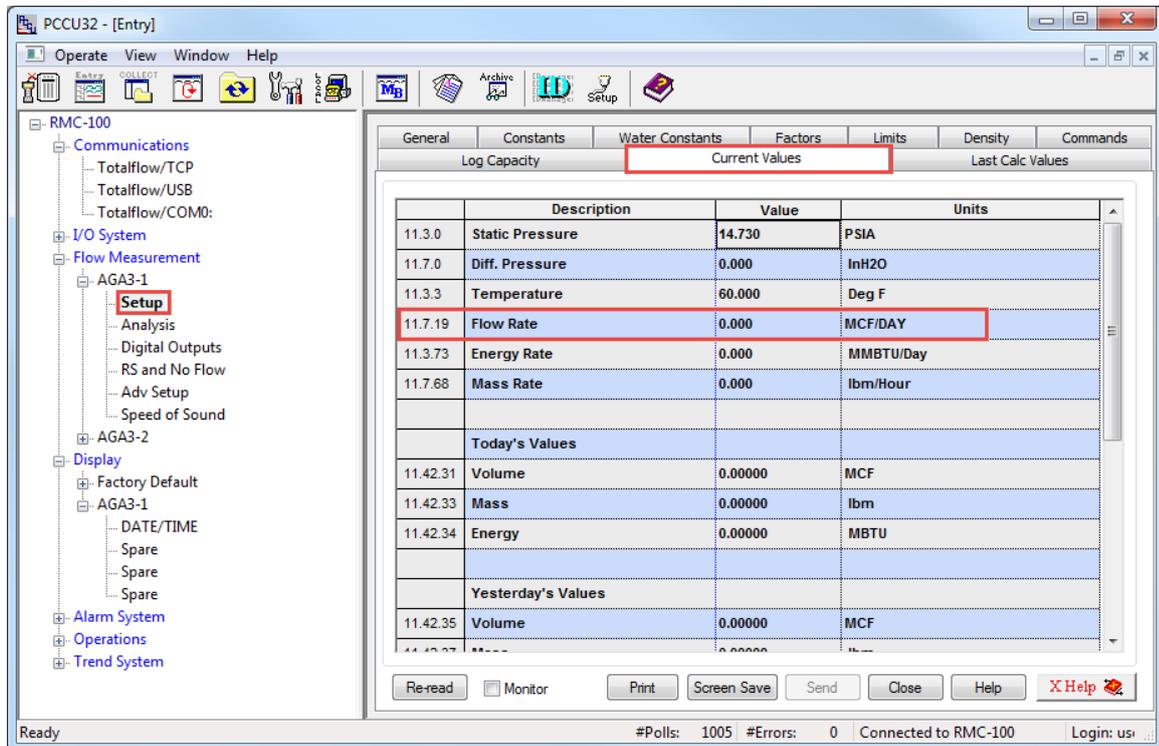
2. Determine the application register that stores the value of the parameter.
 - a. Hover the mouse over the Volume Flow Rate's value on the Current screen. Hold the cursor in place until the register address bubble displays (Figure 5-20). Take note of the register address. In this example, the address is 11.7.19.

Figure 5-20: Obtain register address from the application current value screen



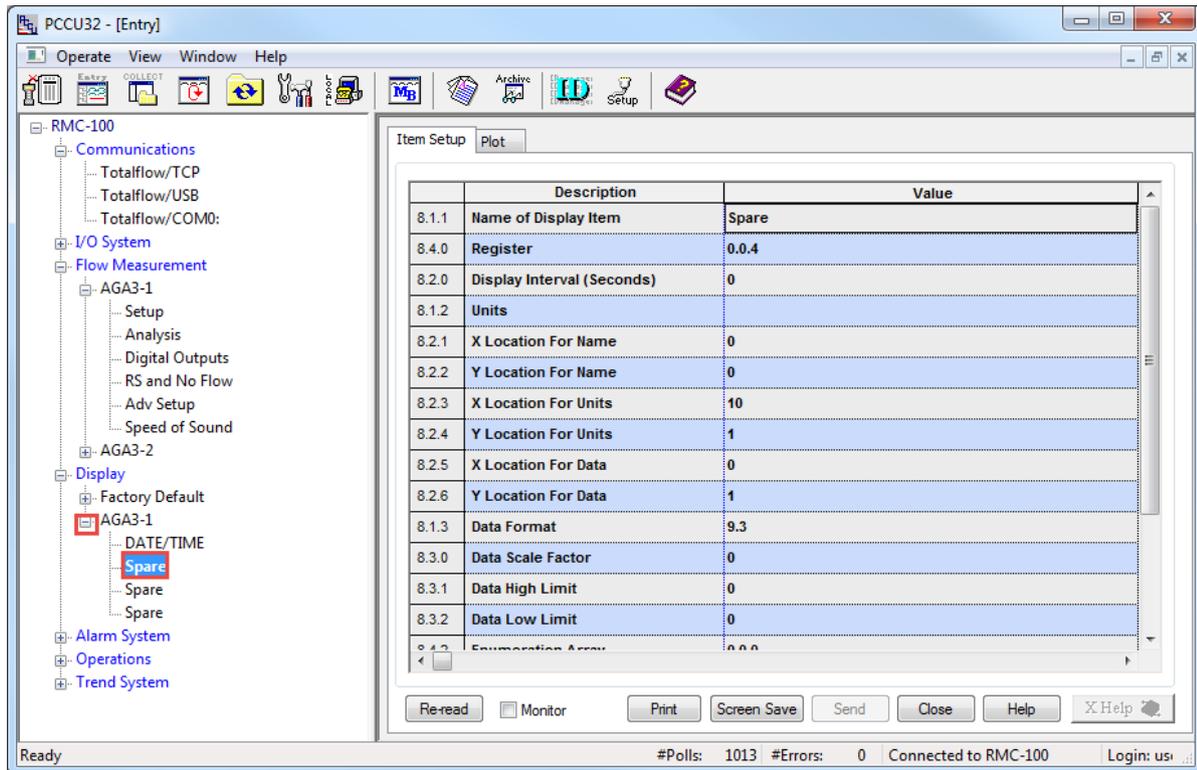
IMPORTANT NOTE: Register addresses for current values are also available on the Current Value screen (Figure 5-21).

Figure 5-21: Determine register addresses for the application's Current Values



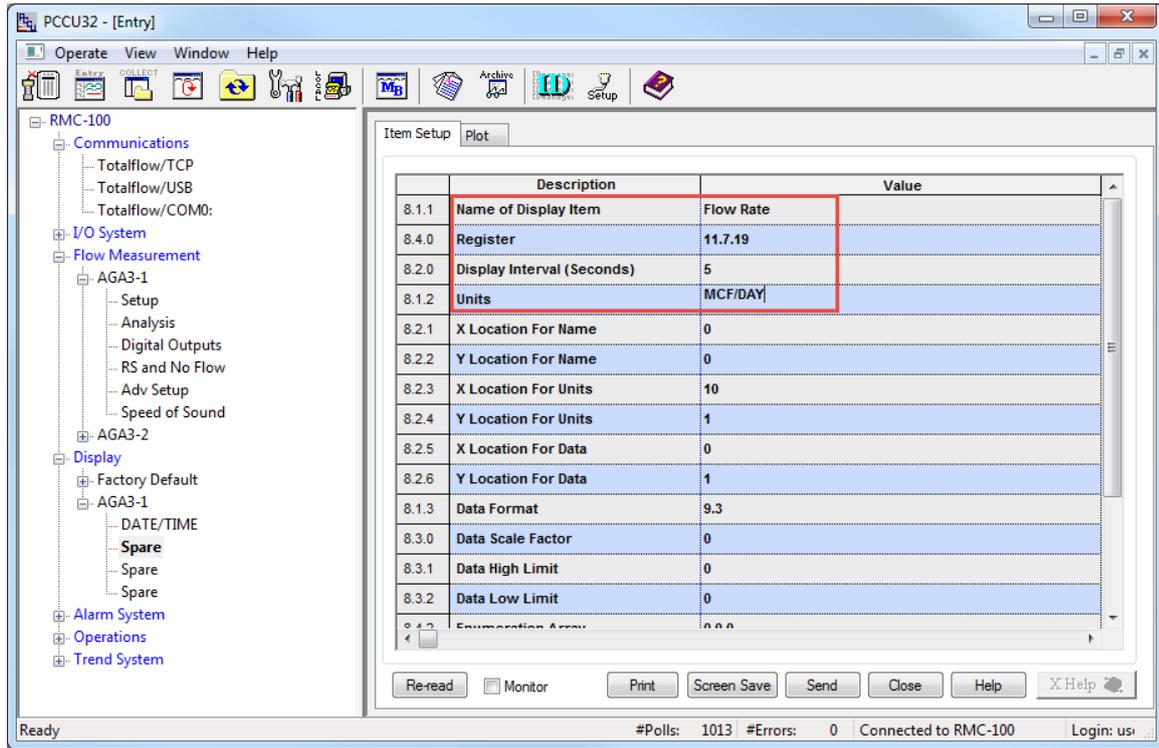
- Click the group name on the navigation tree to expand the folder. Then click a Spare group item. The Item Setup tab displays (Figure 5-22).

Figure 5-22: Spare default Item Setup



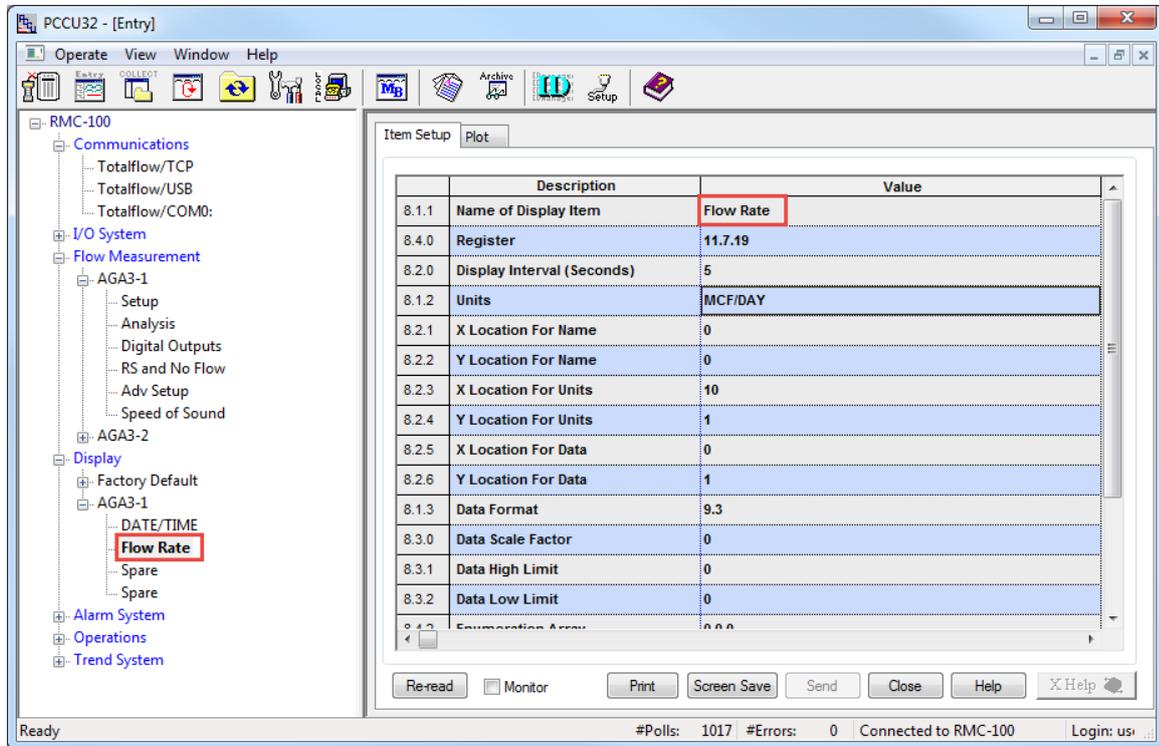
- Click the **Name of Display Item** field in the Value column and type the display item's new name. In this example, Flow Rate (Figure 5-23)
- Click the field in the Register's Value column. Type the item's Register address. Use the value obtained in step 2, in this example: **11.7.19**.
- Type the number of seconds for the item to display into the Display Interval field. The Display Interval default is zero (0). This example sets the interval to 5 seconds.
- Type the unit of measurement for the item's value into the Units field.

Figure 5-23: Basic display item configuration



8. Click **Send** to save.
9. Click **Re-read** to refresh and update the screen with the changes. The new display item name displays on the navigation tree. In this example, the display item reflects the name configured in the Item Setup screen, Flow Rate (Figure 5-24).

Figure 5-24: Configured display item



10. Verify that the LCD displays the parameter, its current value and units. The value must match the value displayed on PCCU. If no value is displayed or the displayed value is incorrect, verify the register address. Incorrect register definition will yield the wrong value. You can also verify the application configuration.
 11. Repeat steps 1 to 10 to customize additional spare display items.
- For more information, click **Help**.



IMPORTANT NOTE: To decrease the number of groups and display items, type a lower number into the Number of Display Groups field on the Display Setup tab. If the number decreases by 1, the last item on the list no longer displays. If the number decreases by 2, last two items on the list no longer display, and so on. To remove items at the top of the list, remove all items, then re-add the items you intend to keep. You cannot delete a group or item out of order.

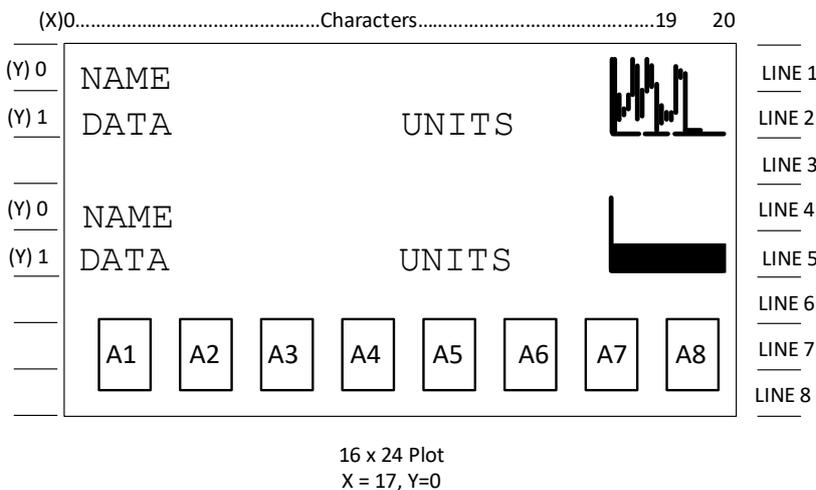
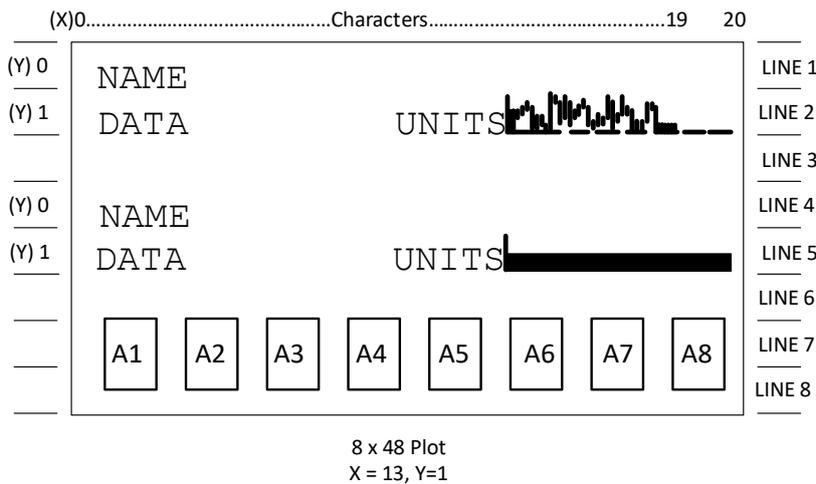
5.4.5 Configure the plot for a display item (optional)

The plot view for a display item is optional. Configure the plot after adding the display item. The plot displays simultaneously with the display item. Two options are available for the plot size ([Figure 5-25](#)). Use a shorter display item name, since longer names can overwrite the plot display on the LCD.



IMPORTANT NOTE: This procedure configures the plot for the display item defined in section [5.4.4 Configure group display items](#).

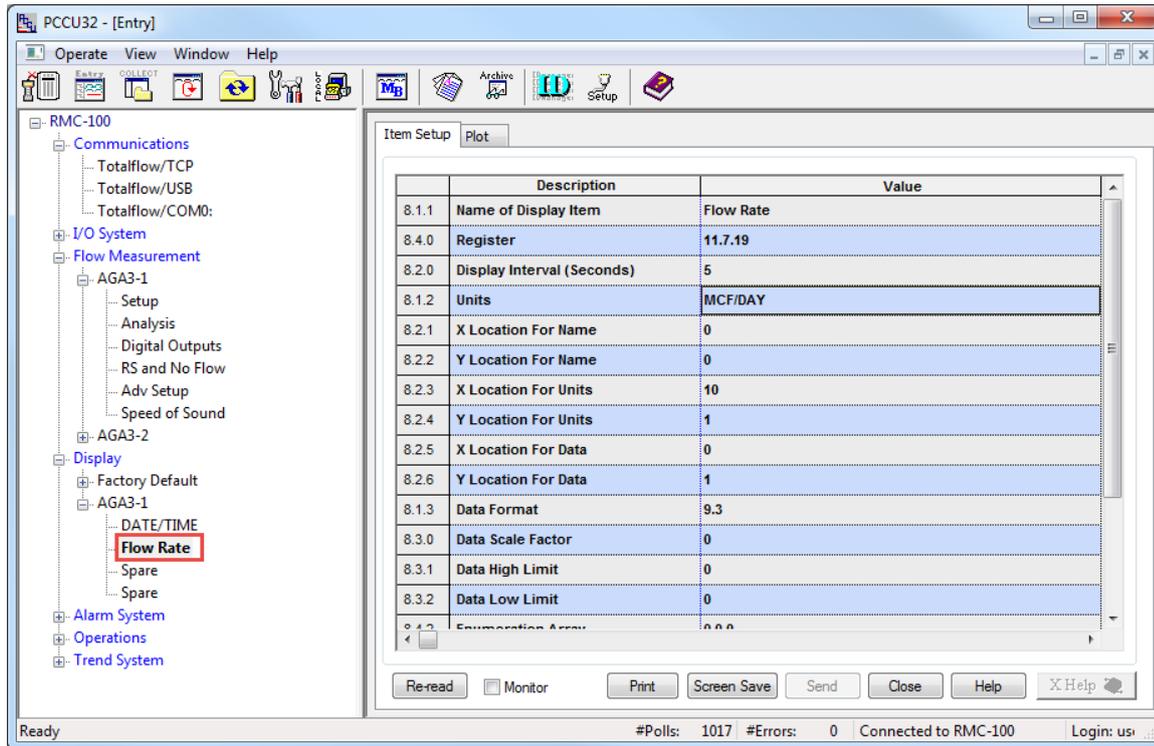
Figure 5-25: Plot sizes



To set up an item's plot:

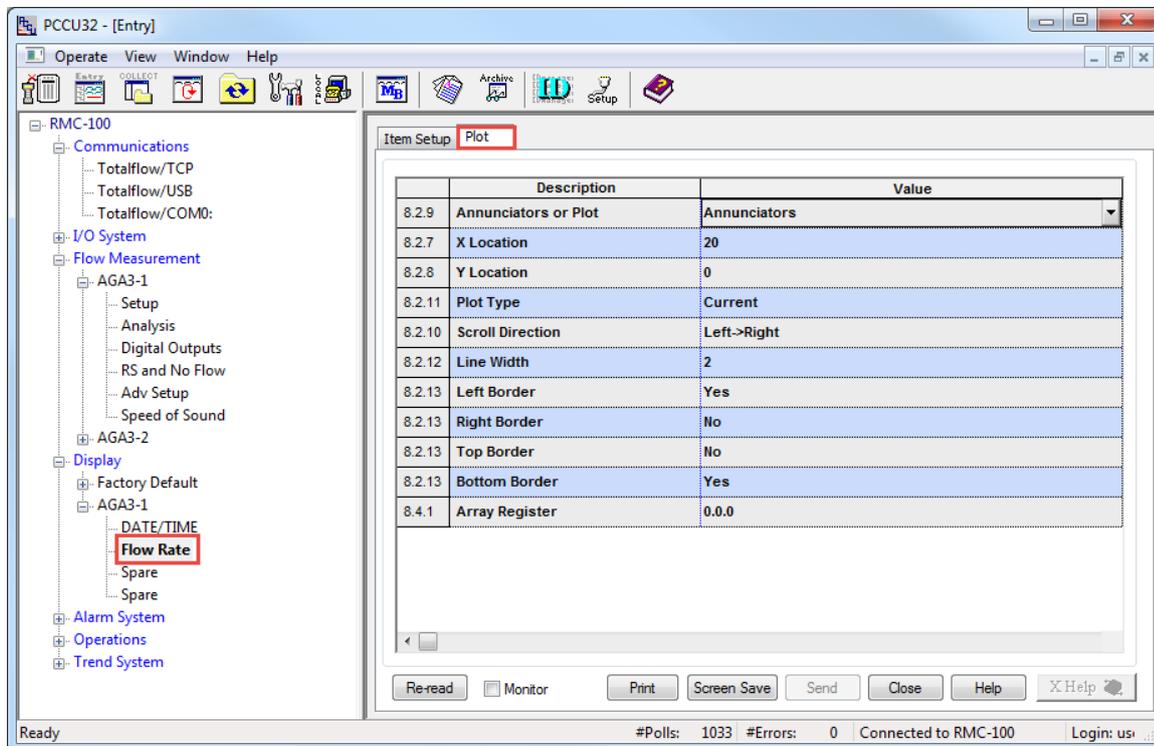
1. Click a display item on the navigation tree.

Figure 5-26: Select display item



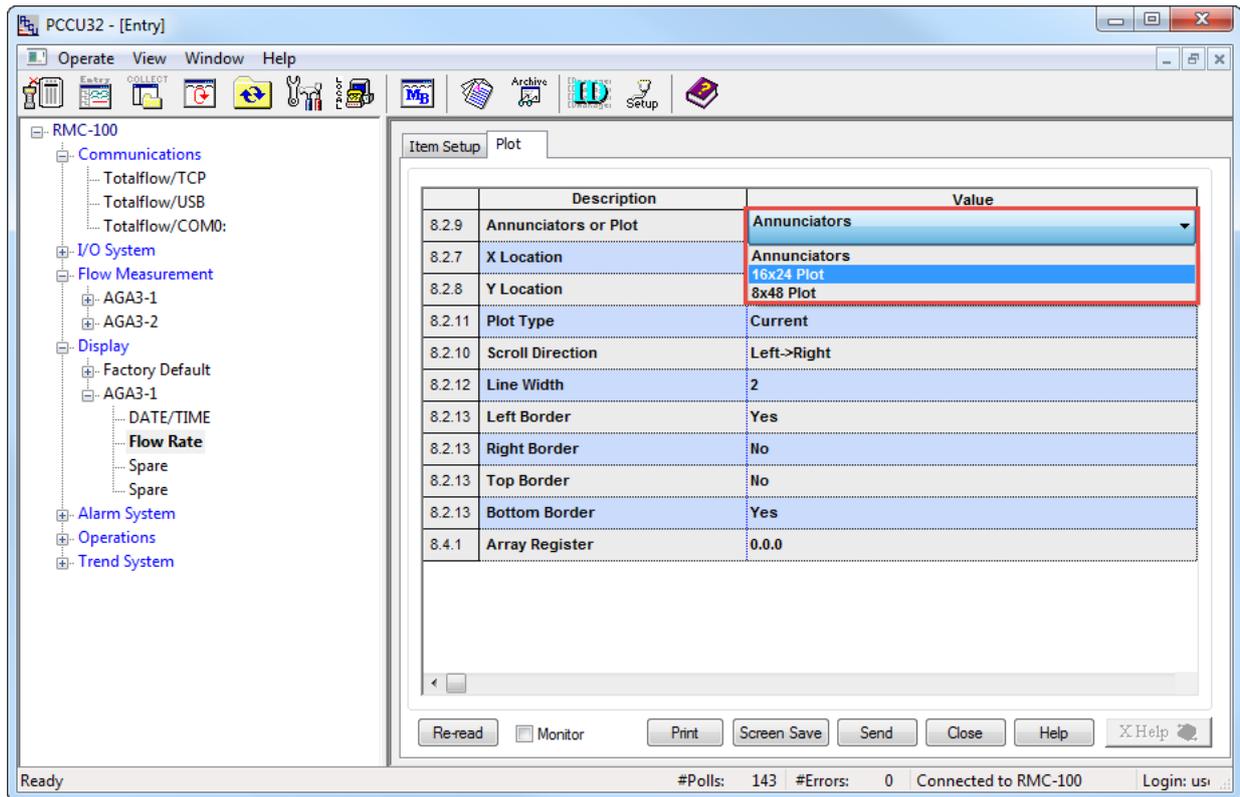
2. Click **Plot** to display the Plot tab (Figure 5-27).

Figure 5-27: Display item Plot screen



3. Click **Annunciators** or **Plot** and select **16X24 Plot** or **8X48 Plot** from the drop-down list to set the plot size (Figure 5-28).

Figure 5-28: Select plot size

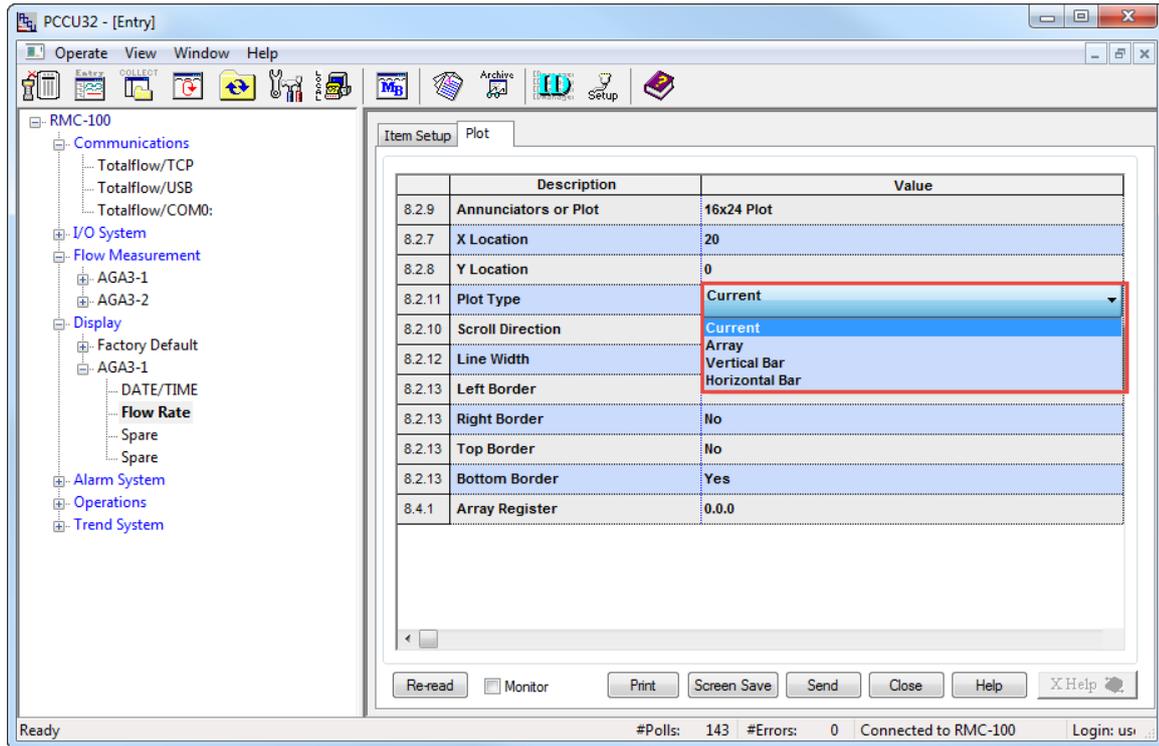


4. Click Plot Type and select one of the following from the drop-down list:
 - Current: live data
 - Array: previously collected data
 - Vertical Bar: current data displays in a vertical bar plot
 - Horizontal Bar: current data displays in a horizontal bar plot

Table 5-3: Plot types and sizes

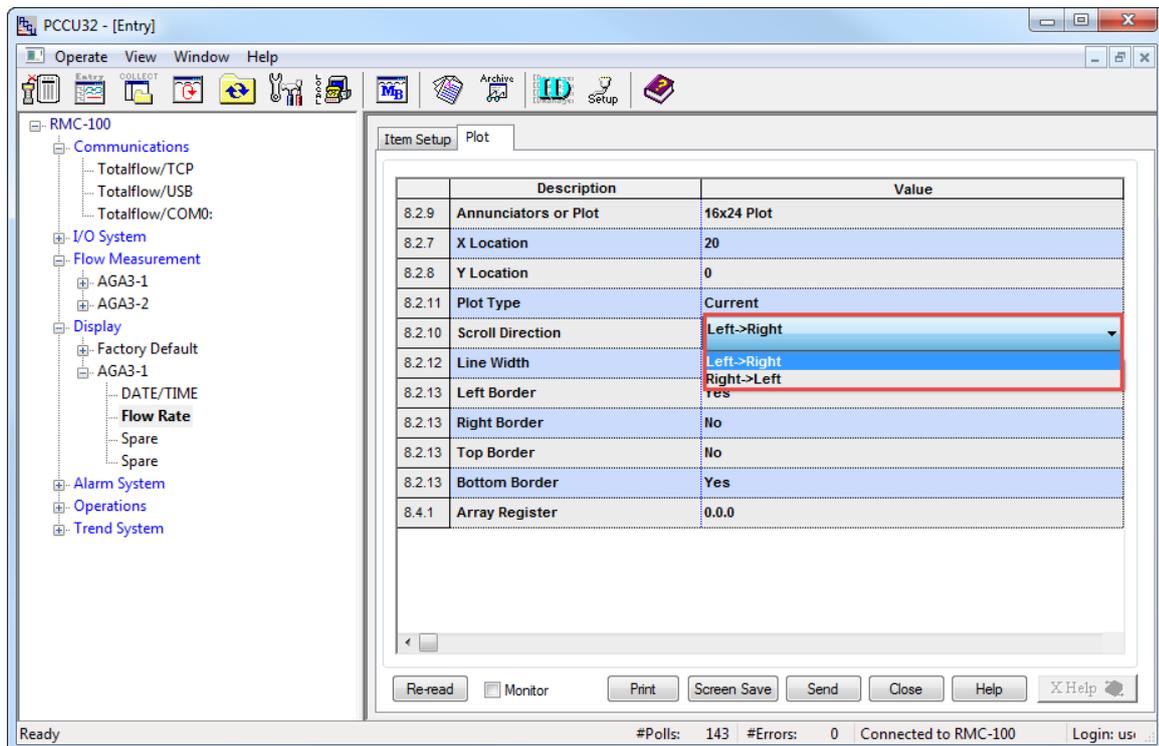
Plot type	8 x 48 Plot size	16 x 24 Plot size
Current		
Array		
Horizontal bar		
Vertical bar		

Figure 5-29: Select plot type



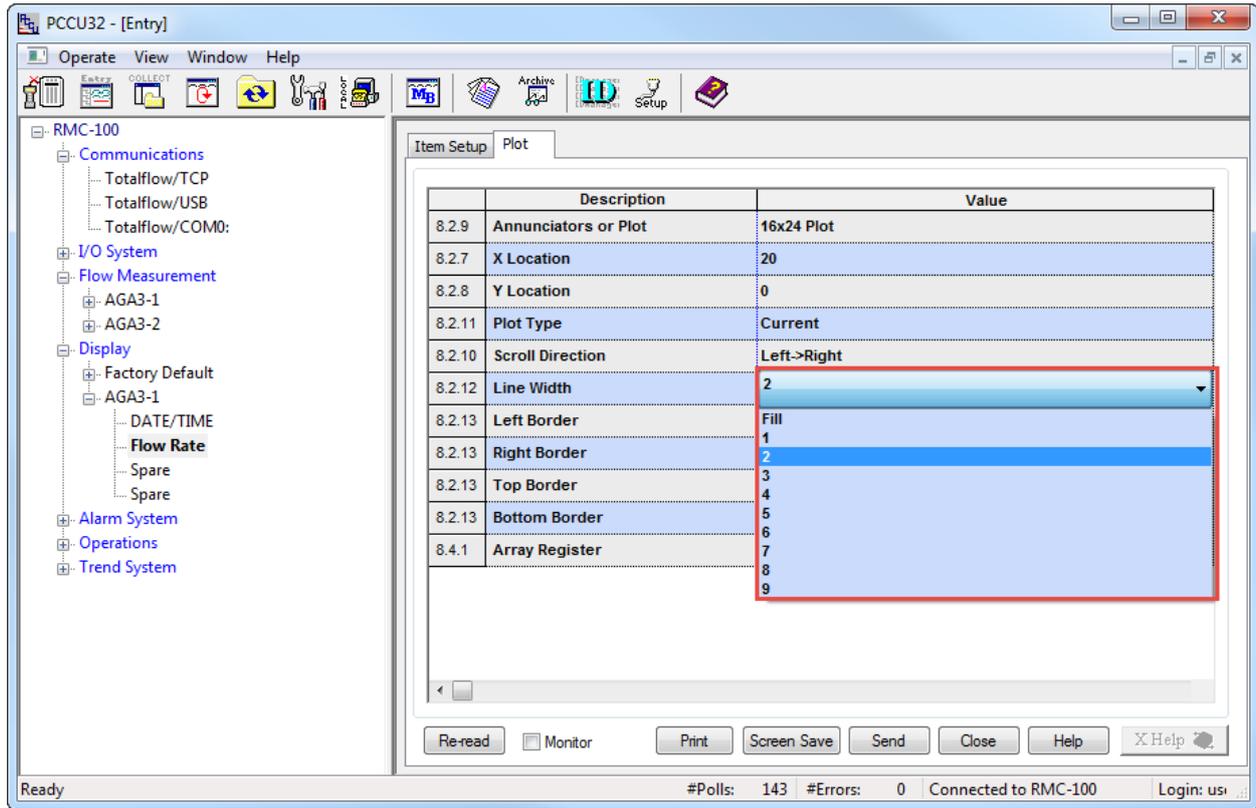
5. Click **Scroll Direction** and select an option (**Left** or **Right**) from the drop-down list (Figure 5-30).

Figure 5-30: Select plot scroll direction



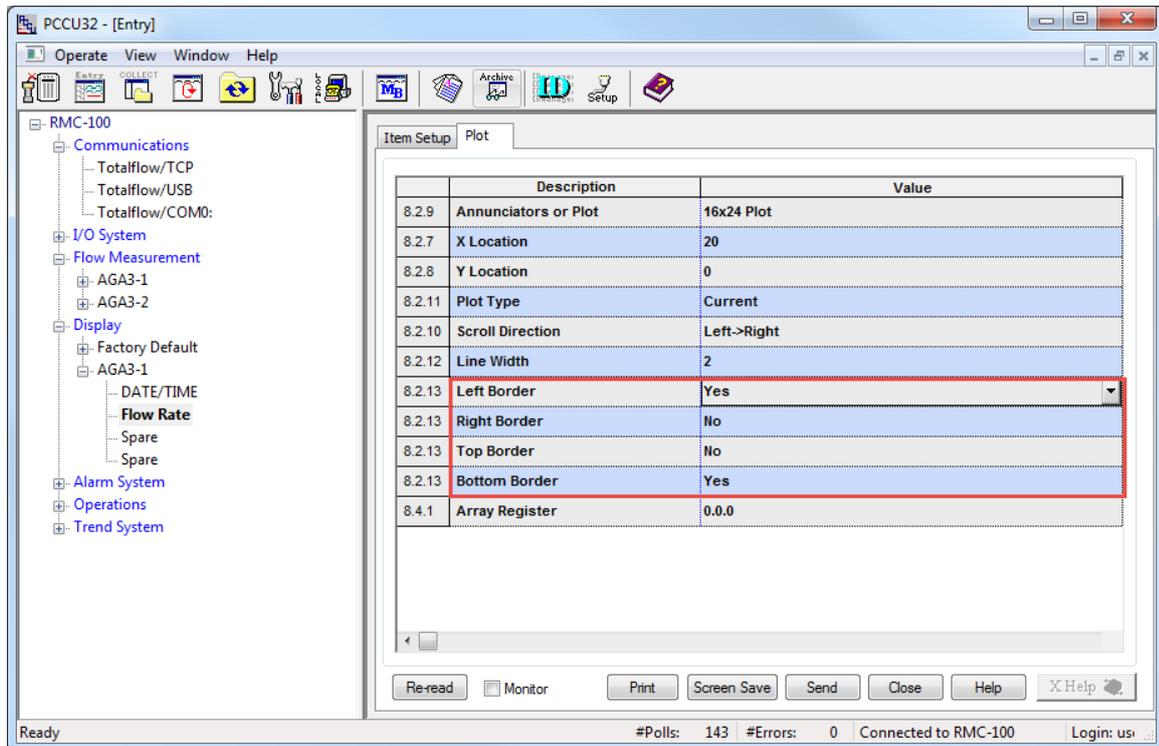
6. Click **Line Width** and type a number into the field or select one from the drop-down list (Figure 5-31). The larger the line width number the thicker the graph line.

Figure 5-31: Select plot line width



- Click the following fields and select Yes or No from each drop-down list (Figure 5-32):
 - Left Border
 - Right Border
 - Top Border
 - Bottom Border

Figure 5-32: Configure plot border display



8. Type the register location for the array into the Array Register field if the Plot Type is Array.
9. Click **Send** to save.
10. Verify that the plot displays on the LCD.
11. Repeat steps 1 to 10 to configure plots for additional display items, if necessary.



IMPORTANT NOTE: The shape of a plot differs based on the type of value and how the value fluctuates over time. Constant values, or values with little variation, are straight lines. Values with greater fluctuation have plots with greater contrast.

5.5 Enable SSH/SFTP

SSH/SFTP servers require a private key for authentication. The keys are in a protected storage location in the firmware (flash) and remain unchanged by any software updates.

Customer access to the SFTP is read-only. SSH access is not available to the customer. Customers can copy files from the RMC but cannot write or send files to the RMC.

The following folders are available to copy or download:

- Crash dumps
- Firmware: Main Totalflow application (App), factory startup (cold) configuration, and startup (cold) configuration
- Logs: System and device loader log files
- tfData: Running (warm) configuration files



IMPORTANT NOTE: SSH/SFTP services are disabled by default for security. Perform this procedure only if required and you are an advanced user. Before enabling, see section [6 Configure security \(recommended\)](#), or contact technical support.

SSH/SFTP access is TCP/IP based. Enable and configure Ethernet with valid IP parameters

To enable the SSH/SFTP services on the RMC:

1. Click **Communications** on the navigation tree.
2. Click Network to display the Network tab.
3. Click **SSH/SFTP Service (Port: 9696)** to enable the services.
4. Click **Send** to save the configuration.
5. Click the **Ethernet** tab.
6. Click **Network Adapter** to enable Ethernet.
7. Type valid network parameters into each of the fields (IP Address, Default Gateway, and Subnet Mask). See section [4.4.2 Enable serial port switched output power](#) for more information.
8. Click **Send** to save the configuration.
9. Click **Help** to display the Ethernet Tab topic for more information to establish a read-only SFTP connection.

5.6 Application credits (credit key)

ABB provides a secure USB flash drive containing four credits to activate application licenses. If this is not enough to activate all required applications, call the ABB main office on the last page of this manual to purchase additional credits.

Credit key actions include:

- Add more credits to the credit key.
- Transfer credits from an ABB Totalflow device to the credit key.
- Transfer credits from the credit key to an ABB Totalflow device.
- Move credits from one credit key to another credit key.
- Move credits from one ABB Totalflow device to another ABB Totalflow device.

The only program that can write to or read the USB flash drive is PCCU32.

If the RMC runs an unlicensed application, this appears on any generated reports. The RMC logs unlicensed use in the Event Log at the top of each contract day. Unlicensed applications also cause the RMC to connect more slowly than normal.

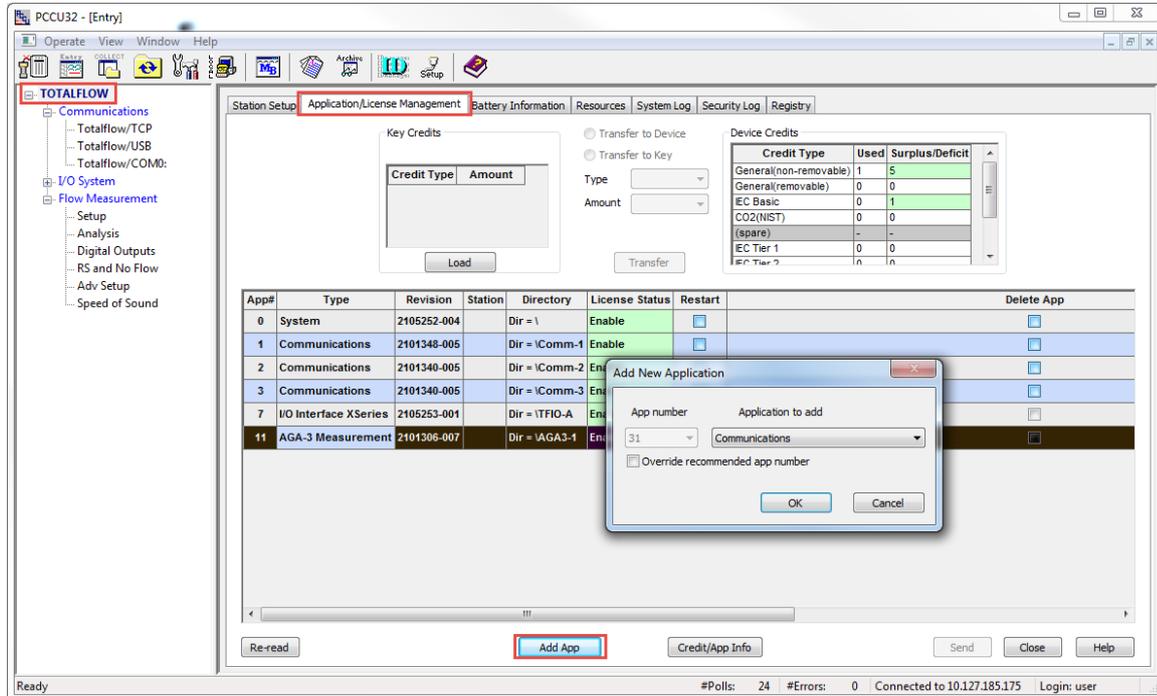
At the Station Setup screen, click the App licensing tab and click **Help** for information about maintaining the credit key.

5.7 Verify the applications

To verify that the purchased applications are instantiated:

1. Click the station ID name at the top of the navigation tree. The Station Setup tab displays.
2. Click **Application/License Management** to display the Application/License Management tab.
3. Verify that the application names display on the Type list.
4. Click **Add App** to add missing applications, as necessary. The Add New Application dialog displays (Figure 5-33).

Figure 5-33: Applications list



5. Click **Application to Add** and select the application from the drop-down list. Then click **OK**.
6. Click **Send** to save the application.

5.8 Enable RMC for MQTT support

MQTT supports connection of the RMC-100 to a service provider or private cloud. It may require authentication certificates for the device. Consult with your IT administrator for configuration options or requirements when using certificates.

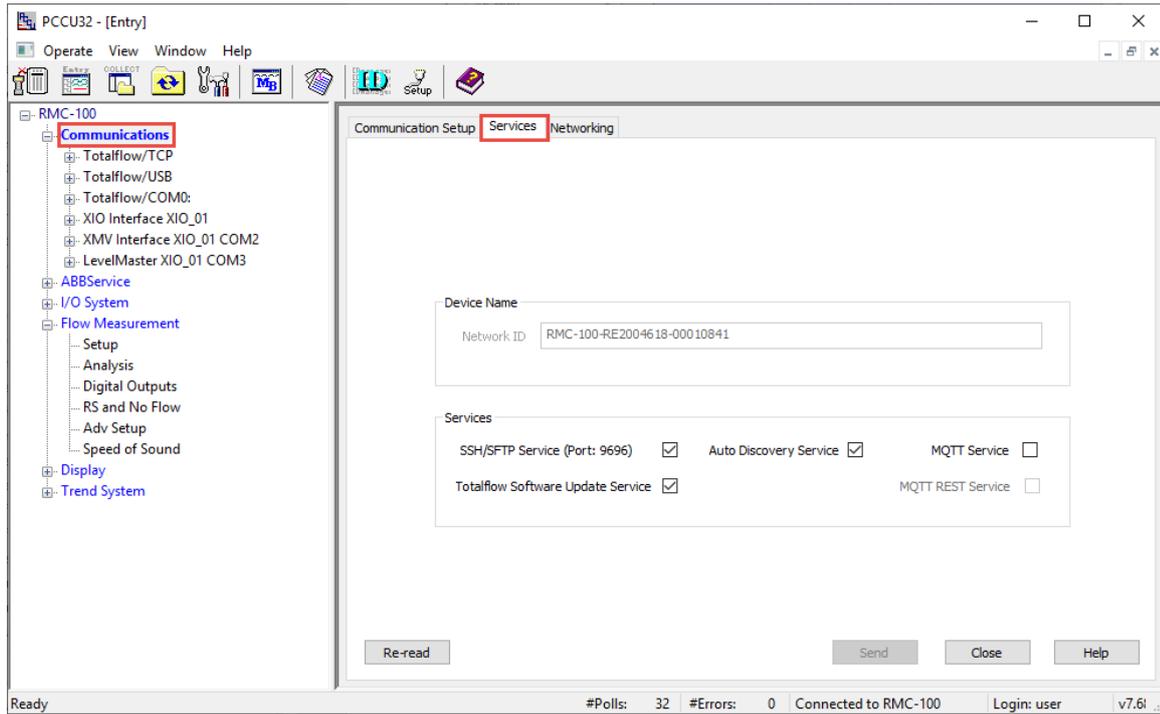


NOTICE – Cybersecurity risk. The RMC-100 is not an internet-facing device. Do not connect directly to the Internet. An MQTT gateway is required between the Digital Oilfield and the RMC. If the customer's corporate network firewall is compromised, the RMC-100 would be at risk without the MQTT gateway.

Enable MQTT and the REST (MQTT configuration interface):

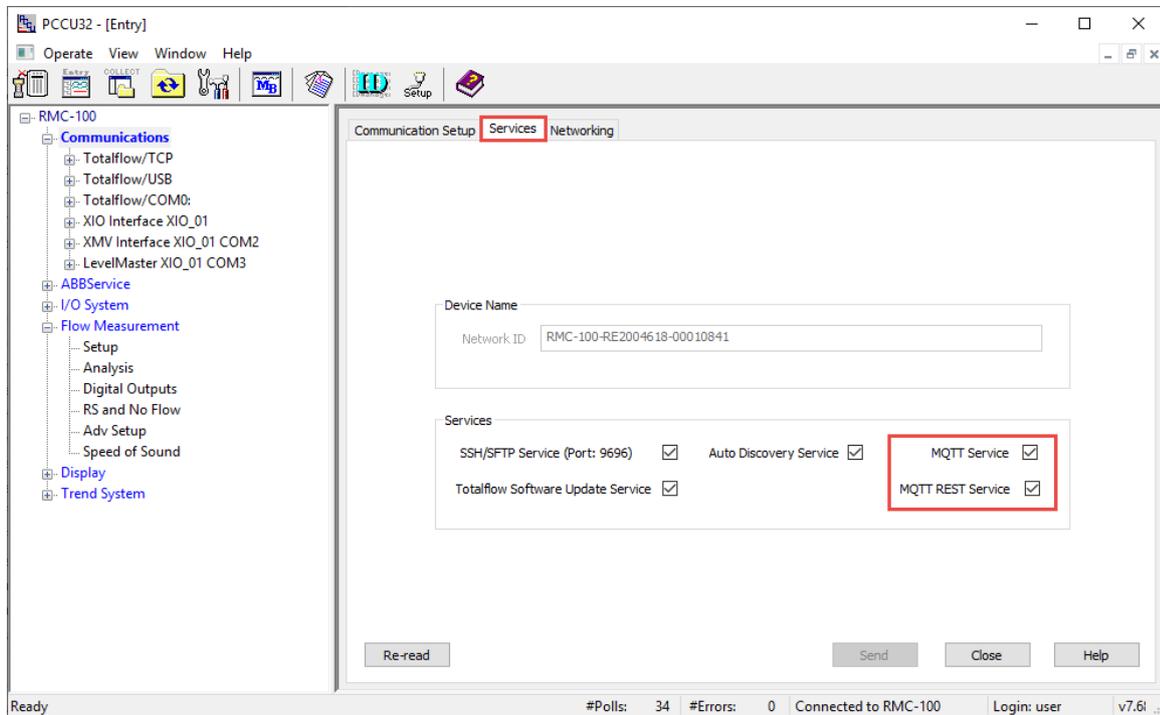
1. On the PCCU Entry mode navigation tree, select **Communications>Services** (Figure 5-34).

Figure 5-34: RMC-100 Services



2. Select the MQTT Service checkbox. The MQTT REST Service activates.
3. Select the MQTT REST Service checkbox. This allows access to the MQTT configuration interface from a web browser. Once configuration for MQTT is complete, the REST service can be disabled for security.

Figure 5-35: Enable MQTT Service and REST Service on the RMC-100



4. Click **Send**.
5. Refer to the How to Configure MQTT guide for further configuration details. See Additional information for a link to the document.

6 Configure security (recommended)

To secure access to the RMC, review the security features implemented.

6.1 Access points

Totalflow user interfaces and host products support connection with the RMC through several types of communication ports, protocols, and services. These constitute points of entry that could be subject to inexperienced, unauthorized or malicious access through a point-to-point connection or a connection established over a network. Physical access to the ports must be controlled to protect local and remote access. Enable on-board security or enforce authentication before establishing a connection with any of the ports.

This section lists the communication ports, services, protocols, and the open Transmission Control Protocol (Transmission Control Protocol, TCP) ports that need to be considered when securing devices.

6.2 Communication interfaces

The table below lists the default communication ports available in the RMC with standard configuration. These ports are pre-configured from the factory. When enabled, these ports are ready for use, but are not secured.

Unprotected ports make the full functionality of the device available to any user. Configure security passcode or role-based authentication to prevent indiscriminate access.

Table 6-1: Default communication ports on the RMC

Wired connections communication ports, default names	Default state	Default protocol	Security feature available
MMI, port name: MMI Serial - COM0	Enabled	Totalflow Local (Read-only)	Bi-Level Security code authentication or Role-base Authentication (Role-base Authentication, RBAC)
USB, port name: Totalflow - USB	Enabled	Totalflow Local (Read-only)	Bi-Level Security code authentication or Role-base Authentication (Role-base Authentication, RBAC)
Ethernet 1 and 2, port name: Totalflow - TCP	Disabled	Totalflow/TCP (Read-only)	Bi-Level Security code authentication or Role-base Authentication (Role-base Authentication, RBAC)
COMM1, port name: TF - Remote	Enabled	Totalflow Remote (Configurable)	Bi-Level Security code authentication or Role-base Authentication (Role-base Authentication, RBAC)



IMPORTANT NOTE: The Ethernet ports on the RMC might connect to a Network and peripheral devices. If the peripheral devices send real-time measurement data to the RMC, configure connections correctly to prevent loss of this data due to network issues.



IMPORTANT NOTE: The RMC does not have native wireless support. Access to the RMC from a Bluetooth client is supported with the use of a Bluetooth-to-USB dongle. The table below indicates the default port name and security feature available to protect the device.

Table 6-2: Non-native Bluetooth support on the RMC

Wireless connections communication interfaces	Default state	Protocol	Security feature available
Bluetooth via USB Dongle, Port Name: Bluetooth	Disabled	Totalflow Local	Role-Based Authentication (RBAC)

6.2.1 User-enabled services

Services are software processes that run on the RMC device. The table below lists user-enabled services that open access to the embedded software file system. Unauthorized or malicious use of these services can cause file corruption and render a device inoperable.

Table 6-3: User-enabled services on the RMC

Service Name	Default state	Description	Security feature available
SSH/SFTP Service	Disabled	Serves connection requests for secure login shell and file transfer. Supports connection requests from third-party SSH/SFTP clients	Authentication based on private-public key pairs, passphrase-protected keys
Totalflow Software Update Service	Enabled	Enables or blocks the ability of the device loader to update the embedded software.	None specific to the service. Must use Bi-level security passcode or Role-Based Authentication (Role-Based Authentication, RBAC)

6.2.2 Open Transmission Control Protocol (TCP) ports

The table below lists the open TCP ports on the RMC. These ports are used for all TCP/IP based connections which are supported by the Ethernet ports.

Protocols over TCP can be standard like SSH, or proprietary like Totalflow (Remote or Local).

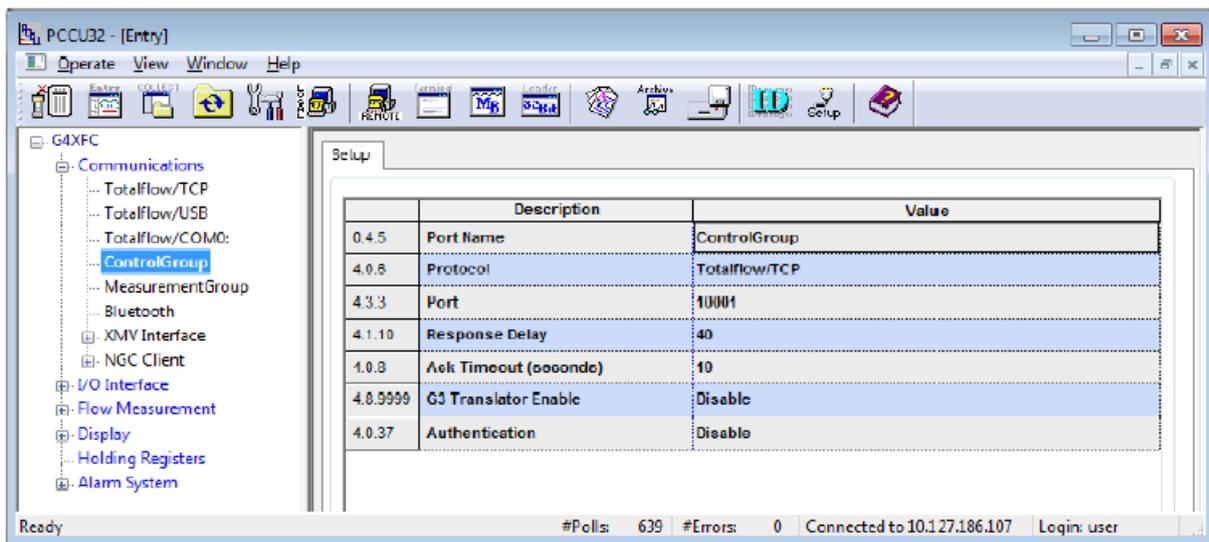
Table 6-4: Open TCP ports on the RMC

Default TCP port	User-configurable	Protocol using the port	Description
9999	Yes	Totalflow/TCP	Assigned to connections used for device monitoring, configuration and data collection or polling. PCCU, WinCCU, TDS and third-party SCADA systems request these connections.
65535	No	Device Loader/TCP	Assigned to the device loader connections for device software update. PCCU requests this type of connection.
9696	No	SSH/TCP	Assigned to secure shell (SSH/SFTP) connections. Third-party SSH/SFTP clients request these connections.
502	Yes	Modbus /TCP	Assigned to connections between the RMC and external Modbus devices for communication and data transfer



IMPORTANT NOTE: For connections with user-configurable ports, use the default value or assign a different port number from the range of 1024 to 65534. Connections using non-default TCP ports are handled by additional Totalflow/TCP communication or Modbus TCP applications configured with different TCP ports. For example, the figure below shows an additional Totalflow/TCP application (named ControlGroup) with a different TCP port (10001).

Figure 6-1: Totalflow/TCP application instance with non-default TCP port





IMPORTANT NOTE: TCP port numbers from 0 to 1023 are universally reserved for well-known ports. Never use these port numbers.

6.3 Denial of Service (DOS) threshold rates

Protection of ports used for TCP/IP communication, such as Ethernet, is very important. Several cybersecurity threats can make a device unavailable for connection.

If the ABB Totalflow device has a Denial of Service (DOS) attack, the device cannot grant requests for connection. It stops responding. The following table provides the DOS threshold rates per packet type. The device stops responding at these thresholds.

Table 6-5: Denial of Service (DOS) threshold rates

Packet type	Description
Ethernet	5 Mbps (7440 packets/sec)
ARP	2 Mbps (2976 packets/sec)
IP	3 Mbps (4464 packets/sec)
ICMP	4 Mbps (5952 packets/sec)
UDP	3 Mbps (4464 packets/sec)
TCP	1 Mbps (1488 packets/sec)

6.4 Security guidelines

The following table contains recommended guidelines to secure access to the RMC. Find procedures for secure configuration throughout this manual, and in quick start guides and online PCCU help files.

Table 6-6: RMC security guidelines

Recommendation	Description
Secure physical access to the device	Control access to the device, its internal components, and connected peripherals.
Secure access with security switch	Turn the onboard security switch on to enforce authentication through bi-level security codes or RBAC. See section 6.5 .
Configure bi-level security codes	Change default security codes to private codes (the default security code for both level 1 and level 2 is 0000). See section 6.5 .
Enable Role-Based Access Control (RBAC)	Configure RBAC. See section 6.6 . Enable role-based access and enable authentication for each of the communication ports. Change the default RBAC passwords and security codes.
Secure network connection	The device only connects to a firewall-protected private network. Do not connect to the Internet.
Secure Bluetooth® access	Enable Bluetooth only when required. Enable RBAC authentication on the port. See section 6.6 .
Secure SSH/SFTP access	Enable the SSH/SFTP service only when required. Change the default SSH/SFTP private keys for all accounts. The SSH/SFTP private keys should always be passphrase-protected. See section 6.7 .

Recommendation	Description
Secure software updates	Enable the Totalflow Software Update service only when required. Use RBAC to limit the ability to enable/disable this service.
Manage credentials	Store all private credentials, keys, and security codes in safe locations. Share private credentials, keys, and security codes only with properly trained and authorized personnel. Change or update private credentials, keys, and security codes as needed.

6.5 Configure bi-level security with security switch

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



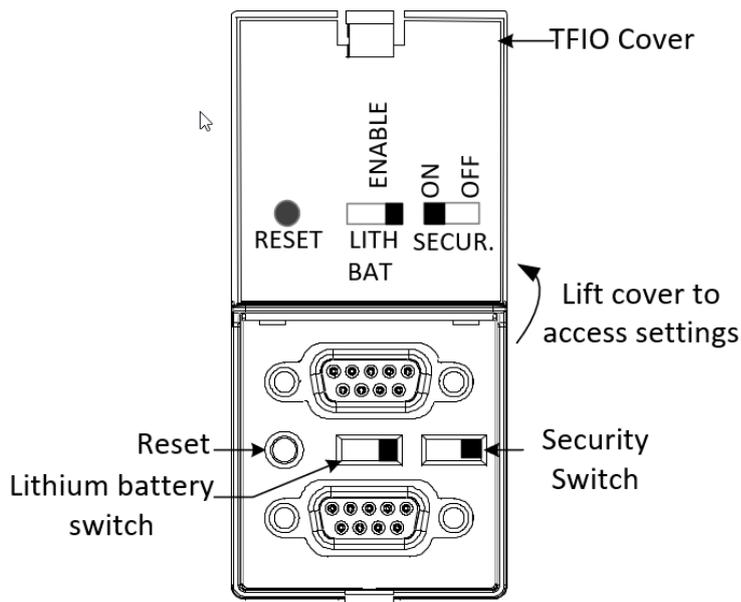
IMPORTANT NOTE: After this procedure is completed, connection to the RMC is restricted to users with the correct security codes.

This procedure requires access to the RMC security switch. If the RMC is installed inside an enclosure, access to the interior of the enclosure is required.

To enable security:

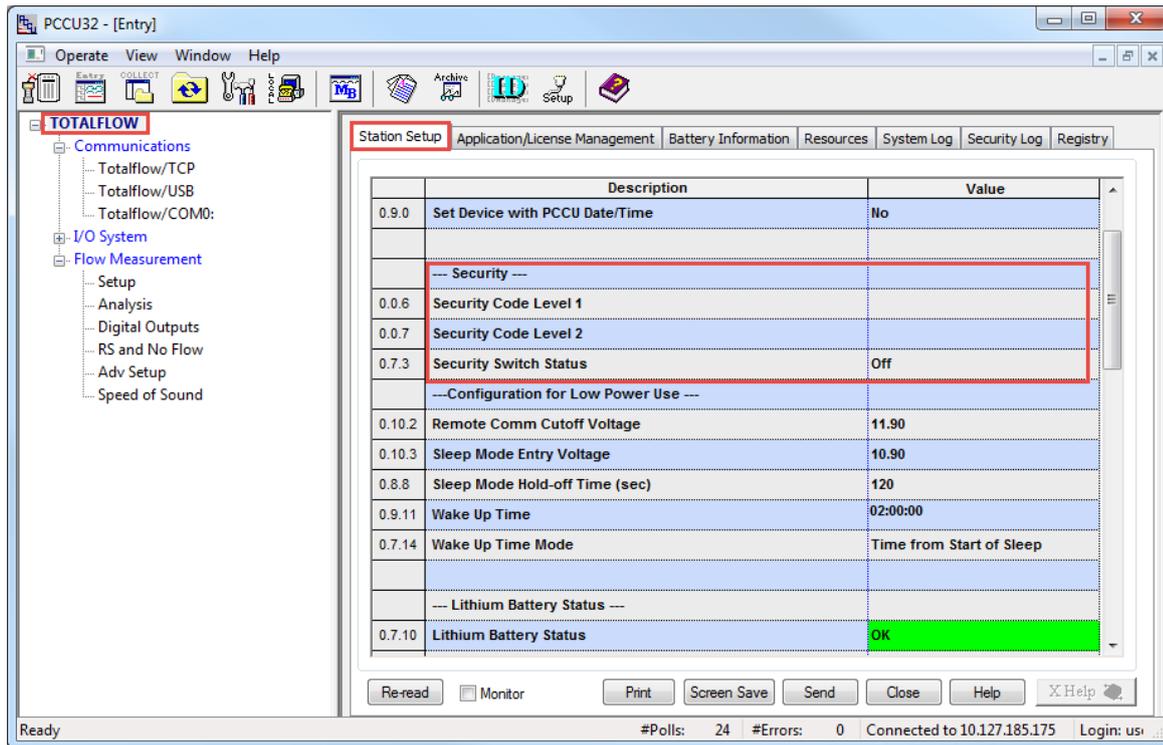
1. Open the enclosure door (if the RMC is installed inside one).
2. Locate and lift the cover over TFIO A and TFIO B.
3. Locate the security switch between the TFIO A and TFIO B connectors. See the figure below.

Figure 6-2: RMC security switch



4. Verify that the security switch is OFF.
5. Display the Station Setup tab and verify that Security Switch Status is Off.

Figure 6-3: Station Setup tab – Security switch status



6. Type a four-digit security code into Security Code Level 1 (Level 1 access grants read only access to the device).
7. Type a four-digit security code for Security Code Level 2 (Level 2 access grants read and write access to the device).



IMPORTANT NOTE: Record the security codes. They are not visible on the Station Setup tab after you save them.

8. Click **Send**.
9. On the RMC, set the security switch to **ON**.
10. On the Station Setup tab, click **Re-read**. Verify that the security switch is On. Enforcement of the security codes is in effect.



IMPORTANT NOTE: PCCU32 requires the security codes the next time it attempts to connect to the device.

The security codes in PCCU32 version 7.57 or later or in WinCCU do not prevent MODBUS® access to the RMC.

6.6 Configure Role-Based Access Control (RBAC)

Role Based Access Control (Role Based Access Control, RBAC) is a feature within PCCU32 that allows an administrator to designate roles and control access levels to various applications and processes in the flow computer. The G5 and newer flow computers and NGC devices support RBAC security files. Each security file is configurable for the specific device type.

When designing an RBAC security system, consider all required user-access to the system. Create the users and an administrator and assign a default role to each.

RBAC security configuration restricts or disables any unapproved applications and functions for the current user. Restricted applications and restricted functions are not visible on the PCCU32 navigation tree. The Send button is also grayed out on applications with read-only functionality.



NOTICE – Security override: After RBAC is implemented it overrides the device-enforced bi-level security and PCCU32-enforced security. When RBAC is enforced, it replaces all other security and specifically implements on a port-by-port basis.

6.6.1 Default access roles

Default roles are automatically available in PCCU32:

- Administrator
- Expert
- Advanced
- Basic
- File Admin

The Administrator role has the highest-level access rights to all functions. Administrators add users, define roles, and save security configuration files to a PC. Expert, Advanced, and Basic roles have decreasing levels of access rights. The File Admin role has the access rights of the Basic role plus minimum rights required for sending and reading RBAC security files to and from G5 and newer devices. The security files can upload to multiple flow computers for implementation.

6.6.2 Set up and create a new RBAC security control file

To set up a new RBAC security system:

- Create a security control file.
 - Create an administrator account.
 - Create individual user accounts and assign default roles.
 - Create customized roles if necessary.
 - Configure communication ports.
 - Save the security file.
1. Launch PCCU32 and click **Operate** > **Security** > **Role Based Access Control** > **Role Administration** on the top menu bar.

Figure 6-4: Configure Role Administration

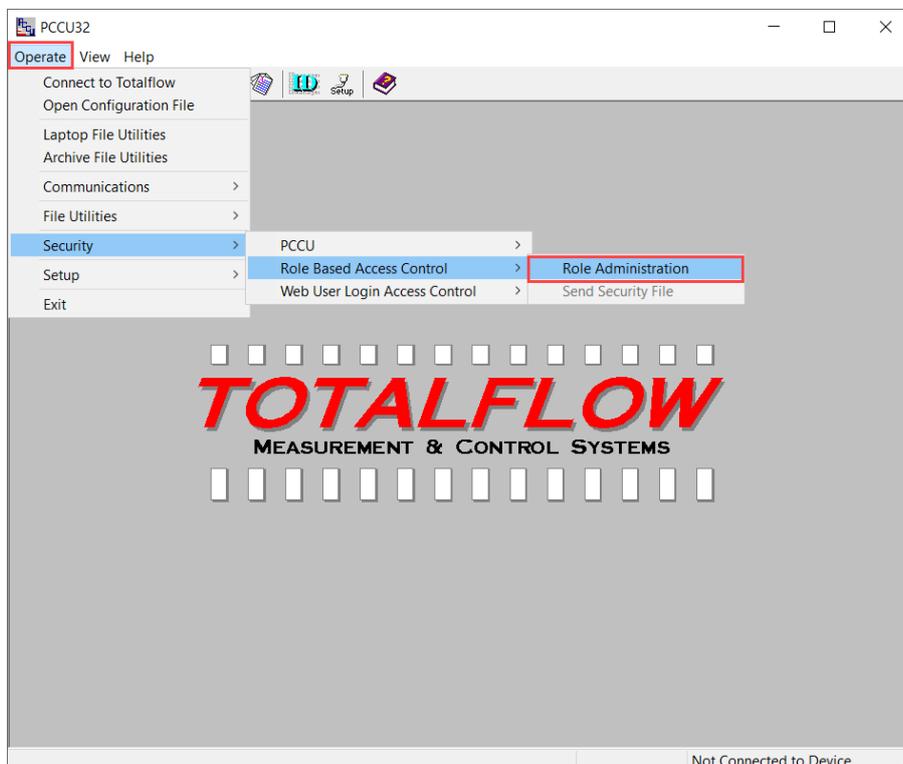
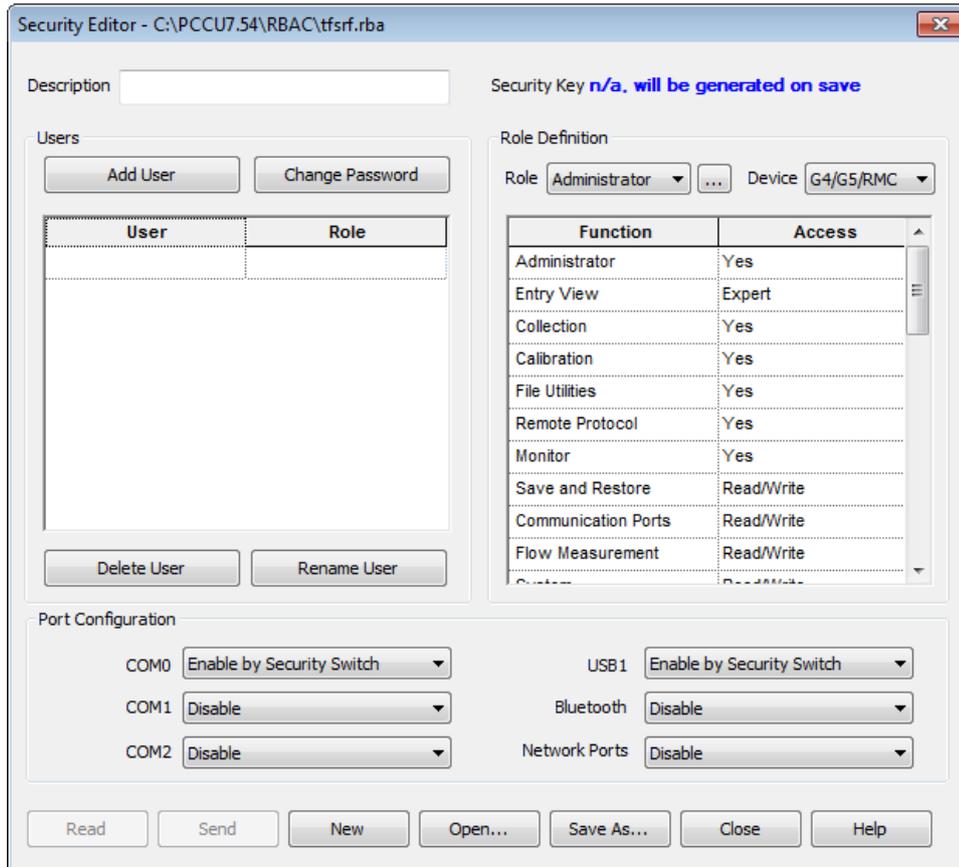


Figure 6-5: Security Editor screen



2. Create the RBAC first:
 - a. Verify that Role displays Administrator.
 - b. Click **Add User**.
 - c. Type the user name into Name.
 - d. Type the password into Password.
 - e. Click **OK**.
3. Follow the procedures detailed in section 6.6.4 Create a new user account to create user accounts with standard roles. Then proceed to Step 4.
4. To define or customize a role, see section 6.6.4 Create a new user account. Return here when complete.
5. To assign RBAC security to a communication port, see section 6.6.5 Enable RBAC authentication on communication ports.
6. Type a description of the security file into Description.
7. Click **Save As** to save the new security control file.
8. Type a password for the security file and click **OK**. The Save Security File dialog displays.
9. Navigate to the appropriate folder, then rename the file as necessary. Click **Save**.



IMPORTANT NOTE: The Security Key displays at the top right corner of the Security Editor dialog. This key displays “n/a will be generated on save” before the security file is saved for the first time, or after changes. After saving, a new security key is assigned and logged into the Security Log. A copy of the security file is saved to the PC connected to the device. The previous key disappears after any modification, and a new one replaces it. The new key and the security control file are automatically logged and saved to the PC. The security control file saves to the PCCU > RBAC folder on the PC and has a default file name tfsrf.rba.

6.6.3 Edit the security file

To edit an existing security control file:

1. Display the Security Editor dialog.
2. Click **Open** to display the Open Security File navigation dialog.
3. Browse to **PCCU > RBAC > [file name.rba]**. Click **Open**.

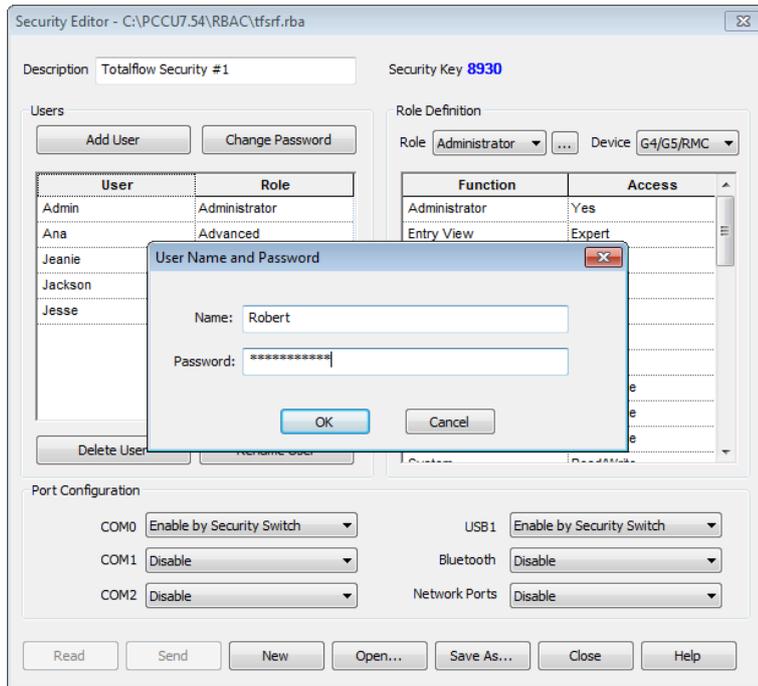
4. Make the necessary changes.
5. Click **Save As**. The Security File Password dialog displays.
6. Type a password for the security file. Click **OK**.
7. Navigate to the appropriate folder, then rename the file as necessary. Click **Save**.

6.6.4 Create a new user account

To add a new user to the RBAC security system:

1. Display the Security Editor dialog and click Add User.
2. Type the user name into Name.

Figure 6-6: User Name and Password dialog box

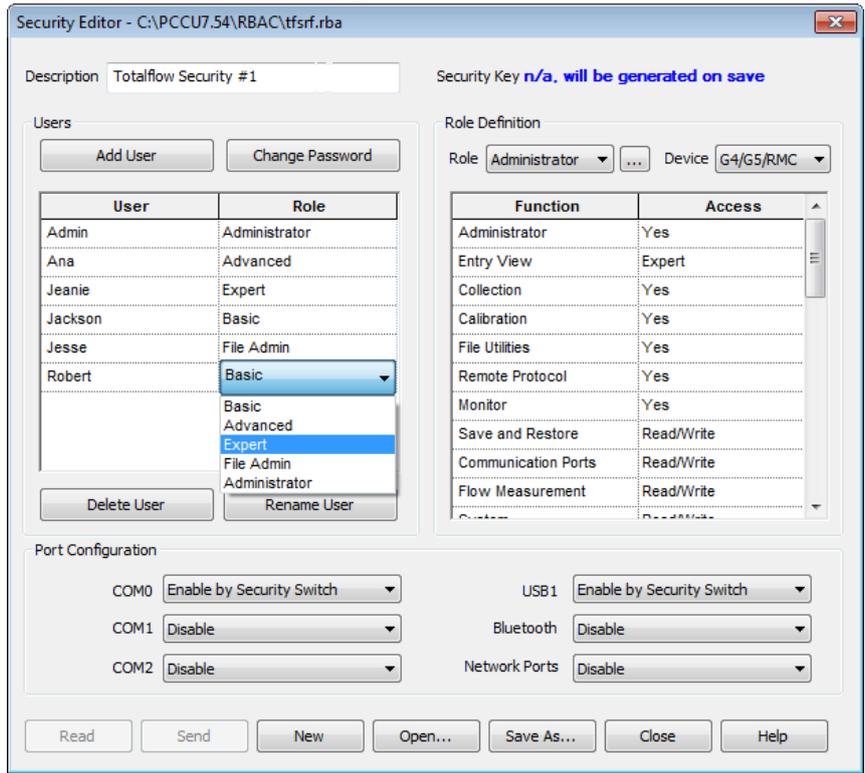


3. Type the user password into Current Password. Click **OK**. The new user account displays on the list of users.
4. Click **Role** beside the new user account and select the appropriate role from the drop-down list.



IMPORTANT NOTE: During the initial setup, no customized roles exist. Create at least one additional user account before creating a customized role. Then, assign the new role to a new or existing user account.

Figure 6-7: User role assignment



- Repeat steps 1 through 4 for each user account.
- Click **Save As** to save and name the new security control file.
- Type a password for the security control file in the Current Password field and click **OK**.

6.6.5 Enable RBAC authentication on communication ports

Enabling RBAC authentication on communication ports secures access to the device. Connection to the ports requires authentication with correct credentials. Select one of the methods described in this section. Review the authentication options in [Table 6-7](#).

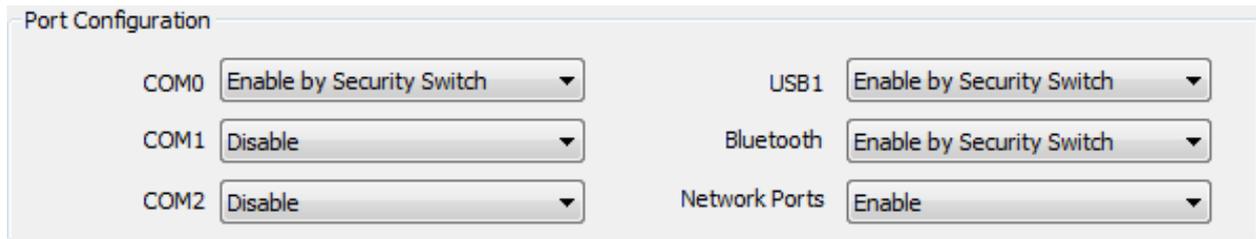
Table 6-7: Per-port RBAC authentication options

Port security setting	Functionality
Disable	Do not perform any RBAC security functions on the port.
Enable	Enable full security over the port to RBAC. Keep records of access credentials and safeguard them. If the administrator name or password are lost, you must reset the device with the factory default configuration to access it. If you restore the factory defaults it deletes all data and the running configuration. See section 8.5.8 for additional details.
Enable by Security Switch	Enable security over the port to RBAC but allow the electronic board security switch to override RBAC security. If the administrator name or password are lost or forgotten, use the security switch to disable the RBAC. If the switch is OFF, log in and reconfigure the security access. No data is lost. See section 6.6.5.2 .

6.6.5.1 Enable authentication from the RBAC security editor

- Select the preferred authentication option for each port ([Figure 6-8](#)).

Figure 6-8: Enable port authentication from RBAC security editor



2. Click **Save As** to save changes to the security control file.
3. Type the password for the security control file into Current Password and click **OK**.

6.6.5.2 Enable authentication from the Entry mode

Enable one port at a time to enable RBAC authentication.

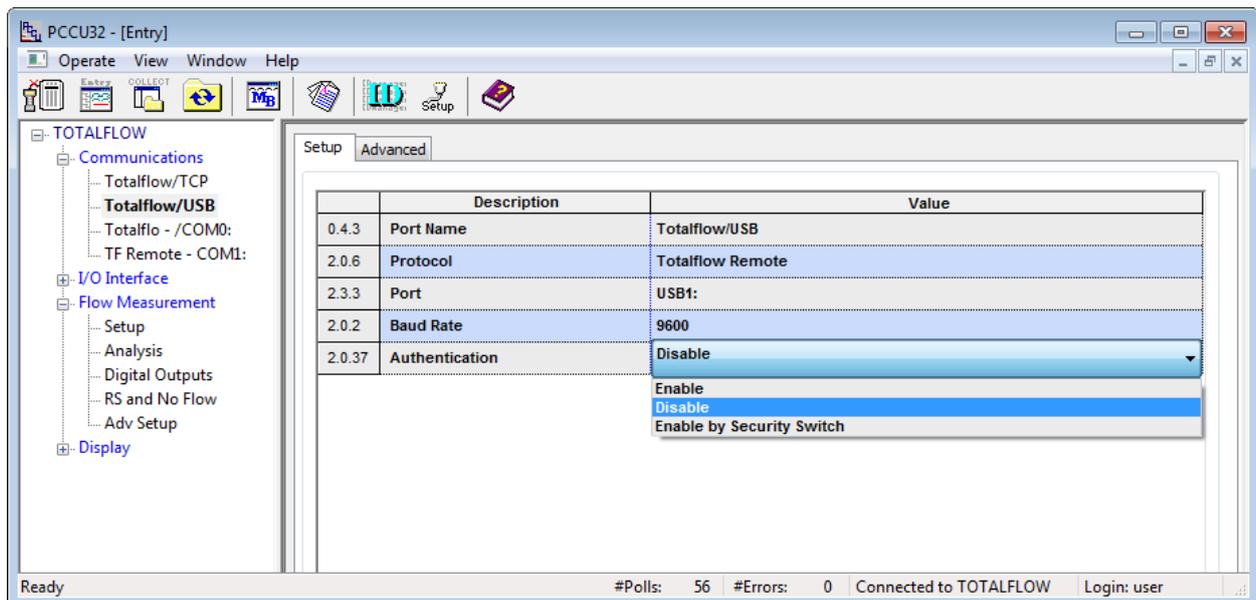
To use entry mode in Advanced or Expert view to configure or override communication port security:

1. Launch PCCU and click Entry. The navigation tree displays.



2. Click the communication port on the navigation tree.
3. Select **Enabled** or **Enable by Security Switch** from the Authentication drop-down list. ([Figure 6-9](#)).
4. Click **Send**.
5. Repeat steps 1 through 4 for each of the communication ports.

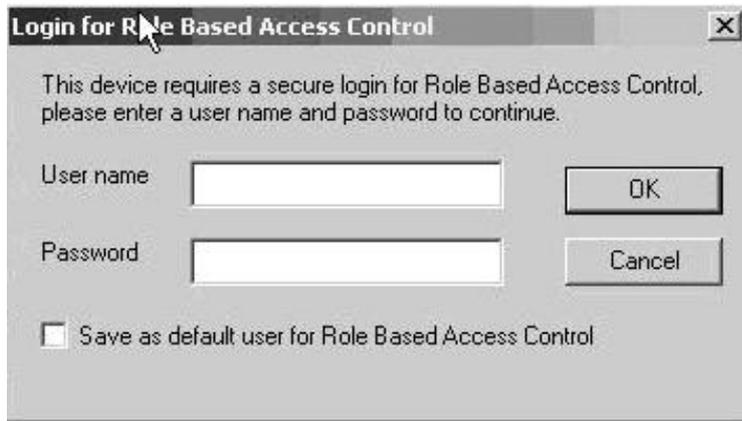
Figure 6-9: Enable communication port authentication - Entry mode



6.6.6 Use default RBAC credentials

A login screen requests the user name and Password whenever PCCU connects to a flow computer through an RBAC-enabled port.

Figure 6-10: Login dialog box

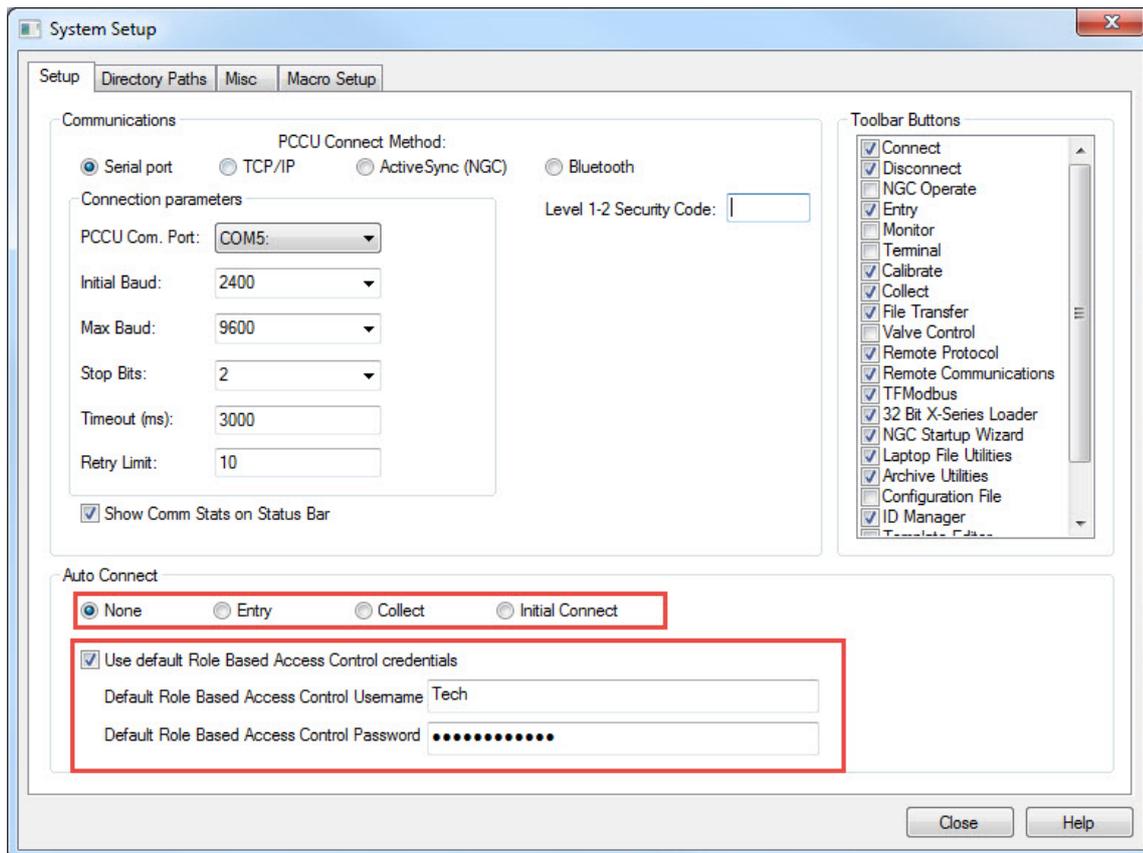


Set the user name and password as default credentials in PCCU, if necessary. The User Name and Password fields autofill with the default credentials on subsequent logins.

To create, change or disable the RBAC credentials in PCCU:

1. Click **Setup** on the toolbar or click **Operate > Setup > System Setup**.
2. Set the defaults in the Auto Connect section ([Figure 6-11](#)):
 - a. Select Entry, **Collect**, or **Initial Connect**. Click **Help** for additional details.
 - b. Select **Use Default Role Based Access Control credentials**.
 - c. Type the user name into Default Role Based Access Control Username.
 - d. Type the password into Default Role Based Access Control Password.

Figure 6-11: System Setup Auto Connect and RBAC credentials



3. Click **Close** to exit PCCU connection setup.

6.7 Secure the SSH/SFTP service

RMC devices implement the Secure Shell (Secure Shell, SSH) and Secure File Transfer Protocol (Secure File Transfer Protocol, SFTP) service. This provides secure shell login access and file transfer capability from a client PC or laptop.

SSH and SFTP provides secure access, instead of the unsecured access of Telnet and FTP in earlier device generations.

SSH/SFTP communication is client-server based. The SSH/SFTP server is implemented in the Totalflow device. The SSH/SFTP client is implemented in third-party software on the computer that communicates with the device.

When the SSH/SFTP service is enabled, the SSH/SFTP server initializes and enters listening mode. When the server is in listening mode, it can process requests for connection from SSH/SFTP clients. The service grants connections only to properly authenticated clients.

6.7.1 Supported SSH/SFTP accounts

The table below lists the three SSH/SFTP accounts. Customers can access the Totalflow-user account, which is read-only. The developer and tech-support accounts are only available to ABB personnel for service and troubleshooting, or to advanced users and cybersecurity managers who want to generate private keys to replace factory default keys.



IMPORTANT NOTE: Call ABB Customer Support on the last page of this manual to request Totalflow-user account default private keys. See the SSH and SFTP service overview topic in PCCU online help for instructions to establish read-only SFTP connections.

Table 6-8: Security keys

Account Name	Access privileges	Default keys	Access
Totalflow-user	Only SFTP access (Read-only)	Totalflow-user private key	The following folders and their contents are available for download: <ul style="list-style-type: none">– Crash Dumps– Flash: Main Totalflow application (App), Factory configuration, Startup (cold) configuration– Logs: System and device loader log files– tfData: Running (warm) configuration files
Developer	Full SSH/SFTP access (Read-write)	Developer private key	All file system
Tech support	Full SSH/SFTP access (Read-write)	Tech support private key	All file system

6.7.2 SSH/SFTP authentication

Session keys encrypt the communication between the client and the SSH/SFTP server to provide security. Authentication requires specific private-public key pairs for the type of access. ABB provides default private keys and passphrases to customers upon request. ABB stores the default public keys at the factory in a protected storage location on the device's flash. They remain unchanged by updates of any of the device software components.

To request a connection to the SSH/SFTP service, provide the private key and passphrase. The service compares the private key with the public key stored in the Totalflow device. If the keys pair correctly, the connection is successful.



IMPORTANT NOTE: Private keys do not ship with the product or user interface software. ABB keeps the keys and credentials safely stored. Request keys for SSH/SFTP access. Enable the service only if necessary.

6.7.3 Update default SSH/SFTP keys

ABB Totalflow generates default keys, but customers must generate their own private keys for security reasons. To update the private key, first update the corresponding public key stored on the RMC device. This procedure describes how to regenerate a private key and update its corresponding public key on the device.



IMPORTANT NOTE: Only permit an authorized expert user to perform this procedure. This procedure requires developer or tech-support access. Failure to follow the procedure in its entirety locks access to the SSH/SFTP service. To obtain default keys for this type of access, call ABB Customer Support at the number on the last page of this manual.

6.7.3.1 Update requirements

The key update requires third-party software.

Obtain the following before update:

- Third-party software, such as PuTTYgen, to generate new keys. Download PuTTYgen as part of a putty package or as a standalone utility.
- Third-party SFTP client software to establish SFTP connections with the device (FileZilla).
- Latest PCCU from ABB. Download PCCU from www.abb.com/upstream.
- The private keys for developer or tech support accounts, and their respective passphrases for SFTP. To change the keys for the first time, request the default keys from ABB. Otherwise, use previously updated keys.



IMPORTANT NOTE: There are other options for the third-party software. PuTTYgen and FileZilla are examples. The update procedure is similar with other software

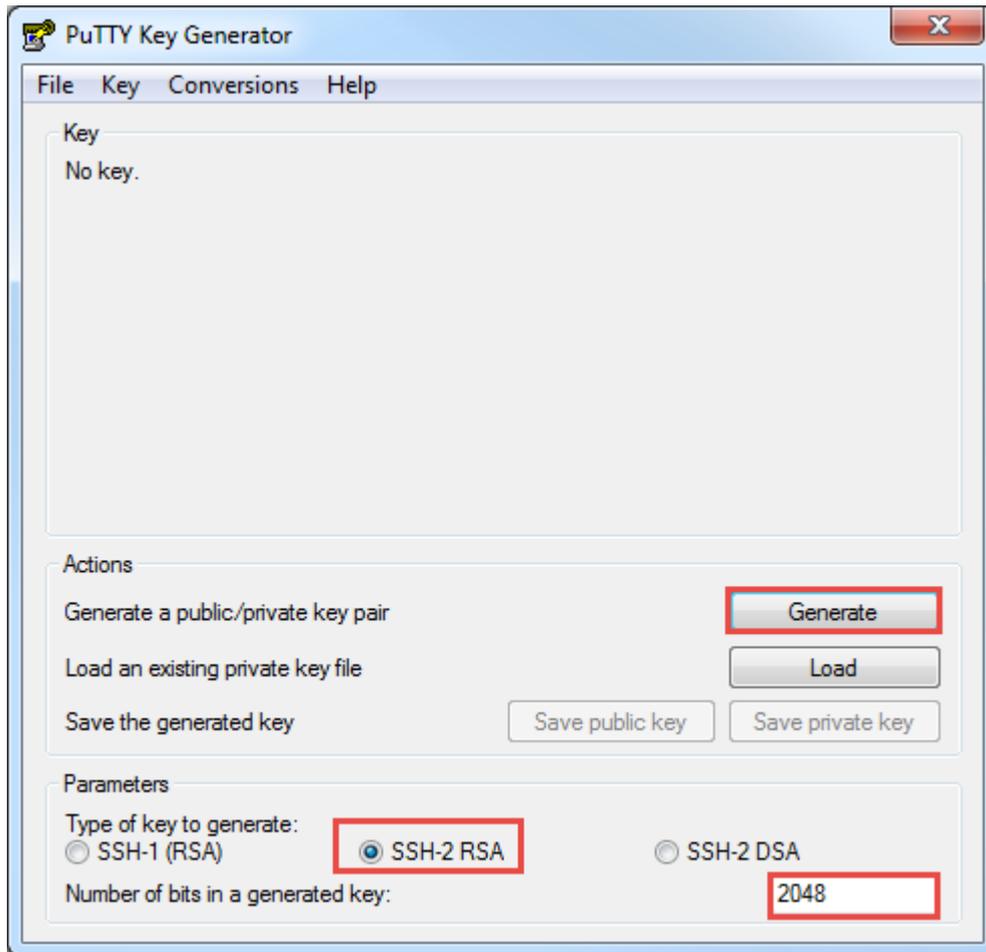
6.7.3.2 Generate private-public key pair

This procedure generates and saves a new private-public key pair. The private key, passphrase and public key are stored safely on the user's laptop or PC. The public key must also be saved in the RMC device. The new private key and its passphrase are necessary to access accounts after update of a device's corresponding public key.

To generate new keys:

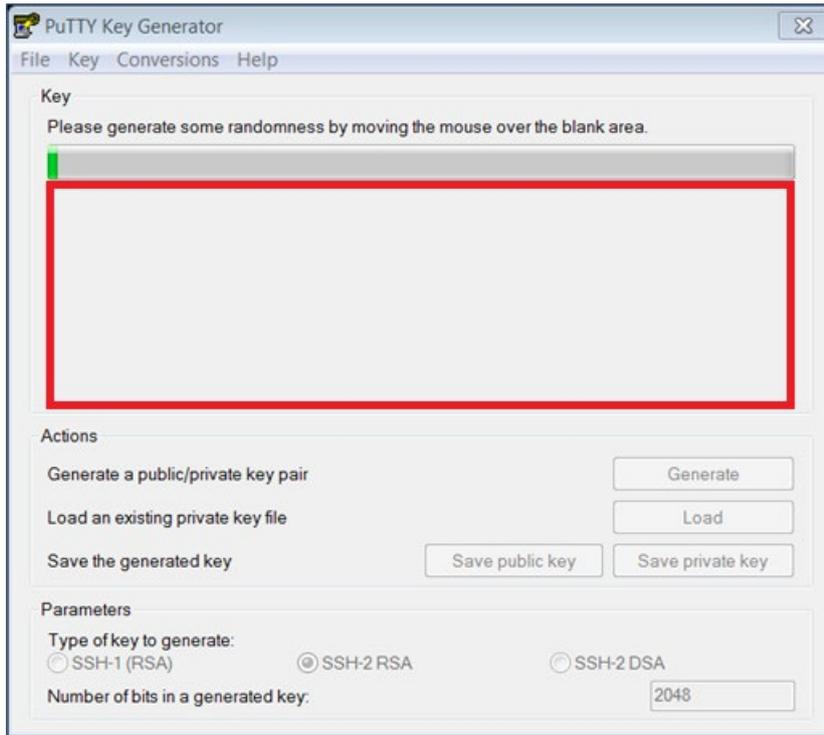
1. Download and install the latest version of PuTTYgen from the link in section [6.7.3.1](#), Update requirements.
2. Launch the PuTTYgen application. In the PuTTYgen Key Generator window, verify that the "Type of key to generate" is set to SSH-2 RSA, and "Number of bits in a generated key" is set to 2048. Click **Generate**.

Figure 6-12: PuTTYgen Key Generator



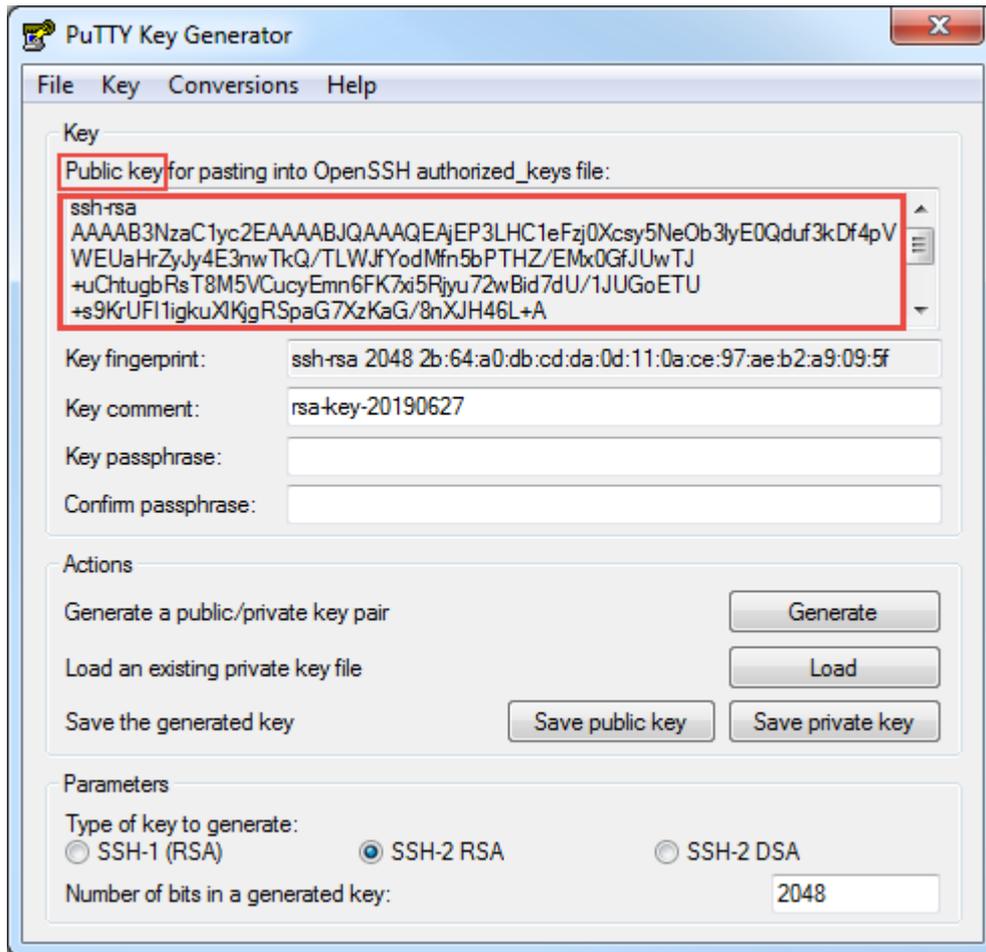
3. Move the mouse to the Key blank field, per the image below. Hold the mouse over that field to prevent delays in key generation.

Figure 6-13: PuTTYgen Key Generator Key blank field



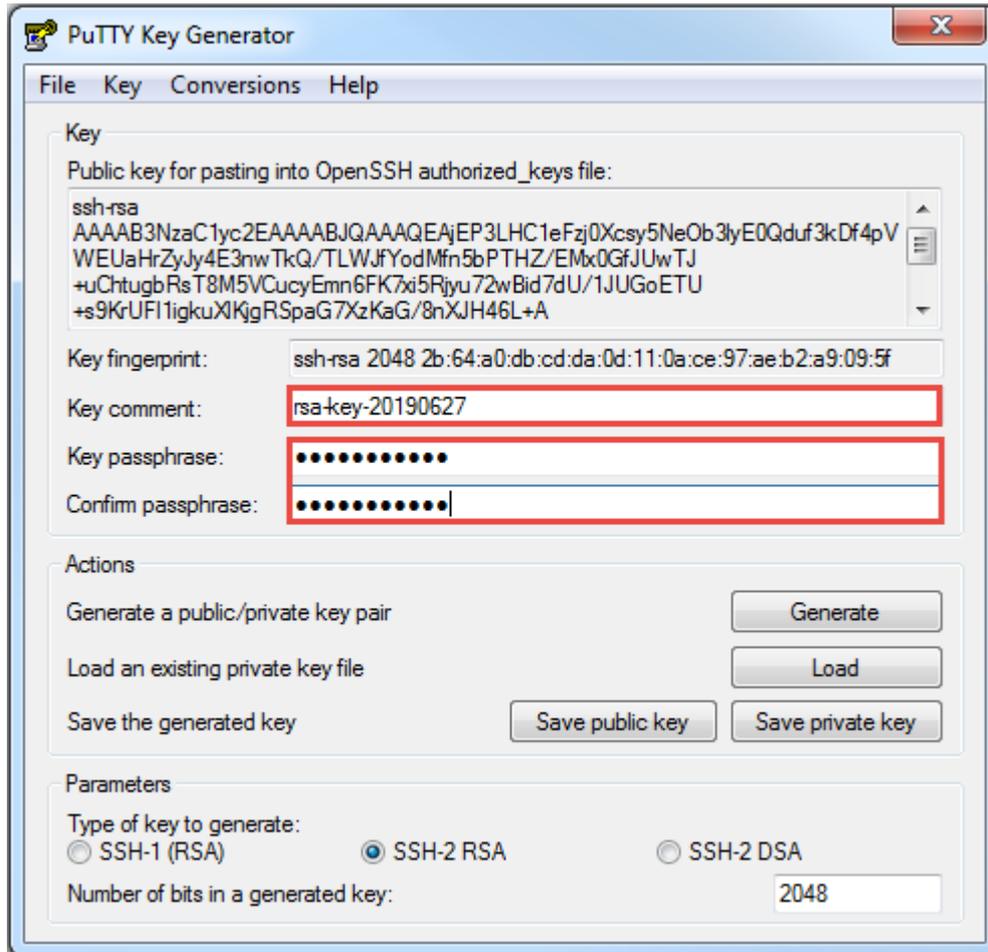
4. Allow the program to generate the new key. The progress bar reaches 100%. The Key field displays the new public key.

Figure 6-14: New public key



5. Accept the key description in Key comment or type a new one into the field.
6. Create a strong private passphrase and type it into Key passphrase and Confirm passphrase.

Figure 6-15: New private key comment and passphrase

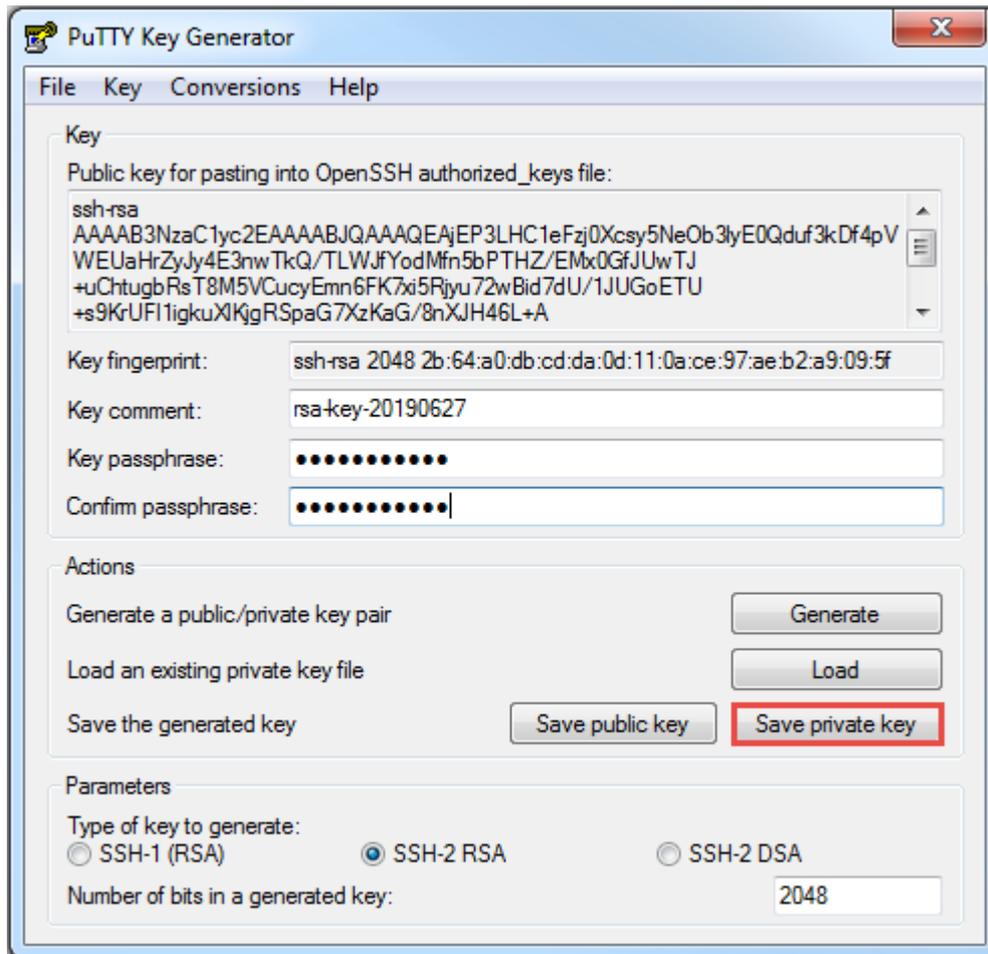


7. Click **Save private key** ([Figure 6-16](#)).



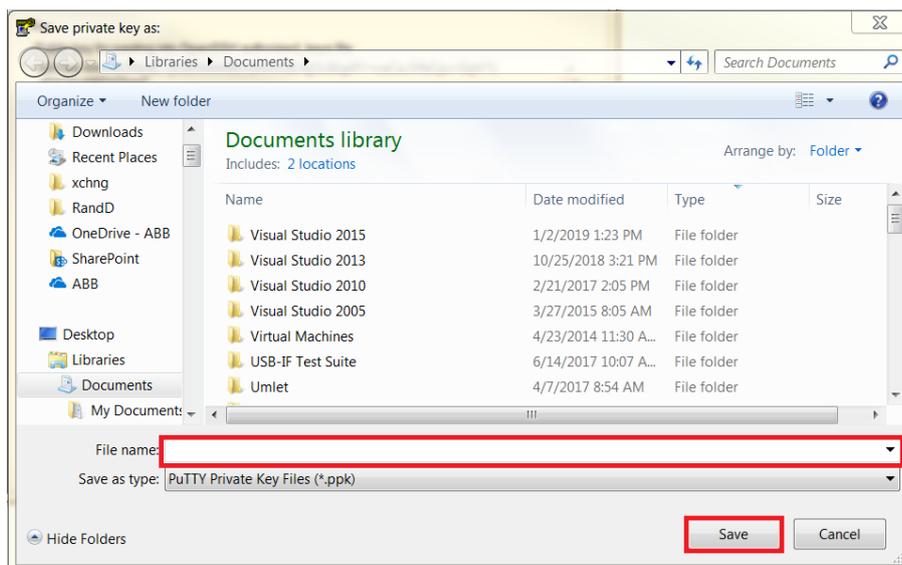
IMPORTANT NOTE: The PuTTY Key Generator generates the private key but does not display it on the screen.

Figure 6-16: Save private key and passphrase



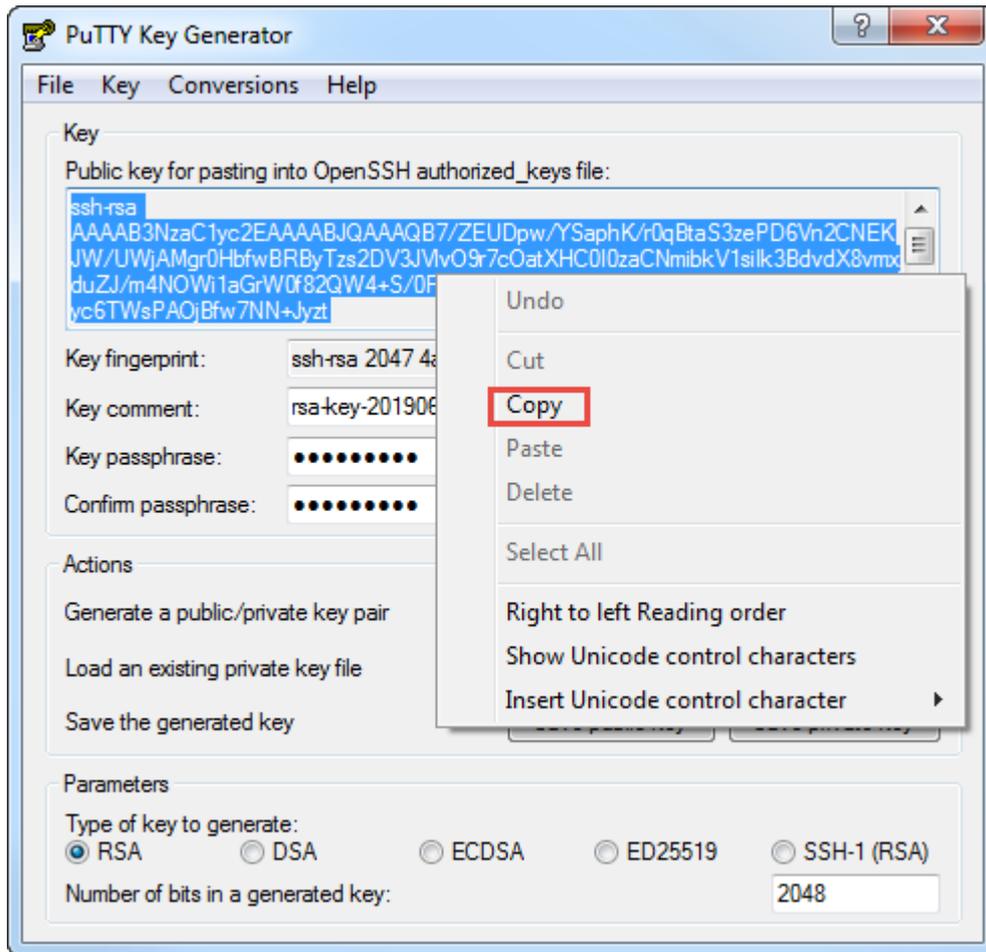
8. Navigate to the correct folder and type the file name into File name. The private key file has a .ppk extension. Use this new private key and its passphrase to access the accounts after an update to the public key.

Figure 6-17: Select location to save private key file



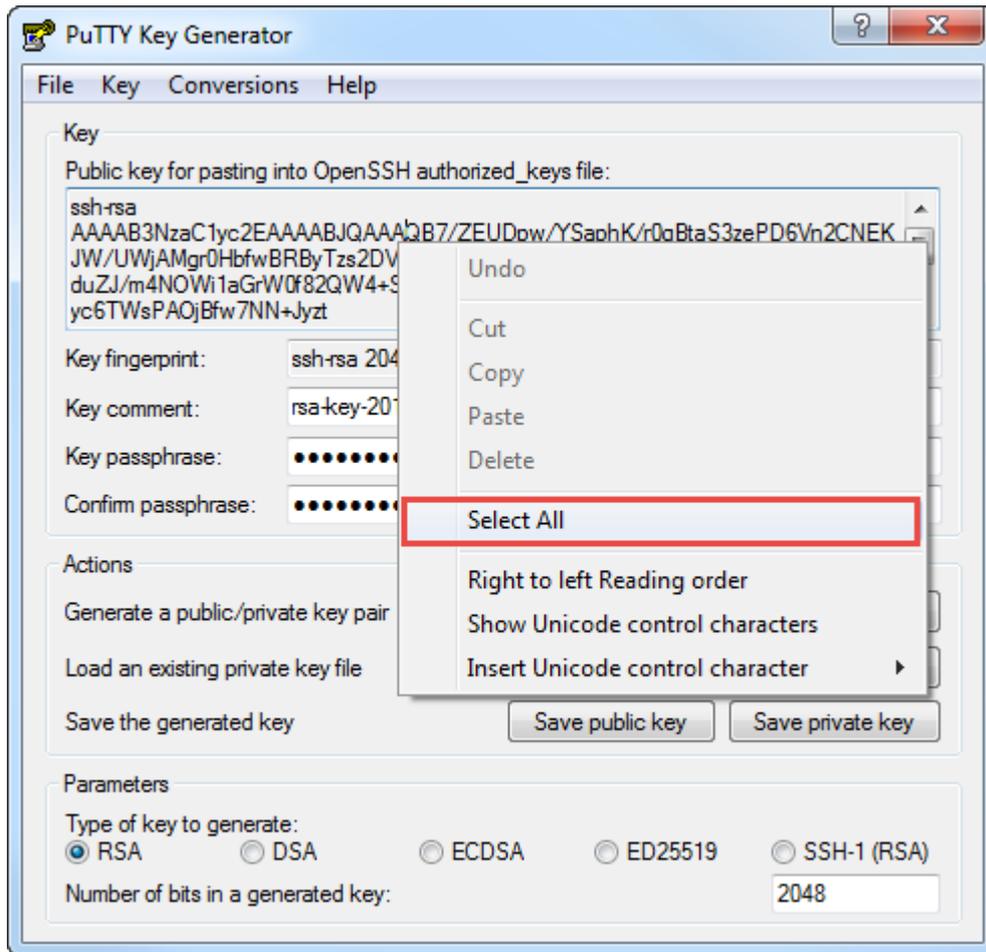
9. Click **Save**. The file browser closes.
10. Right-click the text in Public key for pasting into OpenSSH authorized key file. Click **Copy** ([Figure 6-18](#)).

Figure 6-18: Copy public key from the Key field



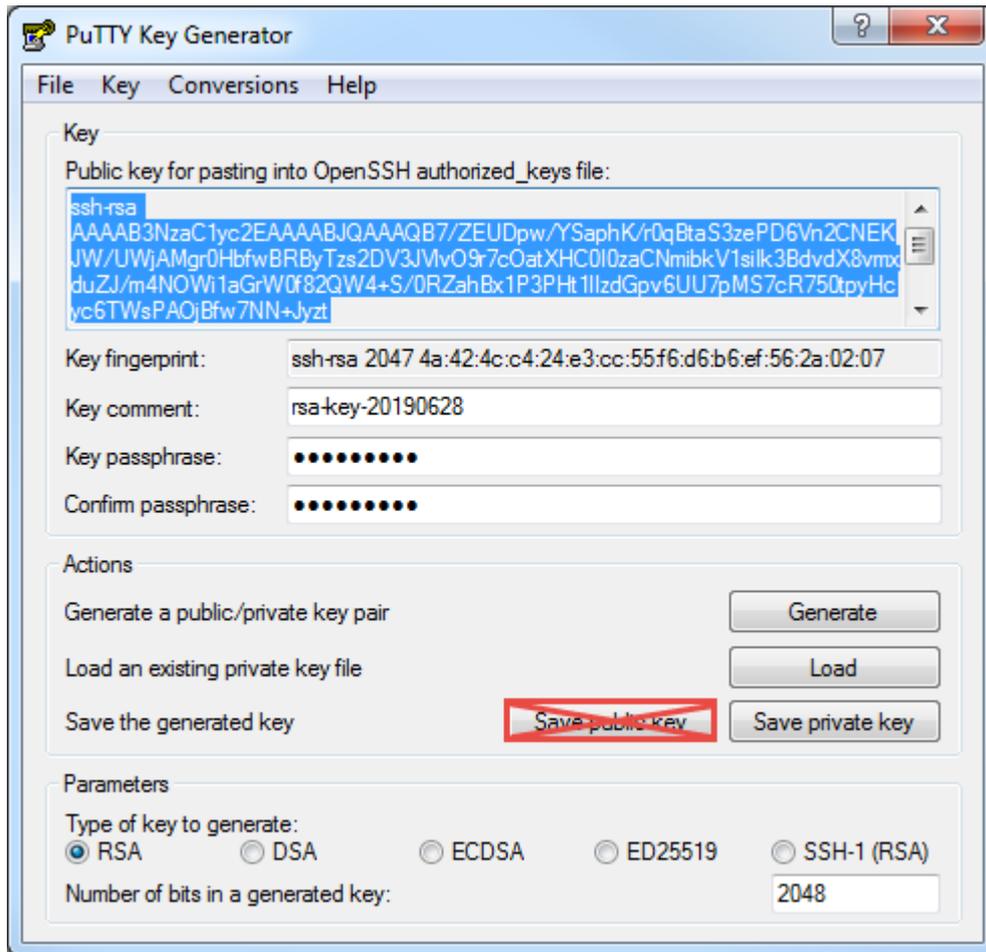
IMPORTANT NOTE: If the public key text is not highlighted, right-click the text and click **Select All** (Figure 6-19). Then click **Copy** to copy the key.

Figure 6-19: Select generated public key text



IMPORTANT NOTE: Do not click Save public key on the PuTTY Key Generator dialog ([Figure 6-20](#)).

Figure 6-20: Do not save public key from the PuTTY Generator dialog



11. Create a new text file on your laptop or PC and paste the copied public key contents into this file.
12. Save the text file. Use one of following file names based on the account type:
 - userkey.txt: A key with this name appends to the available Totalflow-user public keys in the device. The Totalflow user account is accessible after the key update operation, either with the newly created private key or the previous set of private keys for the Totalflow-user account.
 - rootkey.txt: A key with this name appends to the available developer and tech-support public keys in the device. The developer and tech support accounts are accessible after the key update operation with either the newly created private key or the previous set of private keys for developer and tech-support accounts.

The key generation is complete. A key file with the .ppk extension stores the new private key. A corresponding public key text file has one of the two names, above.



IMPORTANT NOTE: Follow steps 1 through 12 for each key to generate new user and root keys.

6.7.3.3 Update public keys on device

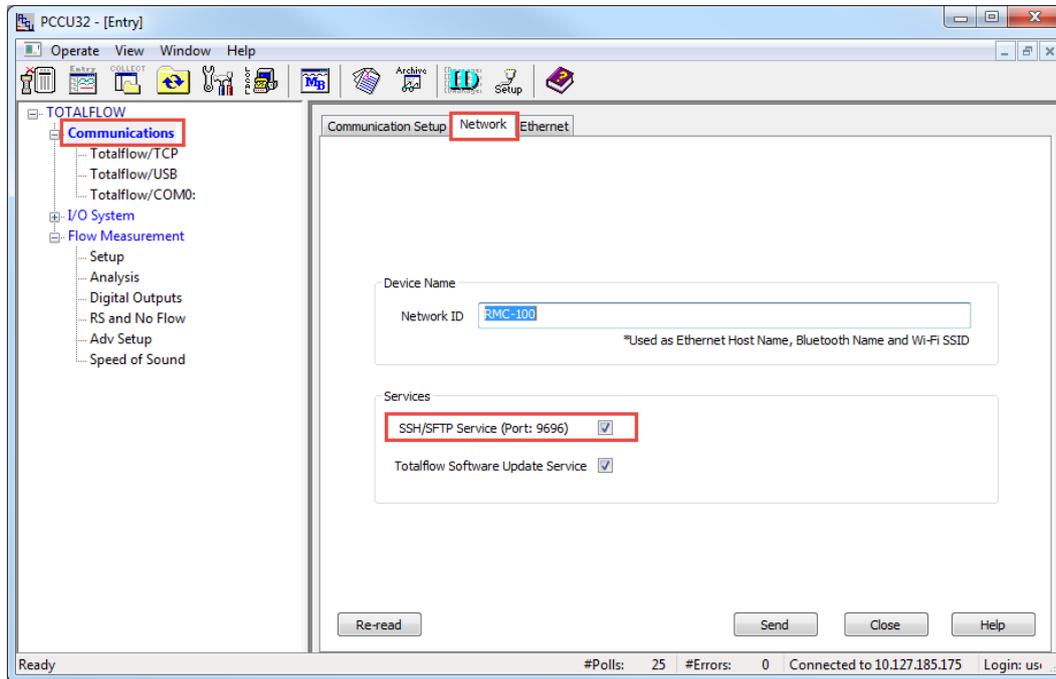
This procedure saves the new public key on the RMC device. The new key appends to an existing key. This procedure requires a TCP/IP-based connection with the device. Verify that the device has a valid IP configuration. The valid IP configuration depends on the type of connection. You can use an Ethernet network or point-to-point connection for this procedure.

To save the public key:

1. Download and install the latest version of FileZilla from the link provided in section [6.7.3.1](#), Update requirements.

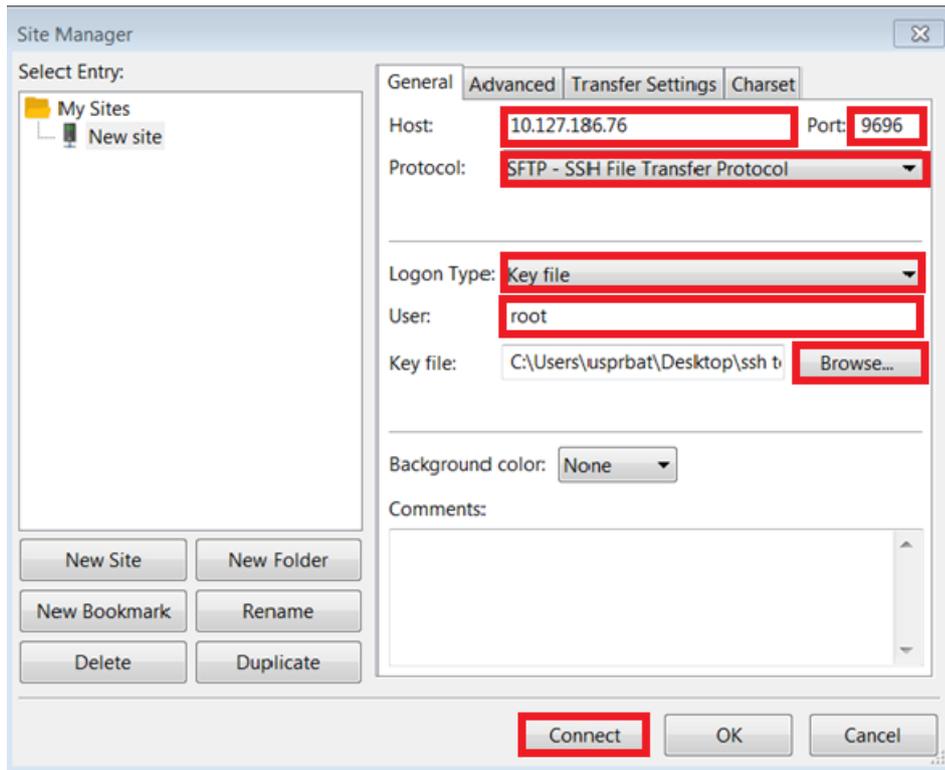
2. Connect to the device's MMI or USB port.
3. Launch PCCU and click **Entry** on the toolbar. The navigation tree displays.
4. Click **Communications**. Then click **Network**.
5. Select **SSH/SFTP service**.

Figure 6-21: Enable the SSH/SFTP service



6. Click **Send**.
7. Click **Ethernet** to display the Ethernet tab and enable, verify, or configure IP parameters. Use a valid IP configuration to access the device over a network. Configure the device to use a local point-to-point to connection, as necessary. Click **Help** for additional details or see section [4.5](#).
8. Click **Send** to save any changes.
9. Connect the RMC device to the network or to the laptop or PC (if the Ethernet connection is local). Keep the serial or USB connection open.
10. Launch the FileZilla application.
11. Click **Open the Site Manager**. The Site Manager dialog displays ([Figure 6-22](#)).
12. Configure the General tab parameters:
 - Host: Type the device's IP address.
 - Port: Type **9696**.
 - Protocol: Select **SFTP- SSH File Transfer Protocol** from the drop-down list.
 - Logon Type: Select **Key file** from the drop-down list.
 - User: Type **root**.
13. Click **Browse** to select the current private key. If this is the first time the keys are changed, use ABB's default developer or technical support private key.
14. Click **Connect**. If the private key is passphrase-protected, a window displays and requests the passphrase before granting the connection ([Figure 6-23](#)).

Figure 6-22: FileZilla Site Manager connection setup



15. Type the passphrase into Password. (Figure 6-23). Use the passphrase provided by ABB or update the key and create your own passphrase.
16. Click **OK**. The laptop issues a warning the first time it tries to connect to the device (Figure 6 23).

Figure 6-23: Type private key passphrase (password)

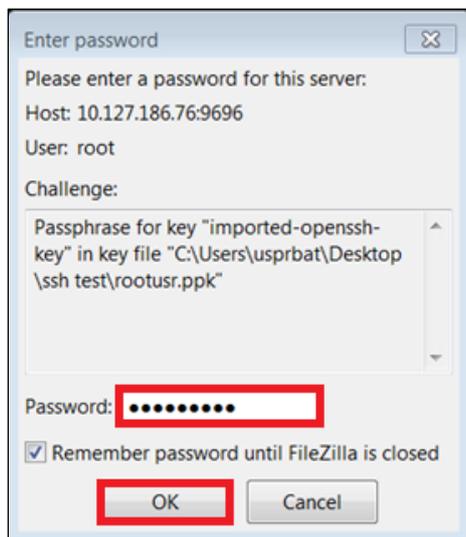
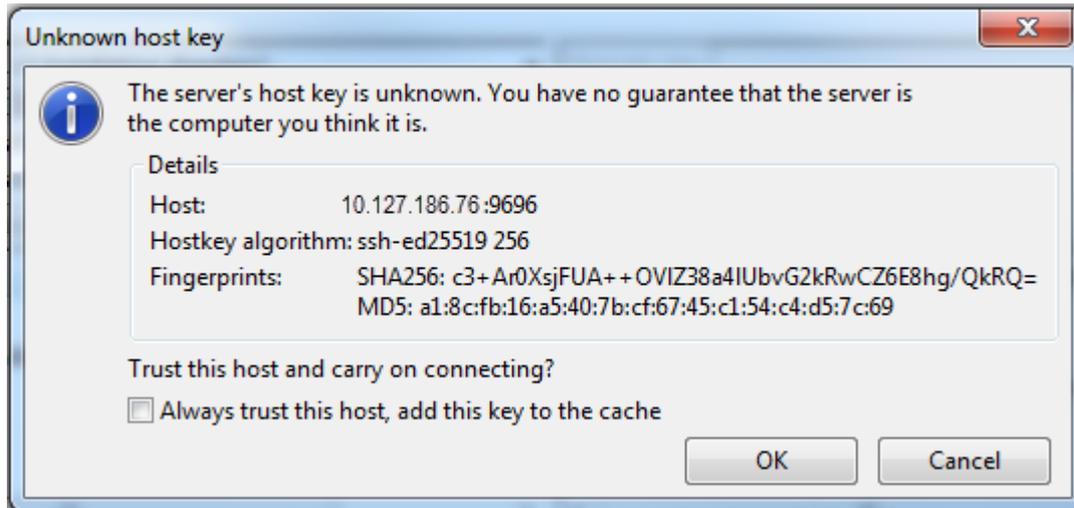
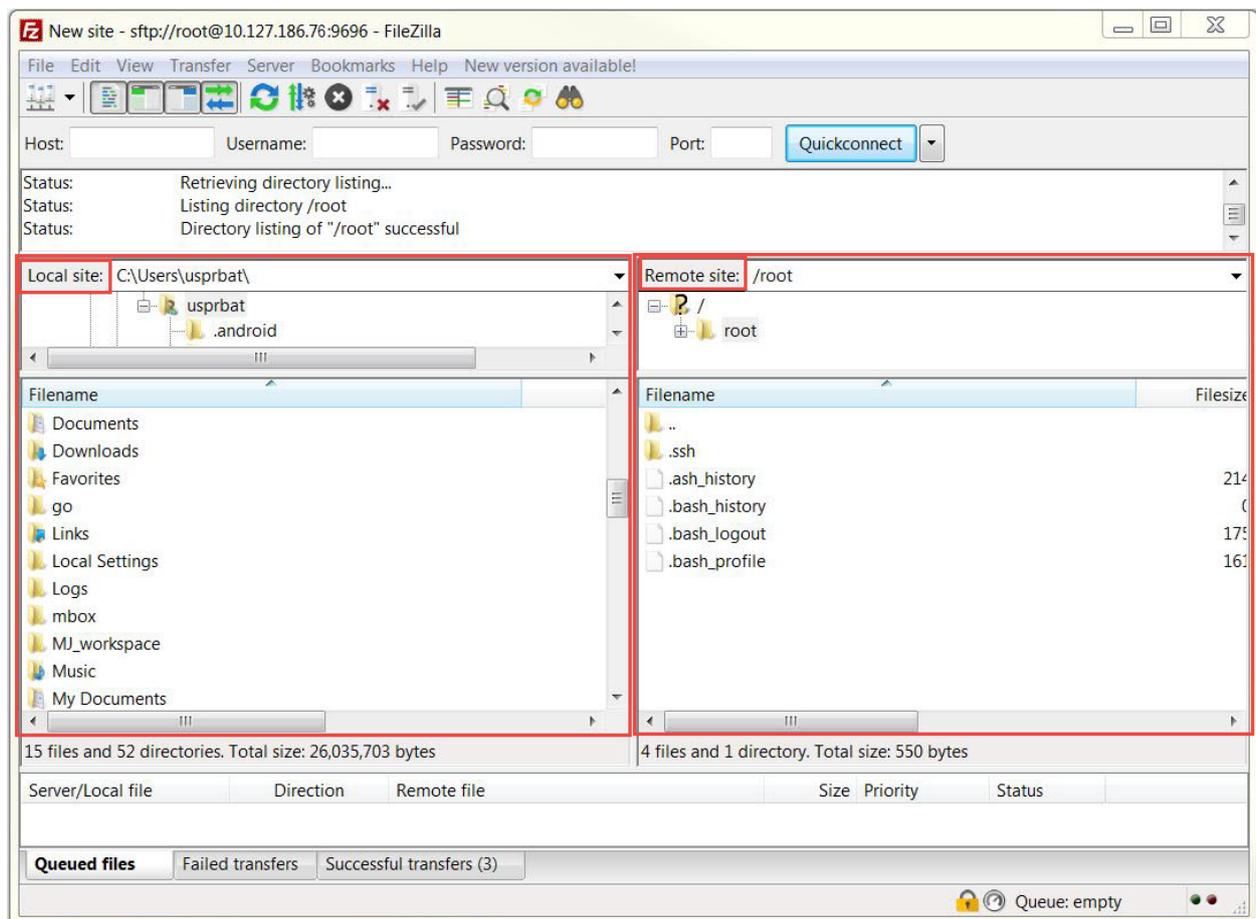


Figure 6-24: Unknown host key warning



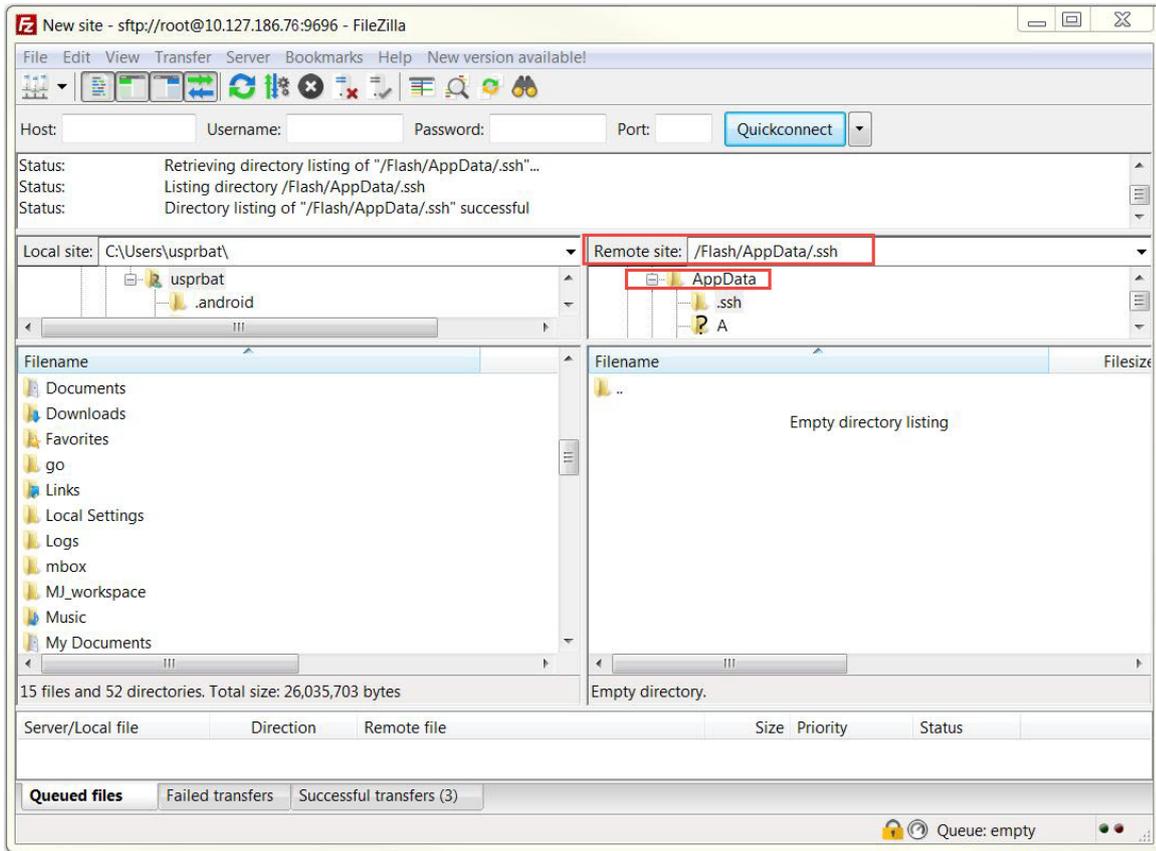
17. Click **OK**. The connection with the device is successful when FileZilla displays the file directories of the laptop or PC (Local site, on the left) and the device (Remote site, on the right) ([Figure 6-25](#)).

Figure 6-25: FileZilla New Site window



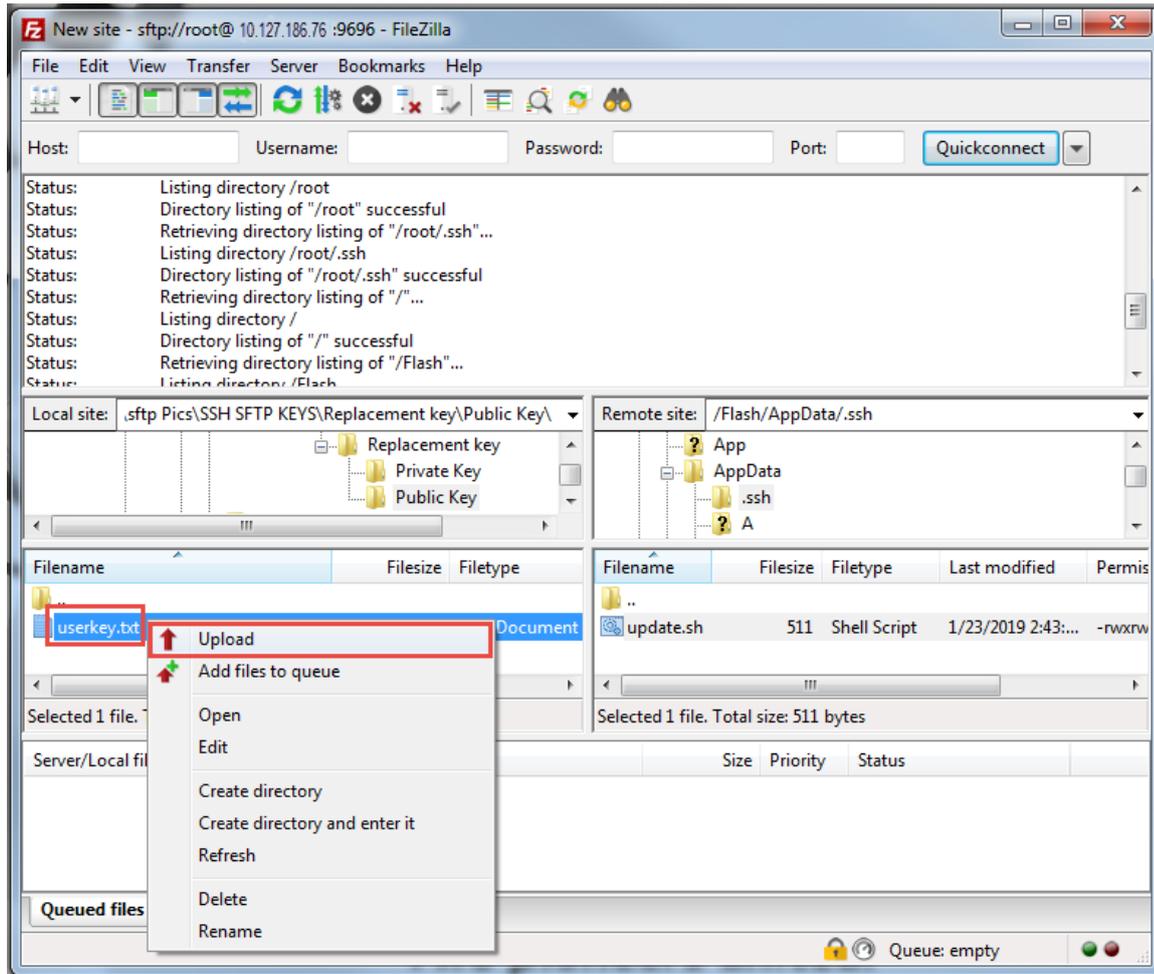
18. Navigate to the directory containing the newly created public key text file (on the left) and open it.
19. Navigate to the /Flash/AppData/.ssh/ directory on the Totalflow device (on the right) and open it. The device updates the keys only if it finds them in them in the specified directory.

Figure 6-26: Open the /Flash/AppData/.ssh/ directory



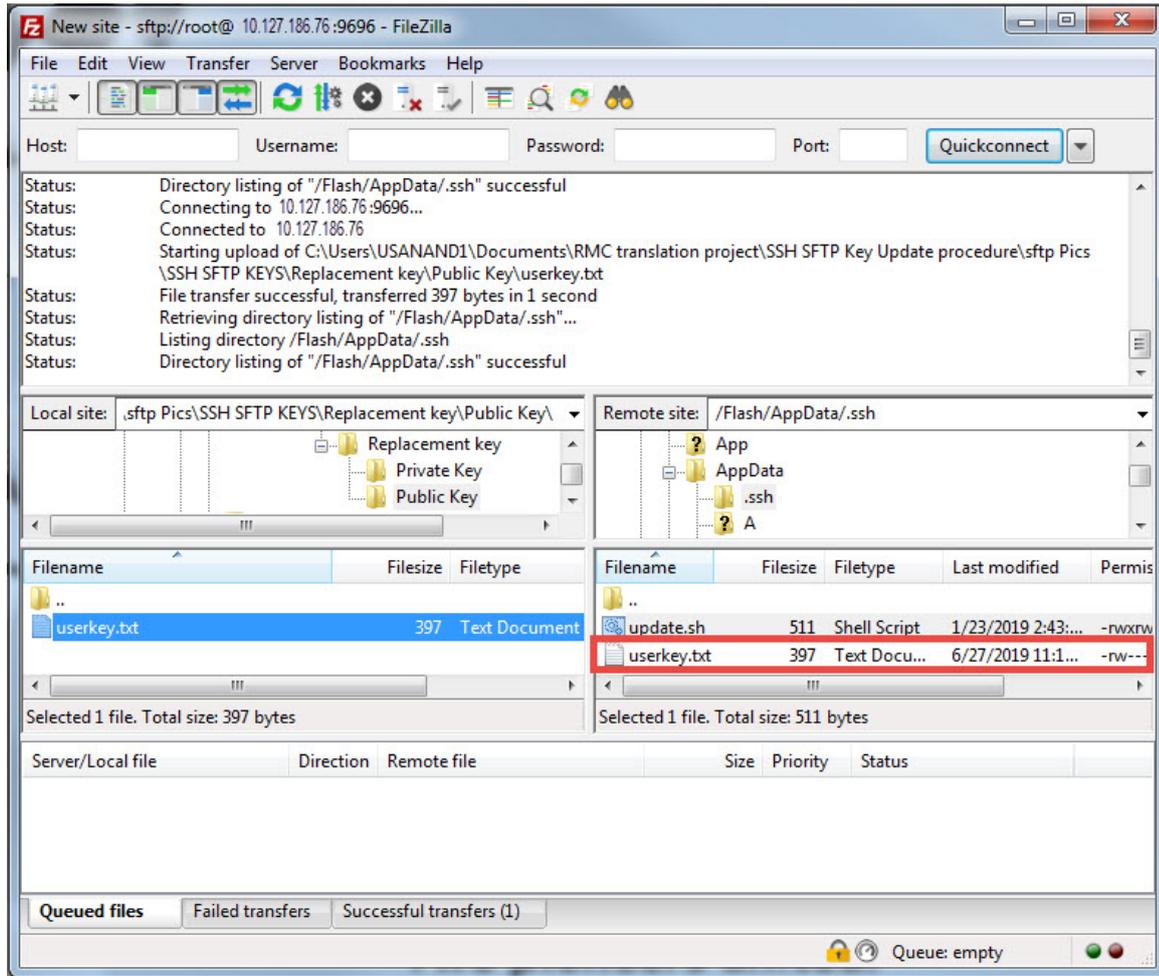
20. Right-click on the new public key file in the Filename window and select Upload from the drop-down list.

Figure 6-27: Upload public key from laptop to device



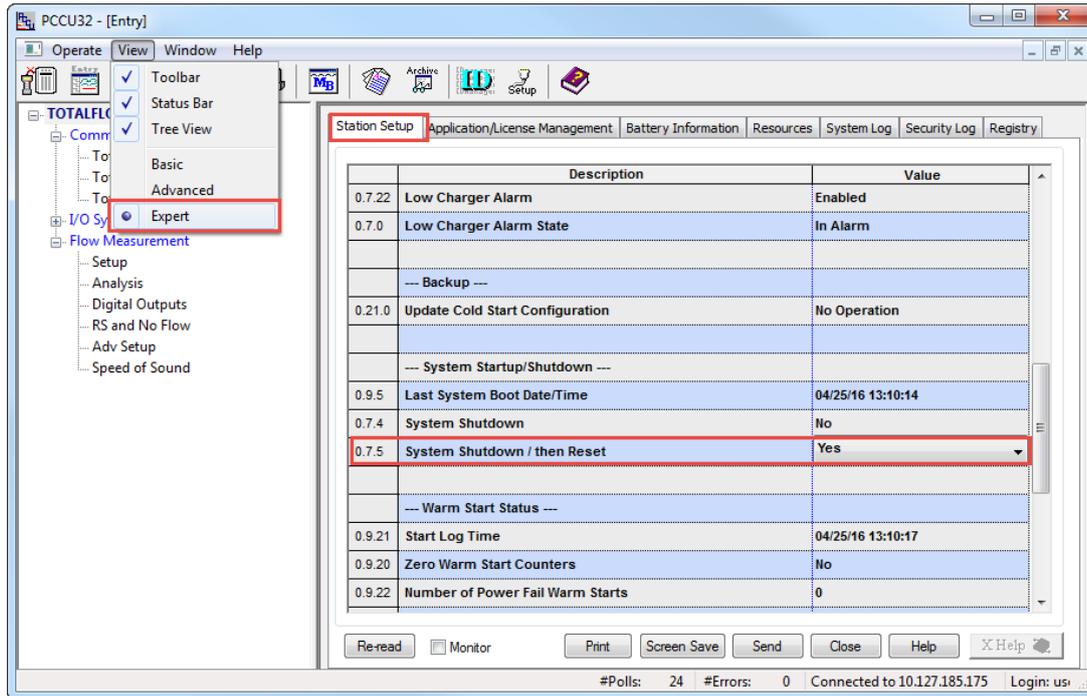
21. Verify that the file copied to the `/Flash/AppData/.ssh/` directory. The name of the file displays under that directory when the upload is complete.

Figure 6-28: Verify public key upload is complete



- Restart the device to activate the public key update (Figure 6-29).
- Launch PCCU and click **Entry** to display the Entry Mode screen. The navigation tree displays.
- Click **View>Expert**. Then click **Yes** to close the warning dialog that displays.
- Click the Station ID at the top of the navigation tree. The Station Setup tab displays.
- Scroll down and click the **System Shutdown/then Reset** Value field. Select **Yes** from the drop-down list.
- Click **Send**. The device restarts and the FileZilla SFTP connection closes.

Figure 6-29: Restart Totalflow device after public key update



With the key upload complete, a new private-public key pair is available for authentication. Test the authentication with these new keys next.

6.7.3.4 Verify authentication with new private-public key pair

Verify that the public key update successfully established a new FileZilla SFTP connection with the new key and passphrase.

To verify:

1. Restart FileZilla.
2. Click **Open the Site Manager**. The Site Manager window displays.
3. Configure the General tab:
 - Host: Type the device's IP address.
 - Port: Type **9696**.
 - Protocol: Select **SFTP- SSH File Transfer Protocol** from the drop-down list.
 - Logon Type: Select **Key file** from the drop-down list.
 - User: Type the user required per account type (For the Totalflow user account, type **totalflow**. For the developer or tech-support accounts, type "**root**".)
4. Click **Browse** to locate and select the newly created private key.
5. Click **Connect**.
6. Type the private key passphrase into the passphrase prompt. FileZilla displays the device's file system directories.



IMPORTANT NOTE: Keep private key files stored in a safe location accessible only to authorized personnel and security managers.

7 Calibration

Calibrate the controller onboard analog inputs and outputs to support different types of external devices, measurement ranges, and engineering units.



WARNING – Bodily injury. Remove power from the RMC to disconnect and reconnect external devices and calibration equipment. Failure to remove power can cause bodily injury or equipment damage. Review warnings in Potential safety hazards. Plan the calibration procedures carefully if you must perform several calibrations. You might be required to remove and reapply power to the RMC several times.

7.1 Analog input calibration

The calibration for analog input (analog input, AI) can be a 3-point or 5-point calibration. [Table 7-1](#) below lists the points for each type of calibration.

Table 7-1: AI calibration points

Type of calibration	Points
3-point	Low, 50%, and 100%
5-point	Low, 25%, 50%, 75% and 100%

Typical external devices include 4-20 mA or 1-5 V transmitters. Use the values in [Table 7-2](#) for the signal (voltage or current) values for calibration points for these types of devices.

Table 7-2: Typical calibration point values

Available calibration points	Current (in mA) for 4-20 mA range	Voltage (in volts) for 1-5 V range
Low	4	1
25%	8	2
50%	12	3
75%	16	4
100%	20	5



IMPORTANT NOTE: To properly calibrate the AI, determine the measurement range and signal type of the external device.

7.1.1 Connect calibration equipment

A calibrator simulates the external device attached to the controller AI during analog input calibration. The calibrator applies the signal (voltage or current) values that would otherwise come from the external device.



NOTICE – Equipment damage. Verify that the voltage or current values from the calibrator do not exceed the acceptable analog input ranges. Verify that the signal is the same type as the AI configuration. Do not turn the calibrator on until the AI is configured for the correct input signal type.



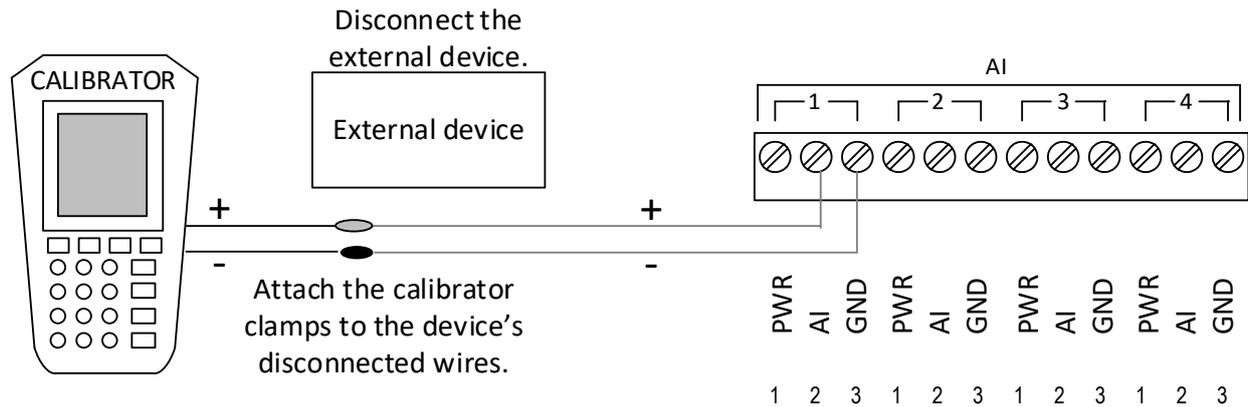
NOTICE – Tainted results. The wire length from the external device to the AI affects the calibration. Use only wires with the correct length from the RMC to the external device to connect the calibrator. Or place the calibrator at the location where the external device is installed.

To prepare and connect the calibration equipment:

1. Power off the RMC.
2. Disconnect the wires from the external device.
3. Turn on the calibrator and set it to the same signal type (voltage or current) as the AI configuration.
4. Turn the calibrator off.
5. Connect the calibrator to the external device's wire ends. Observe the polarity and connect to the correct wire: positive probe to the signal wire, and negative probe to the negative or ground wire.
6. Connect or apply power to the RMC when the calibrator is connected.

[Figure 7-1](#) shows the setup of equipment to calibrate an AI with voltage or current.

Figure 7-1: AI calibration equipment connection



7.1.2 Analog input calibration (voltage mode)

To calibrate the analog input:

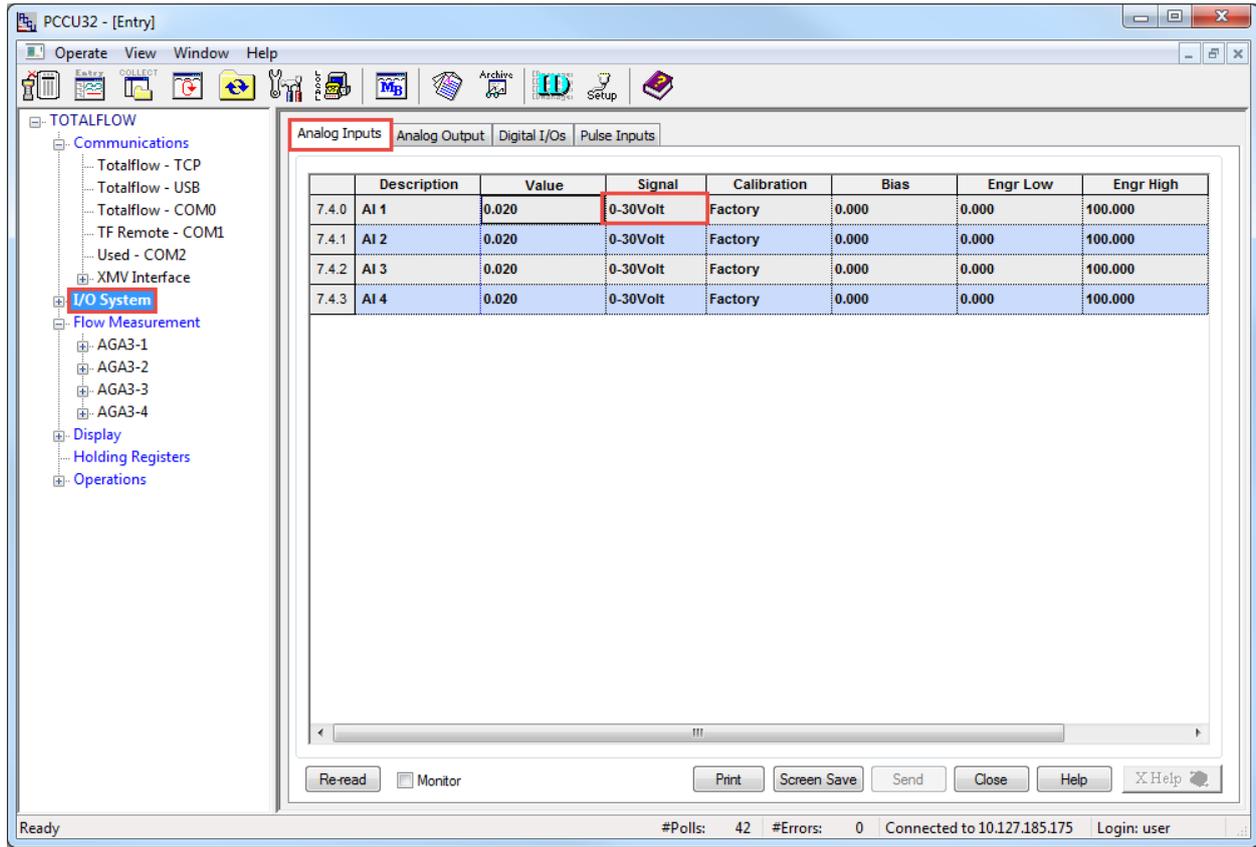


IMPORTANT NOTE: This procedure describes a three (3) point calibration. Available target values for this option display in the calibration window and become active in calibration order: Low Cal Point, 100% Cal Point, and 50% Cal Point. Adapt these instructions for a five (5) point calibration. With a 5-point calibration, five pressure points display in calibration order: Low Cal Point, 100% Cal Point, 75% Cal Point, 50% Cal Point, and 25% Cal Point.

For illustrative purposes, the AI 1 is calibrated for an external device with a measurement range of 0 to 1500 PSI and an output signal range of 1 to 5 Vdc. Set the calibrator to voltage values within this signal range to simulate the external device. Apply voltage values of 1 Vdc, 3 Vdc, and 5 Vdc for the 3-point calibration as shown in [Table 7-2](#).

1. Connect the PC or laptop with PCCU32 to the controller.
2. Launch PCCU32 and click the Entry icon on the toolbar.
3. Verify that the signal to the analog input is voltage:
 - a. Click I/O System on the navigation tree. The Analog Inputs tab displays ([Figure 7-2](#)).
 - b. Verify that the Signal field is set to 0-30 Volt for the AI calibration (see AI 1 in [Figure 7-2](#)).

Figure 7-2: AI 1 set to voltage mode

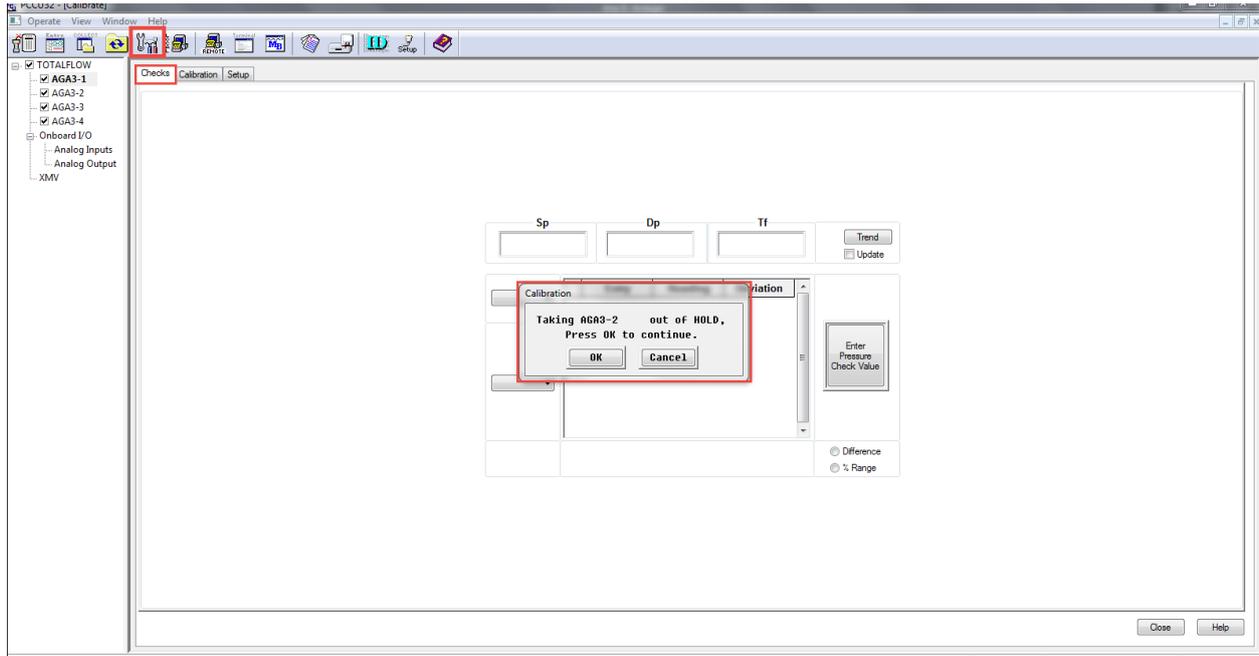


4. Turn on the calibrator.
5. Click the **Calibrate** icon on the PCCU toolbar. The calibration Checks screen displays with a request to take an application out of hold (Figure 7-3). This example shows the request for AGA3-2.



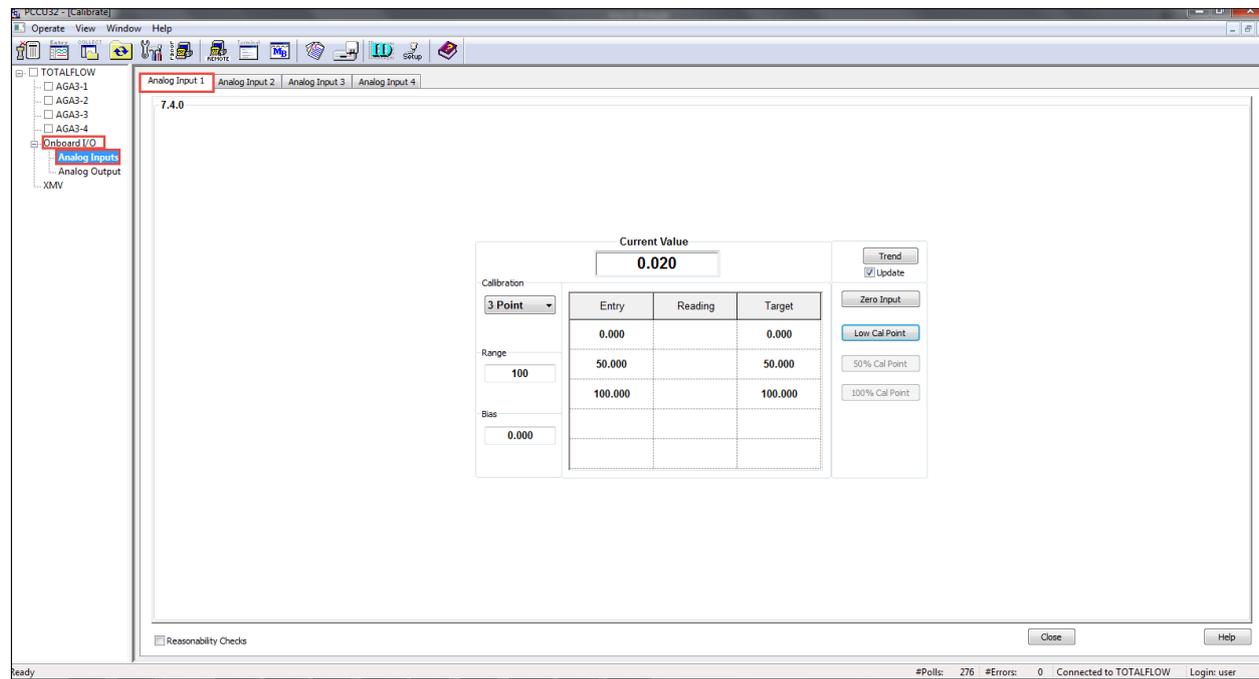
IMPORTANT NOTE: The calibration mode automatically places active measurement applications on hold. This is not required for I/O calibration. The calibration navigation tree in Figure 7-3 shows four AGA3 applications. The checkmark indicates that they are all in Hold mode. Pop-ups display to remove applications from hold. Accept them all. These requests display one at a time until the last application is out of hold.

Figure 7-3: Calibration request to take application out of hold mode



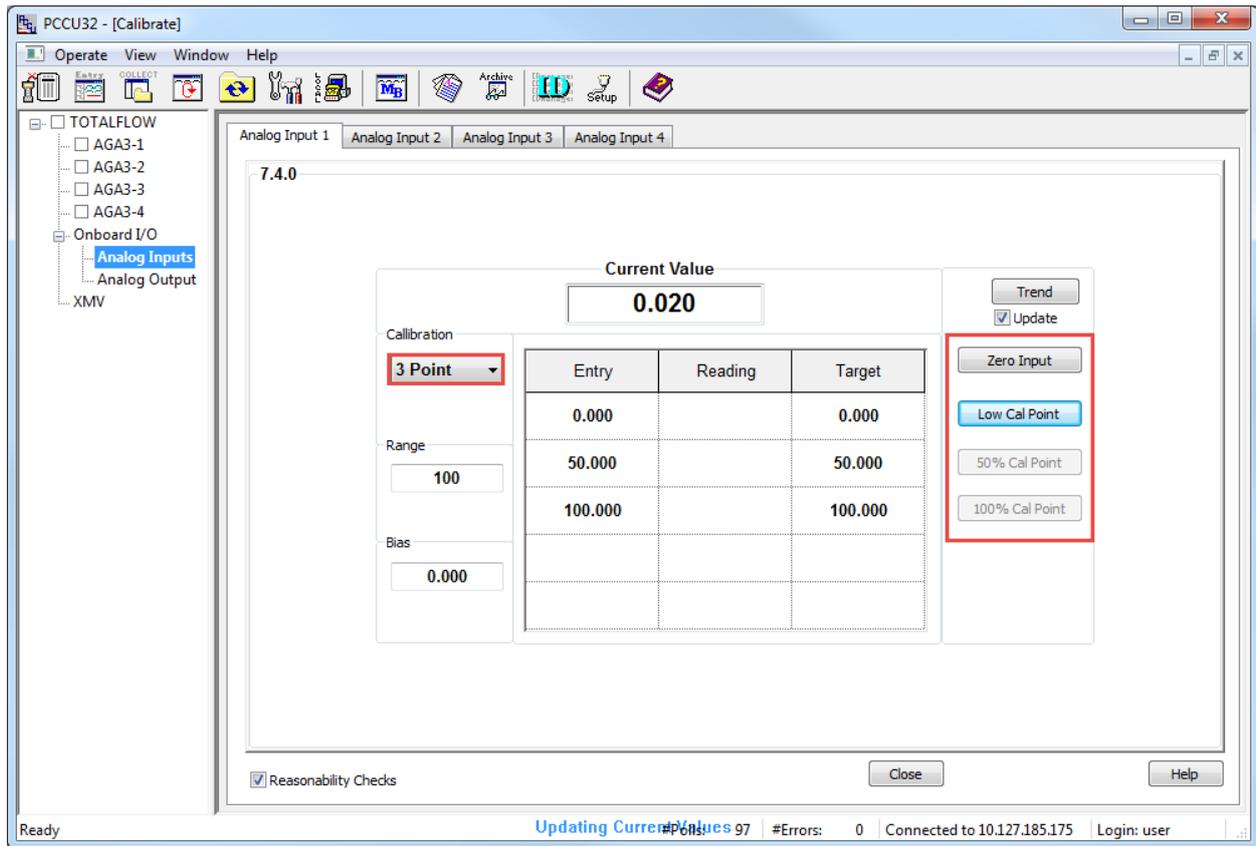
6. Click **OK** to take each application out of hold. The calibration dialog stops displaying after the last application is out of hold.
7. Click the **Onboard I/O** folder on the navigation tree to expand it. Then click Analog Inputs. The Analog Input 1-tab displays (Figure 7-4).

Figure 7-4: Analog Input 1 default calibration values



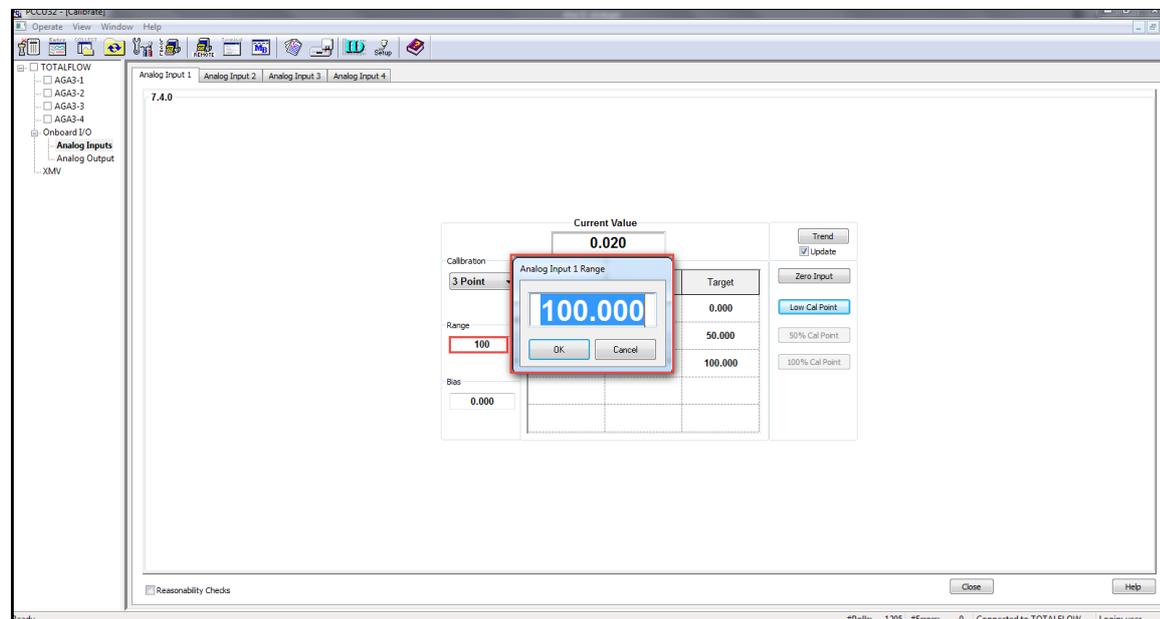
8. Click another Analog Input tab, if necessary, to calibrate.
9. Select either **3 Point** or **5 Point** calibration from the Calibration drop-down list (Figure 7-5).
10. Verify that only the Zero Input and Low Cal Point buttons are enabled and highlighted. The system enables the buttons in the required order for the calibration.

Figure 7-5: Analog Input 1 3-point calibration



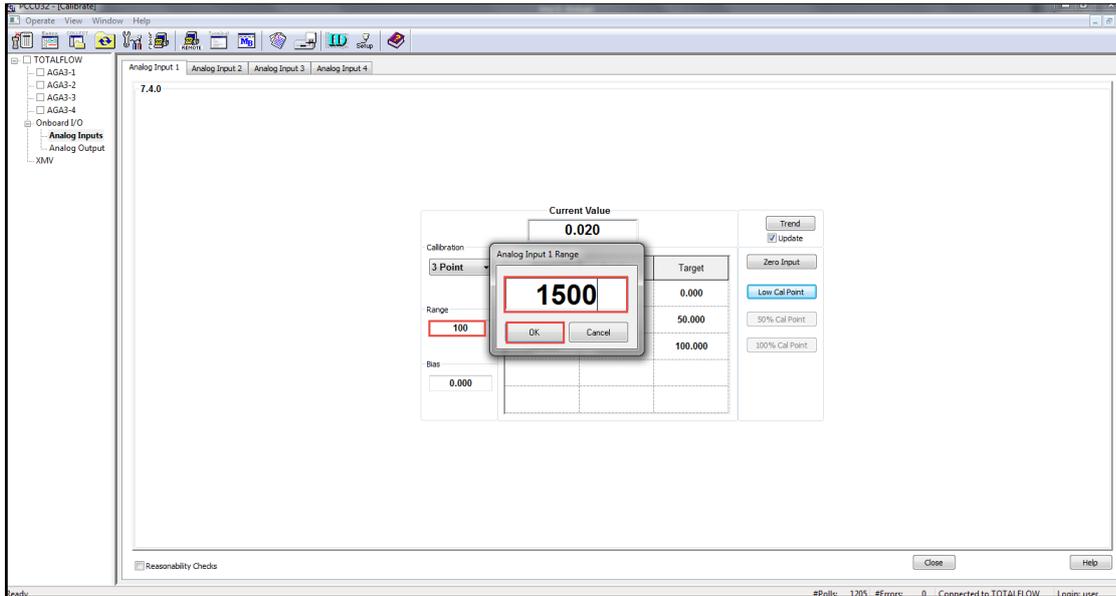
11. Click **Range**. The Analog Input 1 Range dialog box displays (Figure 7-6).

Figure 7-6: Analog Input 1 Range entry



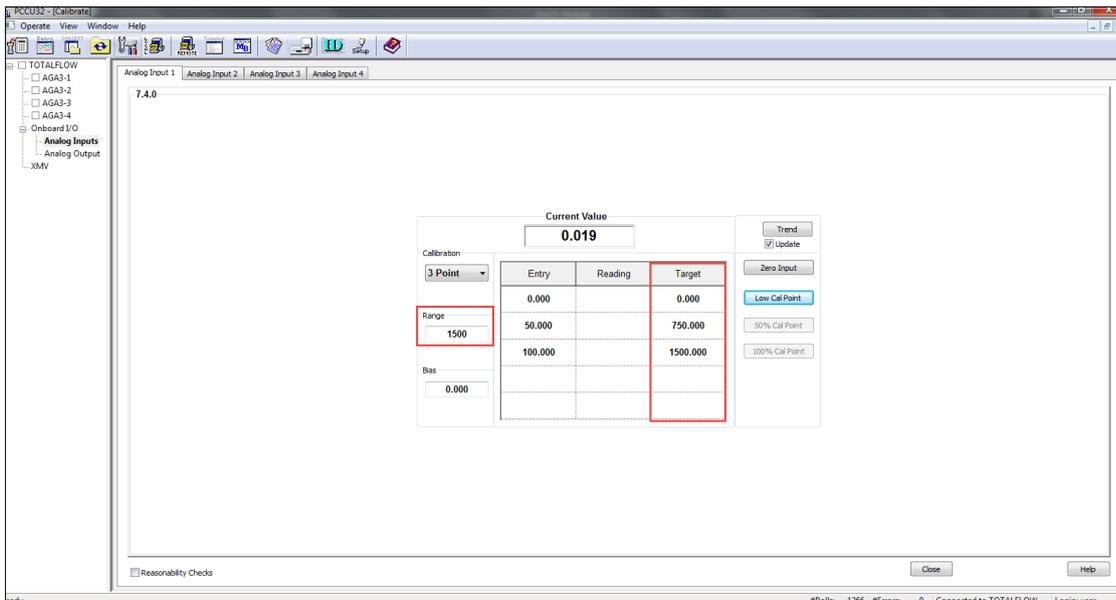
12. Type the external device measurement range into the entry field (1500 for this example) and click **OK** (Figure 7-7).

Figure 7-7: User-defined Analog Input 1 range value



The values in the Target column of the table update to reflect the user-defined range ([Figure 7-8](#)).

Figure 7-8: 3-point calibration target values for user-defined range

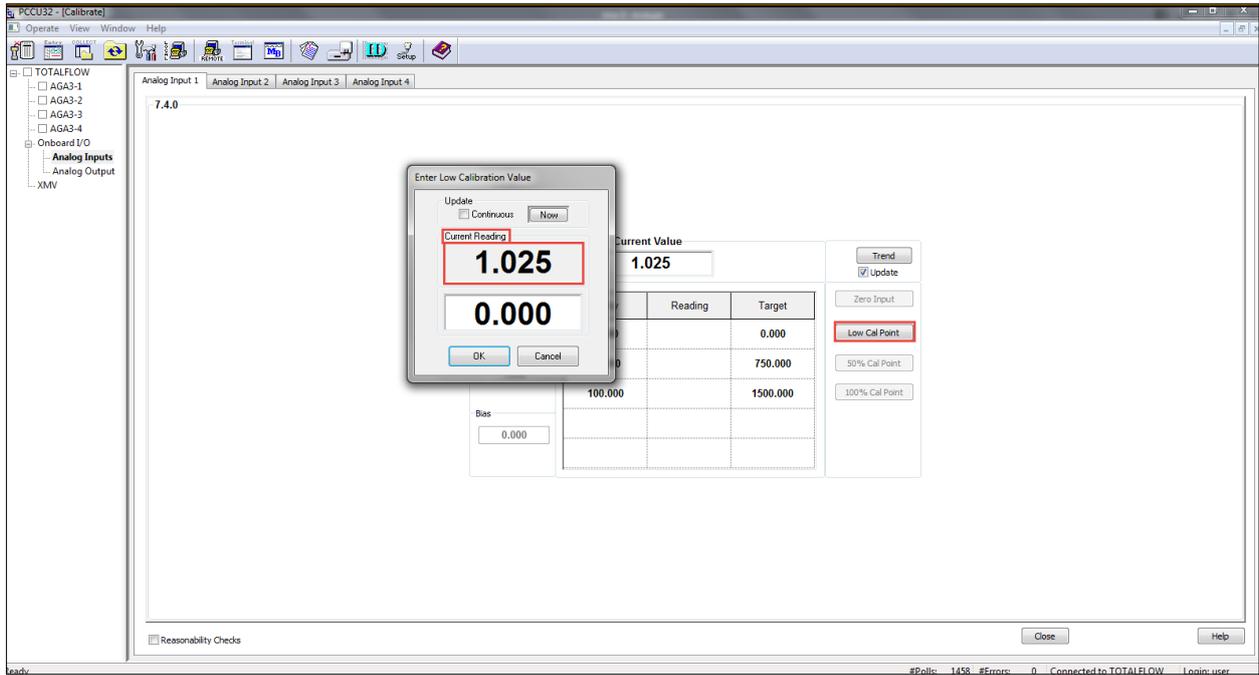


13. Adjust the calibrator to apply the low value of the signal range. For example, if the signal range of the external device is 1 to 5 Vdc, apply 1 Vdc.
14. Click **Low Cal Point**. The Enter Low Calibration Value dialog box displays ([Figure 7-9](#)).
15. Wait for the Current Reading field value to stabilize. This value should match or be close to the signal value from the calibrator (~ 1 Vdc).



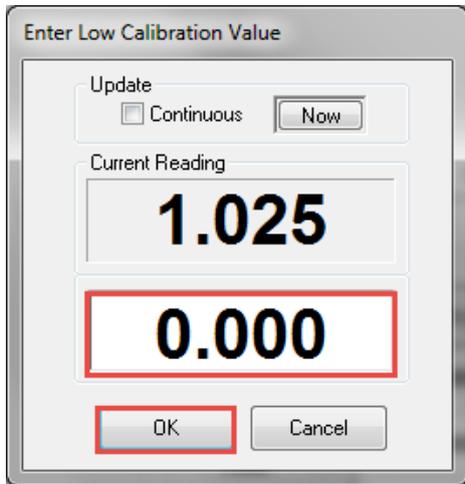
IMPORTANT NOTE: The Current Reading value is also displayed in the Current Value field. The term "current" used in these fields do not reflect values for electrical current. Before calibration is complete, these fields display voltage values. Current means real-time. Fields display values detected at the time the calibrator supplies the voltage to the AI.

Figure 7-9: Low value current reading verification



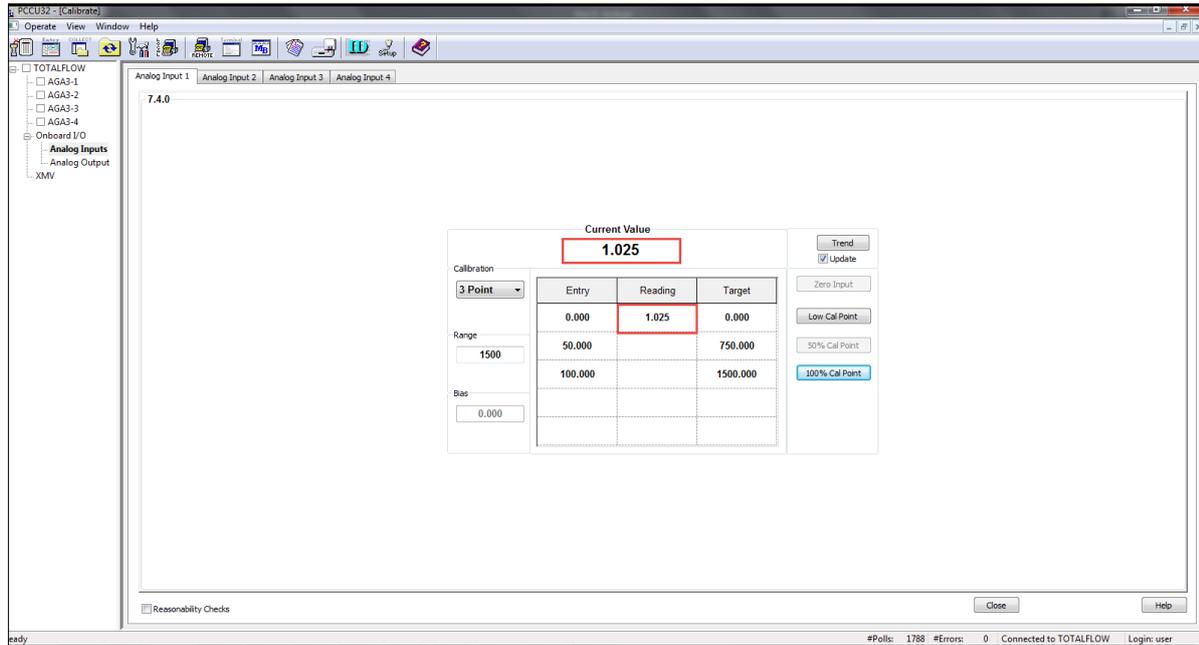
16. Keep the default target low value of 0 (Figure 7-10) or type an appropriate value for your scenario. This example uses 0 for a 0-1500 PSI measurement range. A voltage value of 1 Vdc represents 0 PSI.

Figure 7-10: Default low calibration value for measurement range



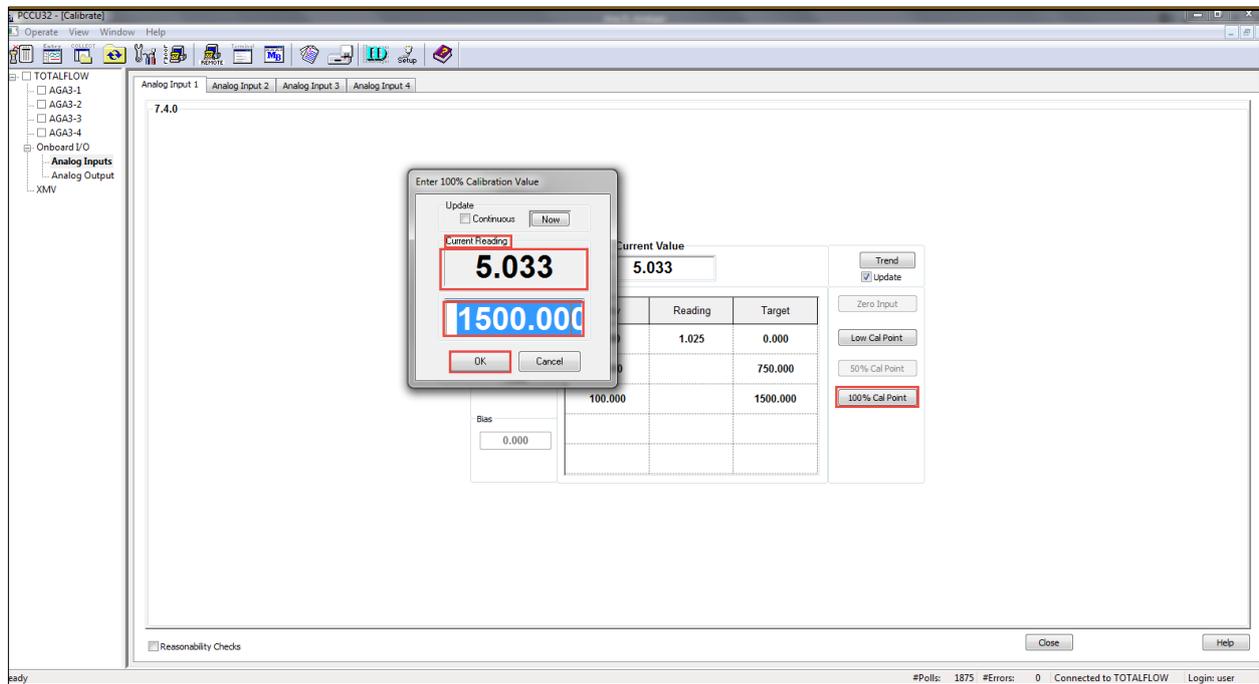
17. Click **OK**. The Reading column updates to reflect the signal value associated with the low value of the range (Figure 7-11).

Figure 7-11: Low calibration value reading



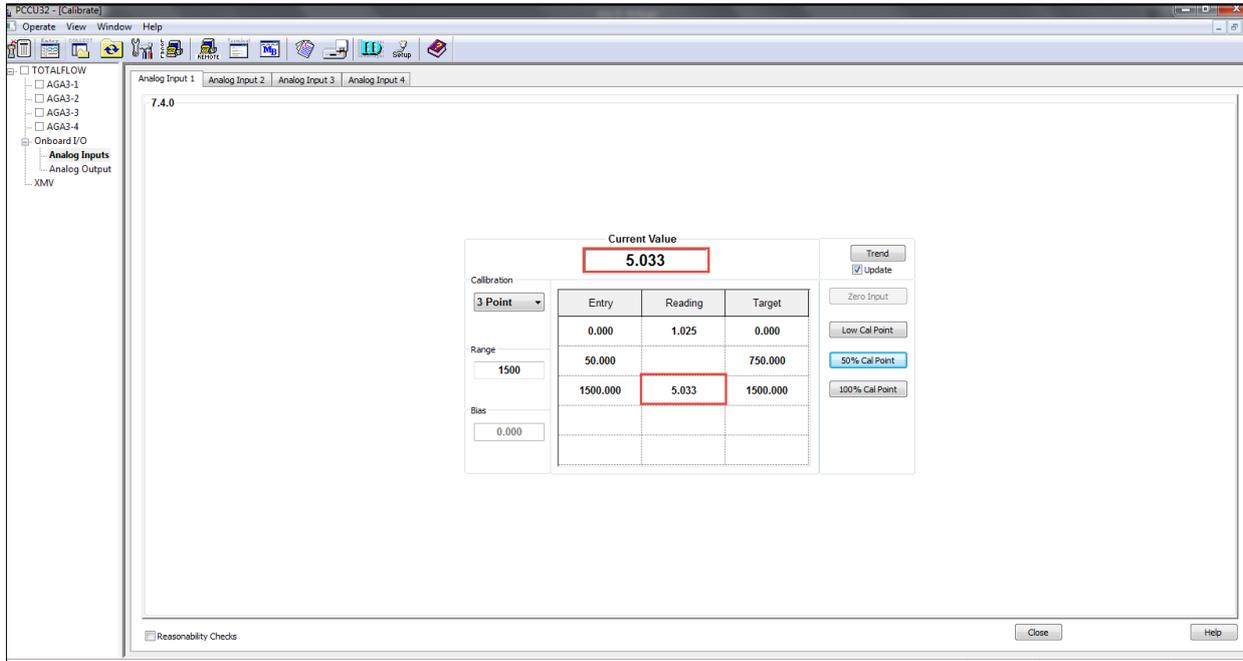
18. Adjust the calibrator to apply the high value (100%) of the signal range. For example, if the signal range of the external device is 1-5 Vdc, apply 5 Vdc.
19. Click **100% Cal Point**. The Enter 100% Calibration Value dialog box displays (Figure 7-12).
20. Observe the value in the Current Reading field. When it stabilizes this value should match or be close to the signal value from the calibrator (~ 5 Vdc).
21. Type the high range value in the field (1500 for this example) and click **OK**.

Figure 7-12: User-defined high value



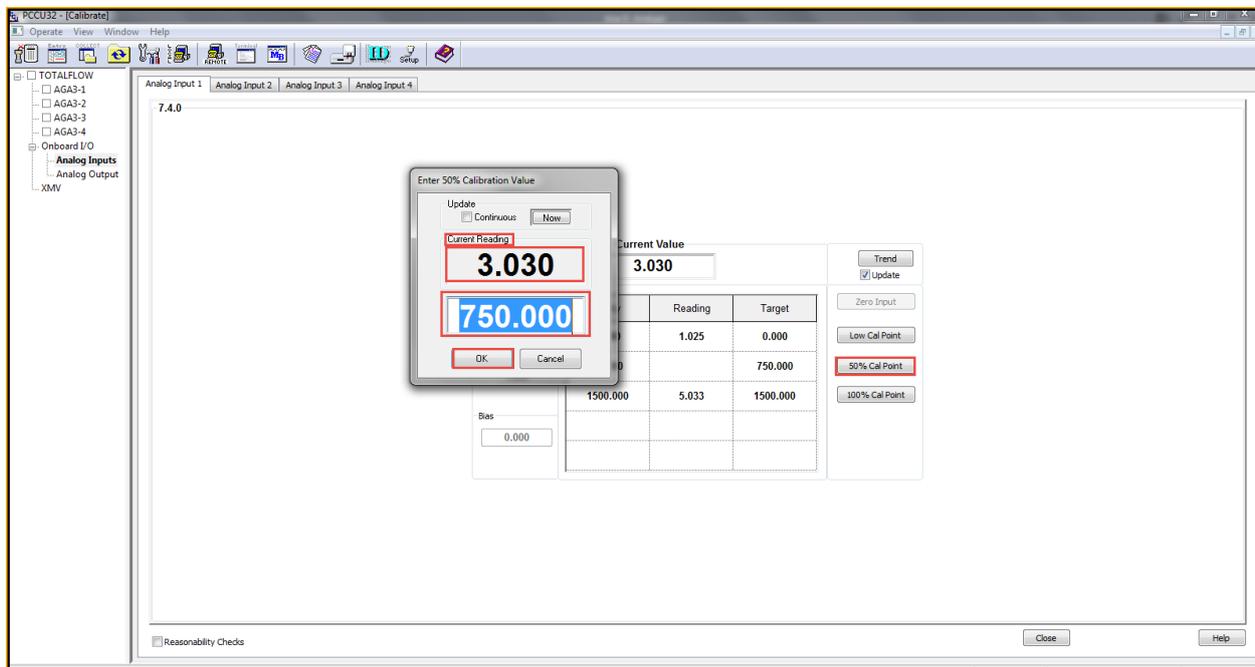
The Reading column updates to reflect the signal value associated with the high value of the range (Figure 7-13).

Figure 7-13: High calibration value reading



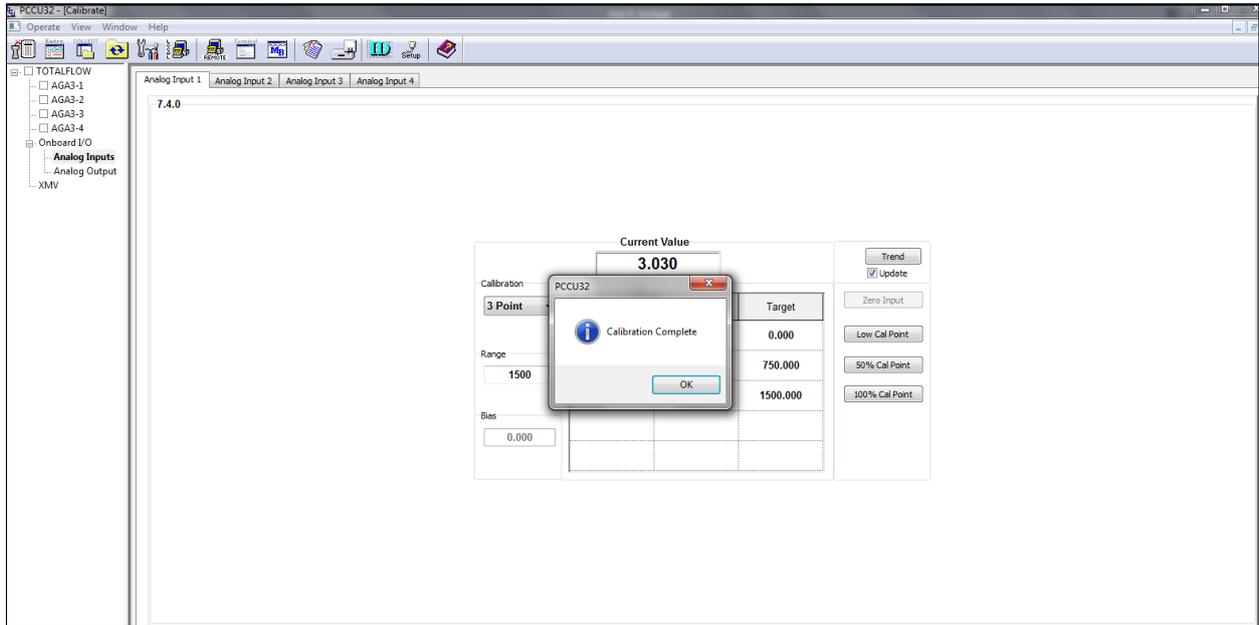
22. Adjust the calibrator to apply the 50% value of the external device signal range. For example, if the signal range of the external device is 1-5 Vdc, apply 3 Vdc.
23. Click **50% Cal Point**. The Enter 50% Calibration Value dialog box displays with the target mid-value automatically calculated. In [Figure 7-14](#), the box displays 750.000. This is the mid-value of 1500.
24. Wait for the value in the Current Reading field to stabilize. This value should match or be close to the signal value from the calibrator (~ 3 Vdc).

Figure 7-14: User-defined mid calibration value



25. Click **OK**. The Calibration Complete message displays ([Figure 7-15](#)).

Figure 7-15: Calibration complete message

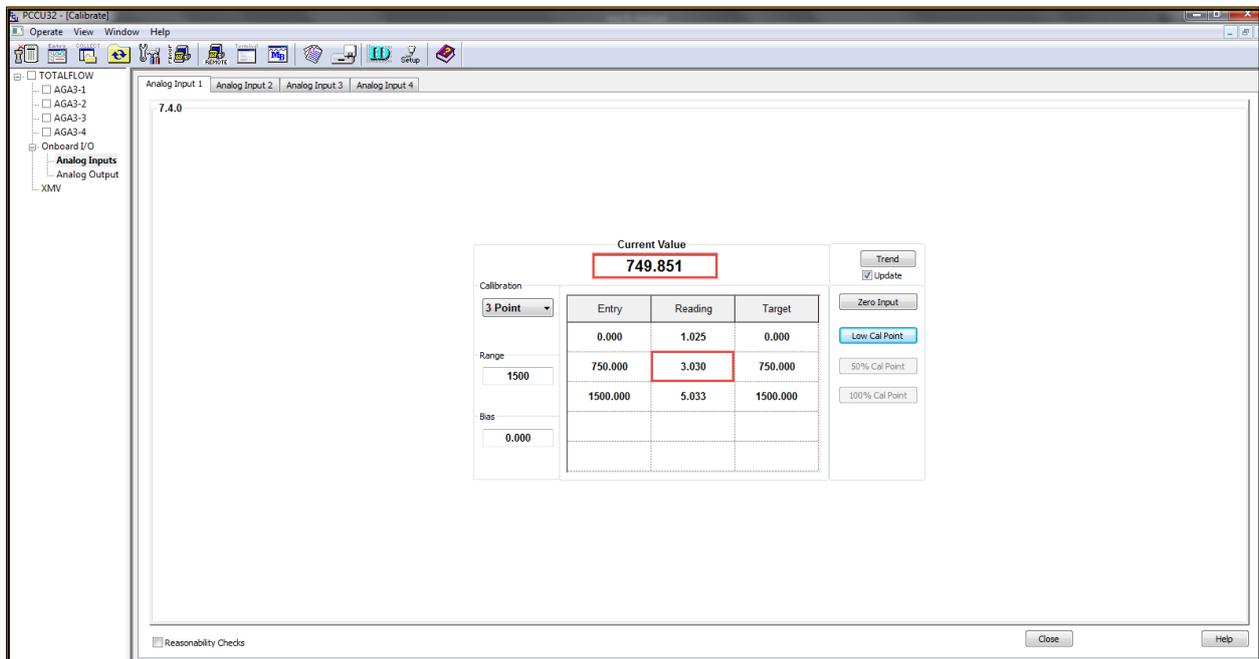


26. Click **OK**. Verify that the Entry and Reading values update, and that the Current Value field displays the calibrated value based on the defined range ([Figure 7-16](#)).



IMPORTANT NOTE: After calibration is complete the Current Value field displays range values, not voltage values.

Figure 7-16: Calibrated AI 1 example (voltage mode)



27. Remain in the calibration screen and keep the calibrator connected to the AI.
 28. To verify the calibration, proceed to section [7.1.4](#), Verify analog input calibration.

7.1.3 Analog input calibration (current mode)



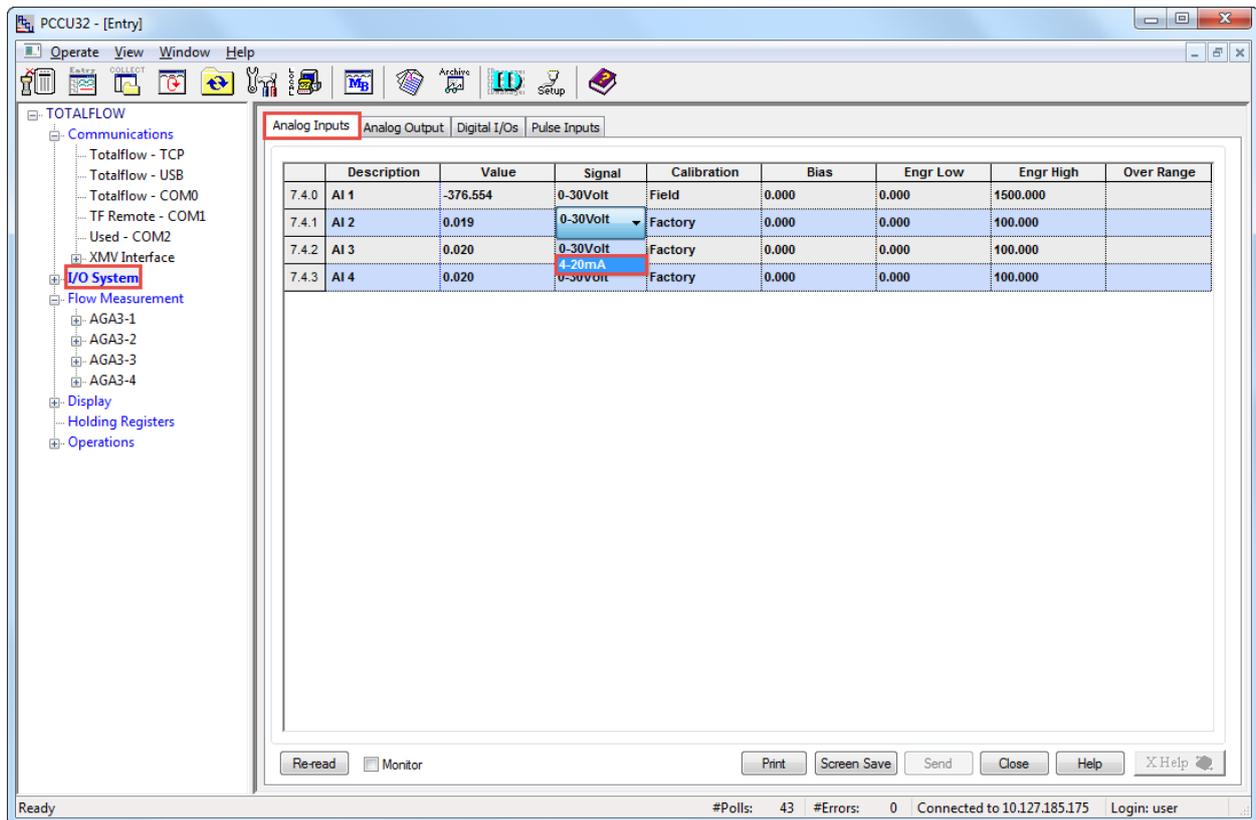
IMPORTANT NOTE: This procedure describes the calibration procedure for a 3-point calibration. Available target values for this option display in the calibration window and become active in calibration order: Low Cal Point, 100% Cal Point, and 50% Cal Point. Adapt these instructions for a five (5) point calibration. With a 5-point calibration, five pressure points display in order: Low Cal Point, 100% Cal Point, 75% Cal Point, 50% Cal Point, and 25% Cal Point.

As an example, the AI 2 is calibrated for an external device with a measurement range of 0 to 1500 PSI and an output signal range of 4 to 20 mA. Set the calibrator at current values within this signal range to simulate the external device. Use voltage values of 4 mA, 12 mA, and 20 mA for the 3-point calibration as shown in [Table 7-2](#).

To calibrate the analog input with 3 points:

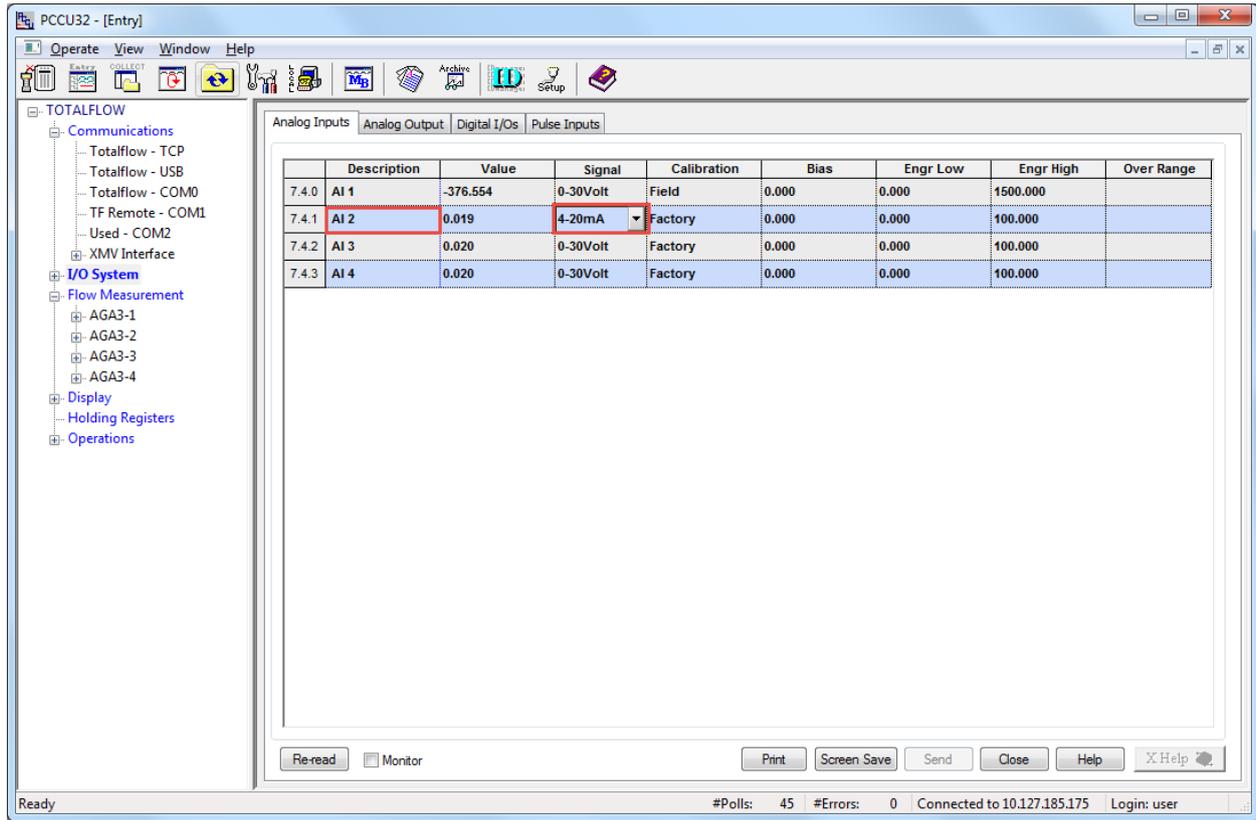
1. Connect the calibrator to the AI, per section [7.1.1](#), Connect calibration equipment.
2. Connect the PC or laptop running PCCU32 to the controller.
3. Launch PCCU32 and click the Entry icon on the toolbar.
4. Change the signal type for the analog input:
 - a. Click I/O System on the navigation tree. The Analog Inputs tab displays ([Figure 7-17](#)).
 - b. Click the Signal field for the AI that is calibrating and select **4-20mA** from the drop-down list (see AI 2 in [Figure 7-17](#)). The default signal value for all AIs is 0-30Volt, which is voltage mode.

Figure 7-17: Change default AI 2 signal mode



5. Click **Send**. AI 2 Signal updates to 4-20mA ([Figure 7-18](#)).

Figure 7-18: AI 2 set to current mode

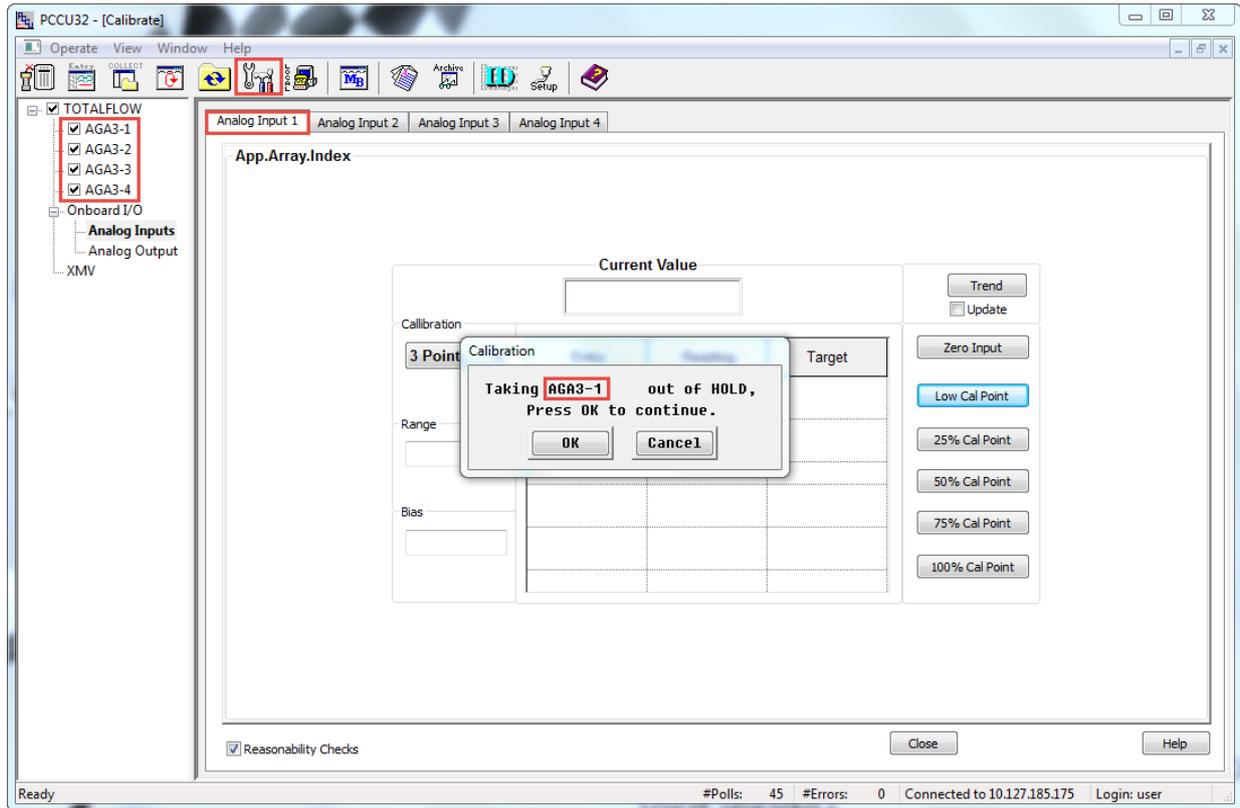


6. Turn on the calibrator.
7. Click the **Calibrate** icon on the PCCU toolbar. The Analog Input 1-tab displays a request to take an application out of HOLD ([Figure 7-19](#)).



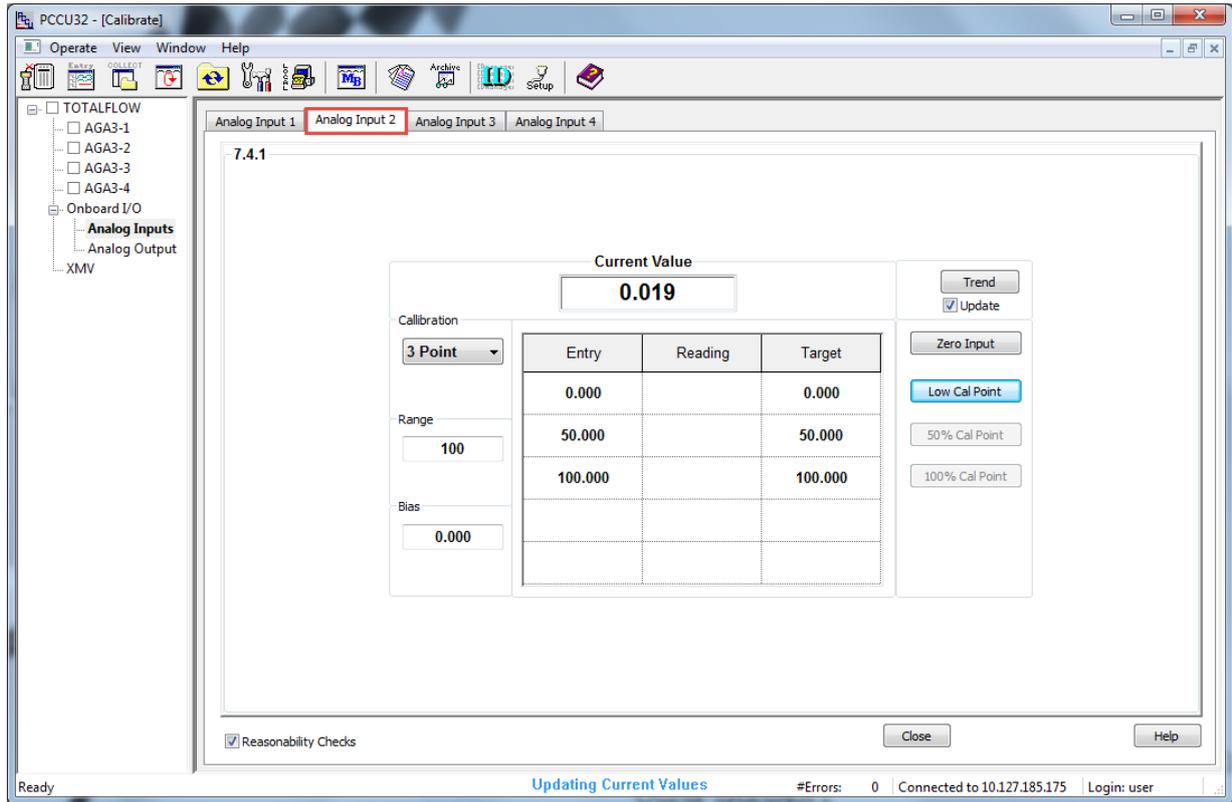
IMPORTANT NOTE: The calibration mode automatically places active measurement applications on hold. This is not required for I/O calibration. The calibration navigation tree in [Figure 7-19](#) shows four AGA3 applications. The checkmark indicates that they are all in Hold mode. Pop-ups display to remove each application from hold. Accept them all. Requests display for each application, one at a time, until the last application is out of hold.

Figure 7-19: Calibration request to take application out of hold mode



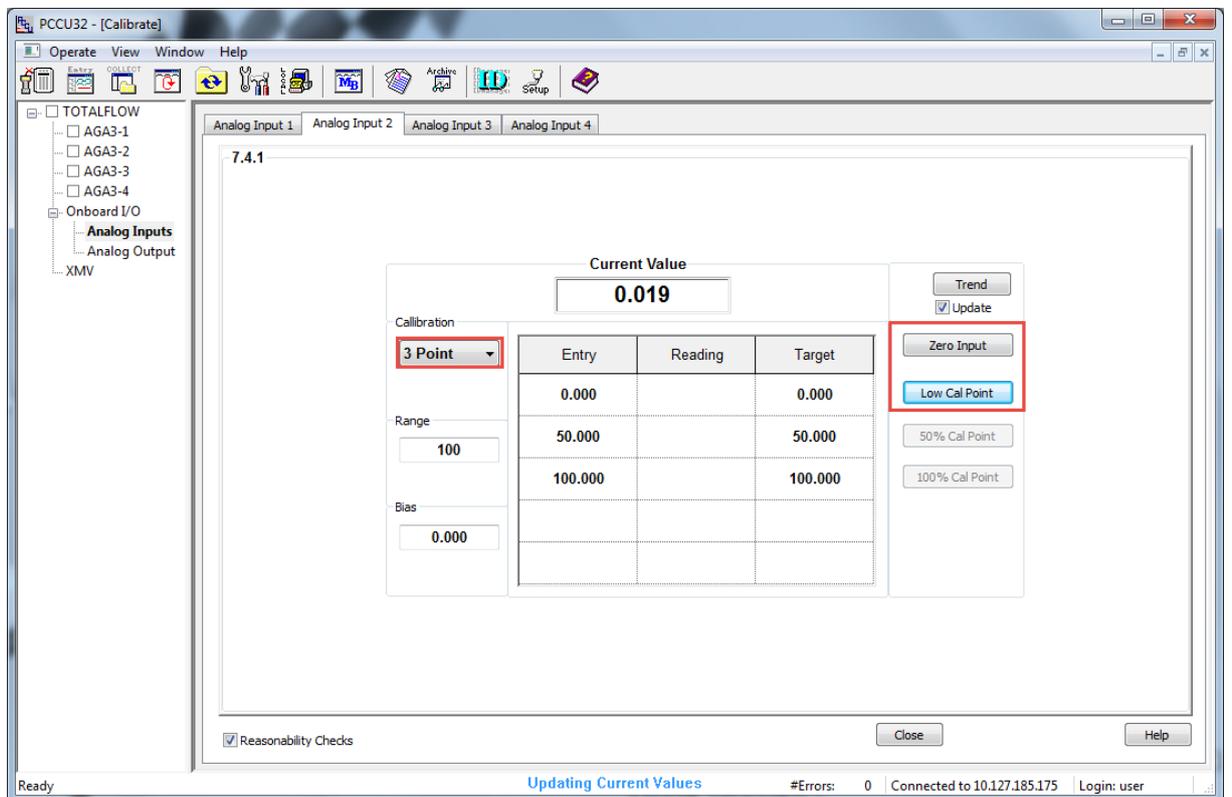
8. Click **OK** for each of the applications on hold. The calibration dialog stops displaying after the last application is out of hold.
9. Click the **Analog Input 2** tab. The Analog Input tab screen displays with default values ([Figure 7-20](#)).

Figure 7-20: AI 2 default calibration values



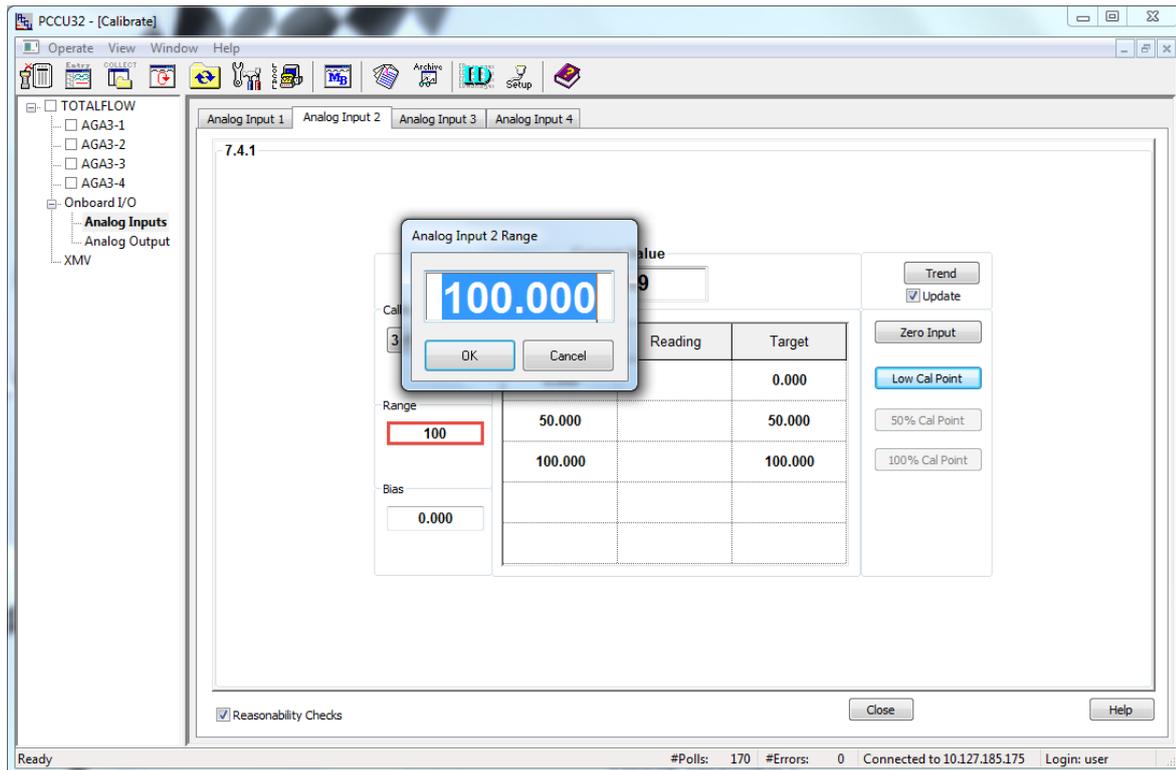
10. Click **Calibration** and select **3 point** or **5 point** from the drop-down list ([Figure 7-21](#)).
11. Verify that only the Zero Input and Low-Cal Point buttons are enabled and highlighted. The system enables the buttons in the order required for the calibration.

Figure 7-21: Analog Input 2 tab with default values



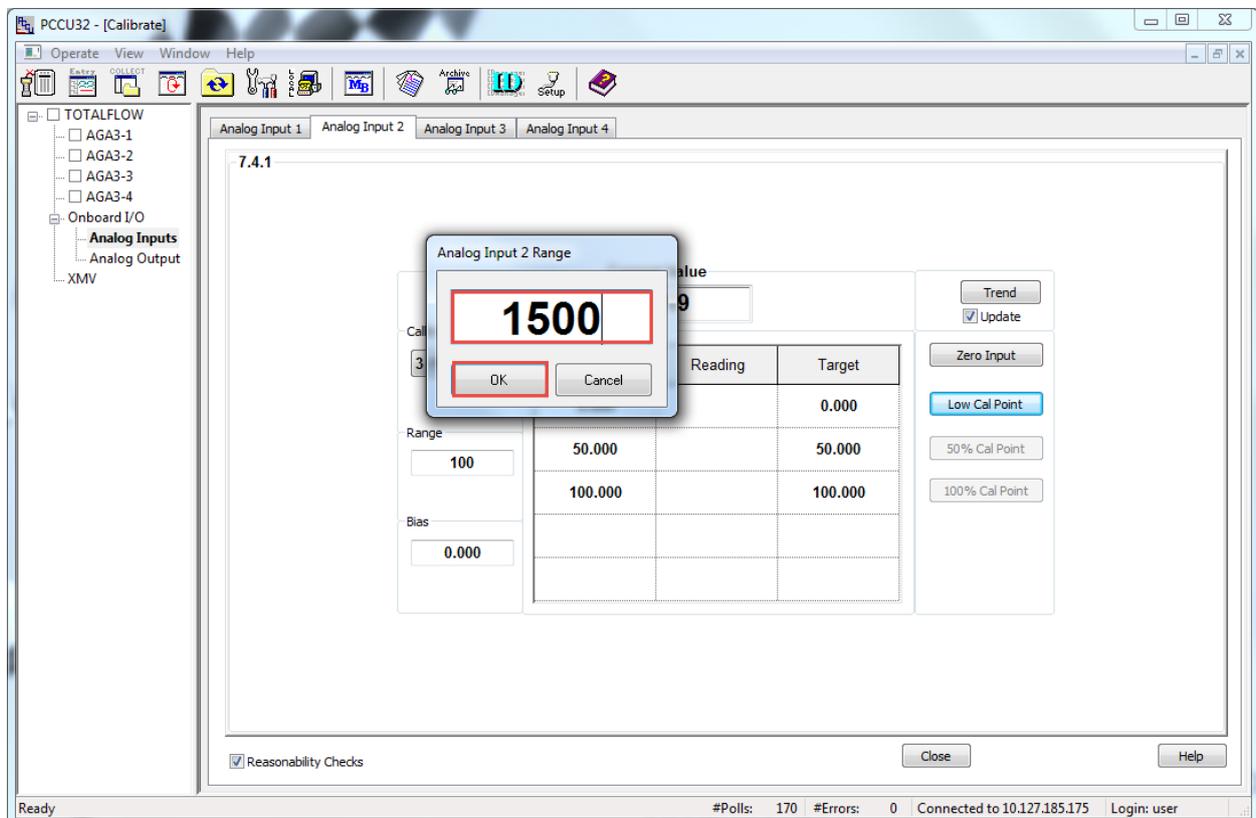
12. Click **Range**. The Analog Input 2 Range dialog displays ([Figure 7-22](#)).

Figure 7-22: Default Analog Input 2 Range



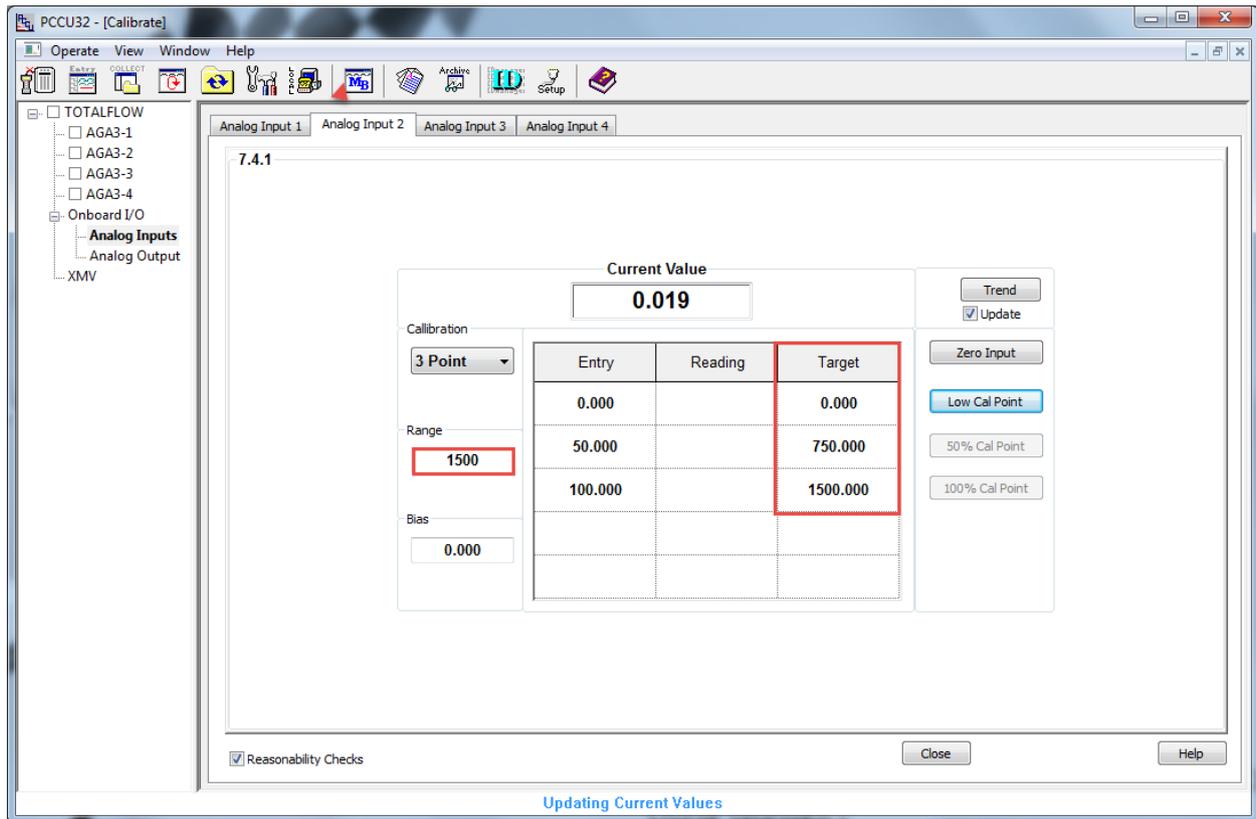
13. Type the external device measurement range into the entry field. In this example, 1500 (Figure 7-23).

Figure 7-23: User-defined Analog Input 2 Range



14. Click **OK**. The values in the Target column of the table update to reflect the new range (Figure 7-24).

Figure 7-24: Target values for user-defined range



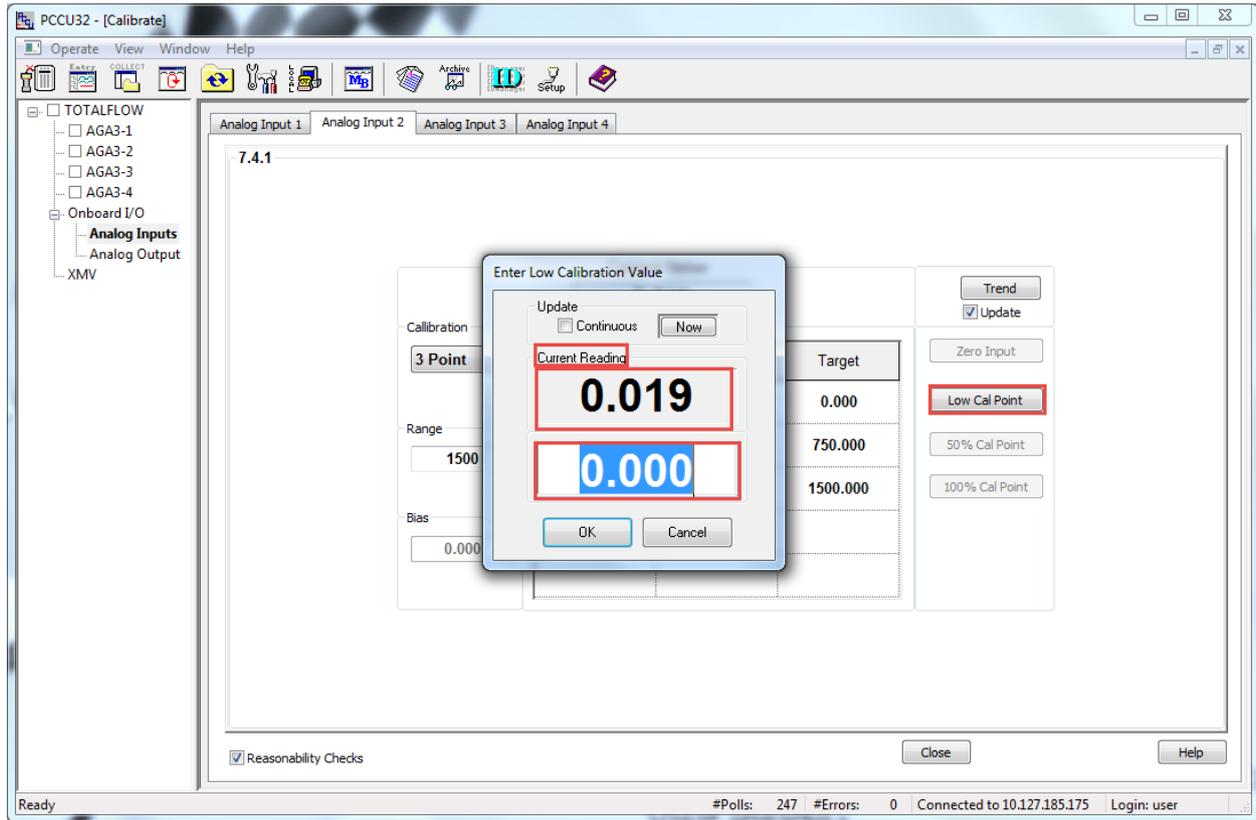
15. Click **Low Cal Point**. The Enter Low Calibration Value dialog displays the default target low value of zero (0.000 PSI) (Figure 7-25). The Current Reading field displays a voltage value of approximately 0 which indicates that the calibrator has not applied any signal to the AI.

IMPORTANT NOTE: The Current Reading field value (Figure 7-25) does not reflect the value for the electrical current applied to the AI. The RMC displays the voltage value detected across the AI's internal resistance (or impedance). The internal resistance is approximately 250 Ω (See analog input specifications for current mode AIs in Table 2-10). For the required 3-point current calibration values of 4, 12 and 20 mA, the displayed voltage should be approximately 1, 3 and 5.0 Vdc respectively. To determine voltage values for different current inputs, multiply the current value by 250 ($V=I \cdot R$).



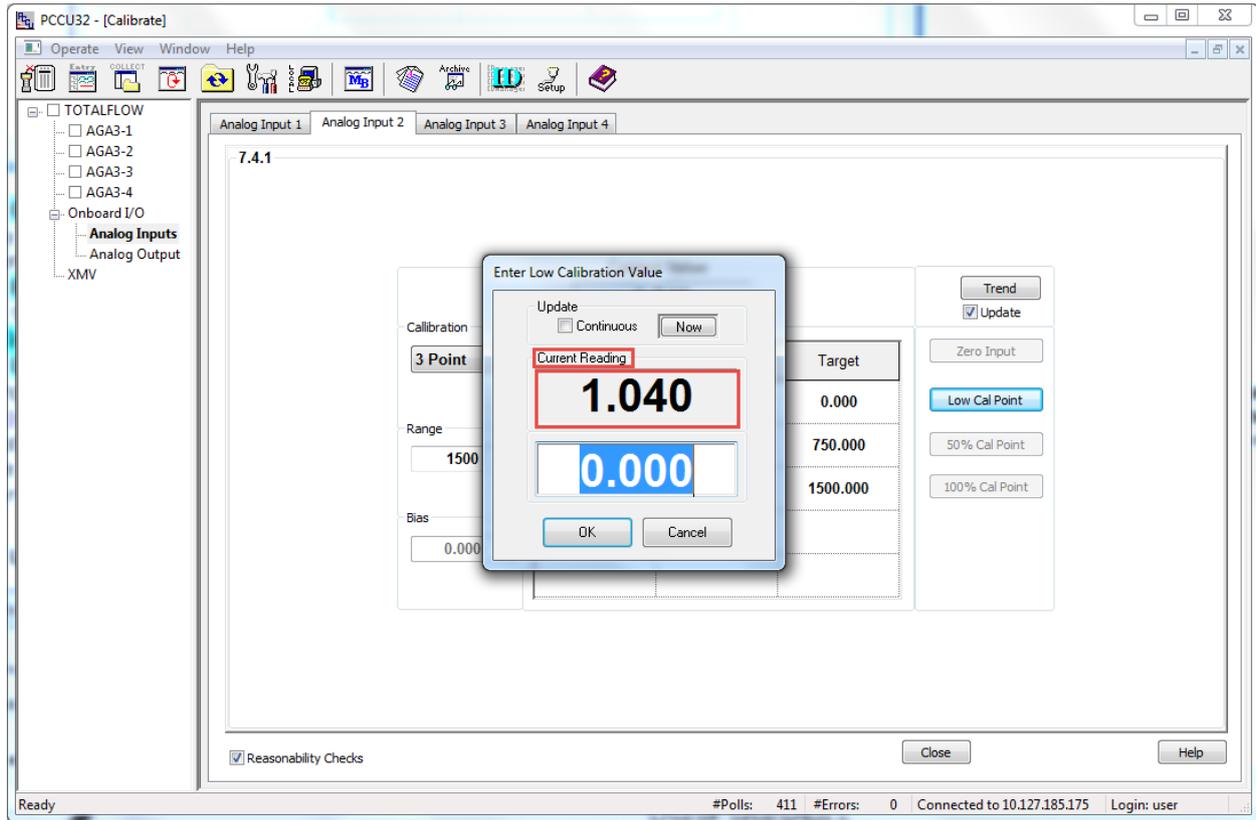
The term "current" in the Current Reading and Current Value fields in the calibration screens, means real time. The value displayed is what the AI detects as soon as the external device supplies the signal. Voltage values display before calibration completes. After calibration, values from the user-defined range display.

Figure 7-25: Low calibration value entry



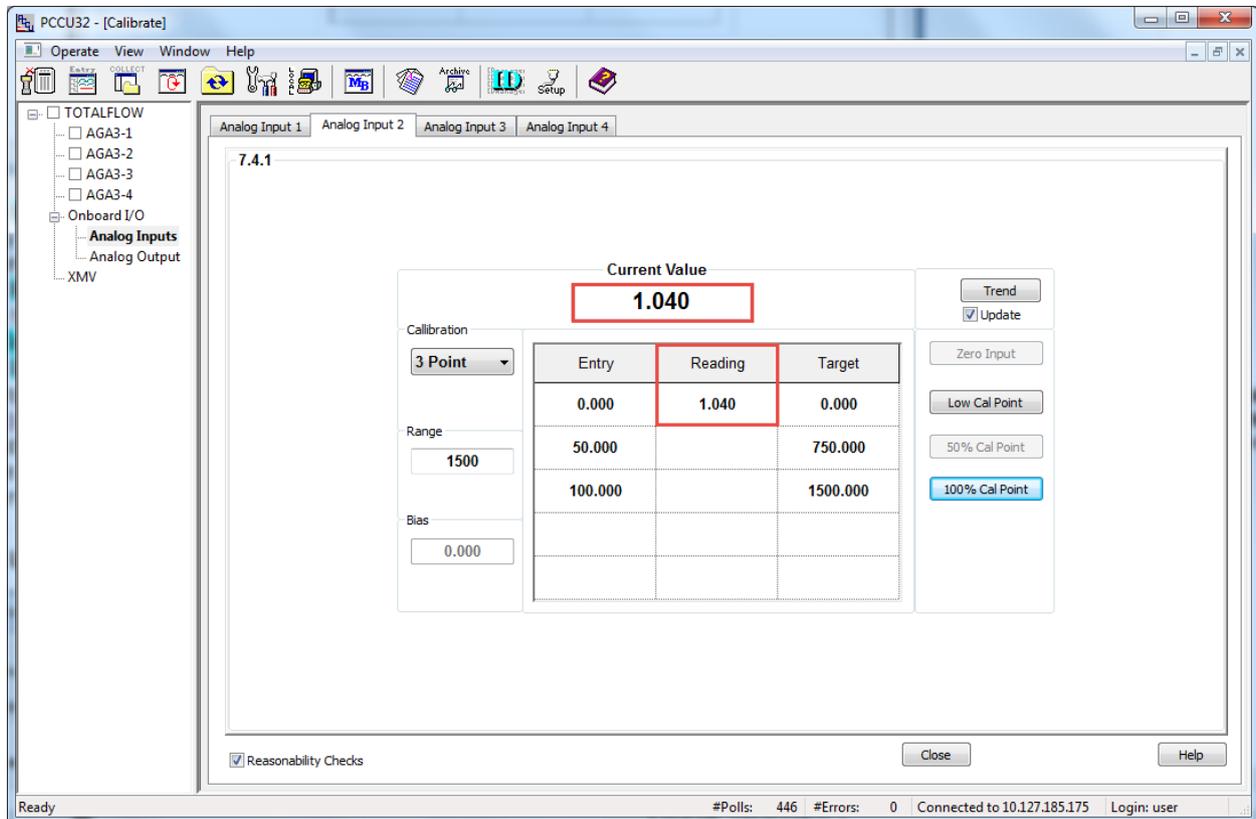
16. Adjust the calibrator to apply the low value of the signal range. For example, if the signal range of the external device is 4 to 20 mA, apply 4 mA.
17. Observe the value in the Current Reading field (Figure 7-26). The expected voltage value for a 4 mA input is approximately 1 Vdc ($0.004 * 250 = 1$ Vdc).
18. Accept the default low range value of 0.

Figure 7-26: Low calibration value reading



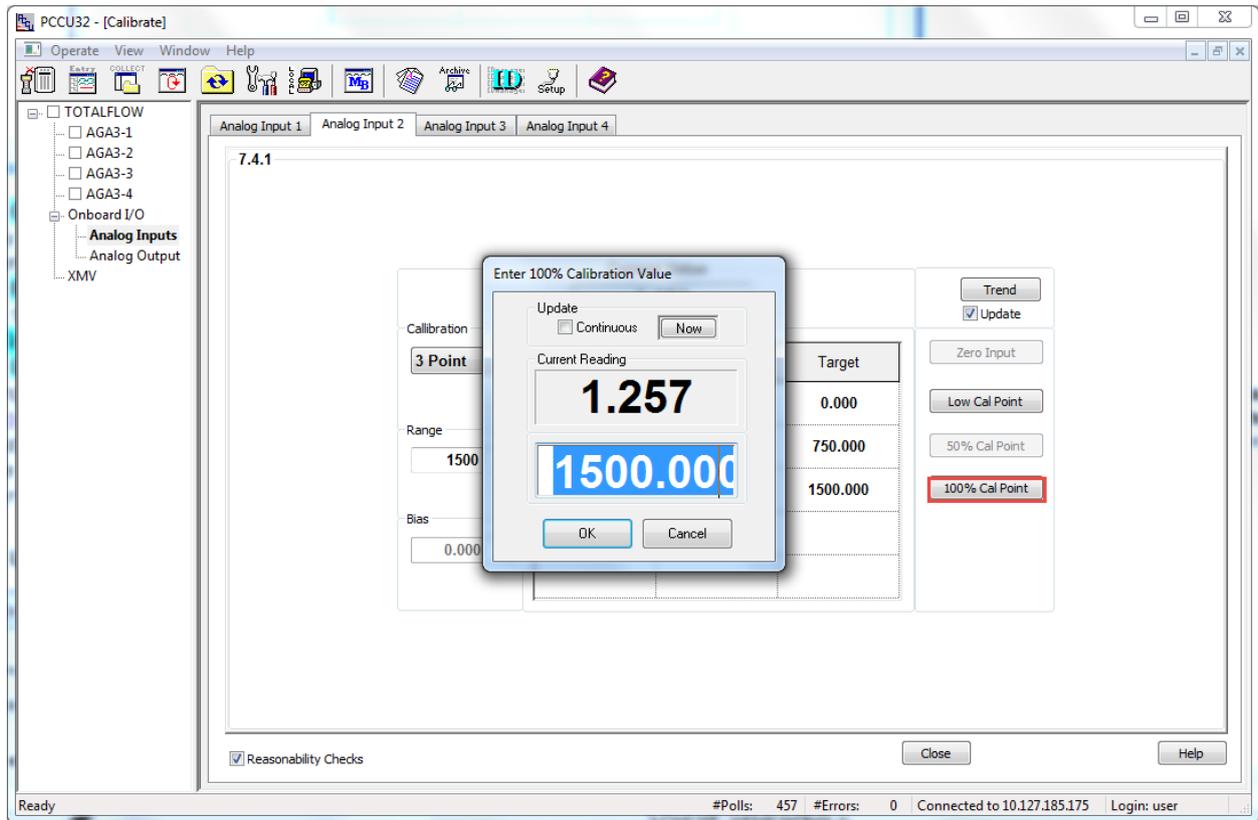
19. Wait for the Current Reading to stabilize and click **OK**. The Reading column updates with the reading for the user-defined low range value (Figure 7-27).

Figure 7-27: Analog Input 2 low value reading



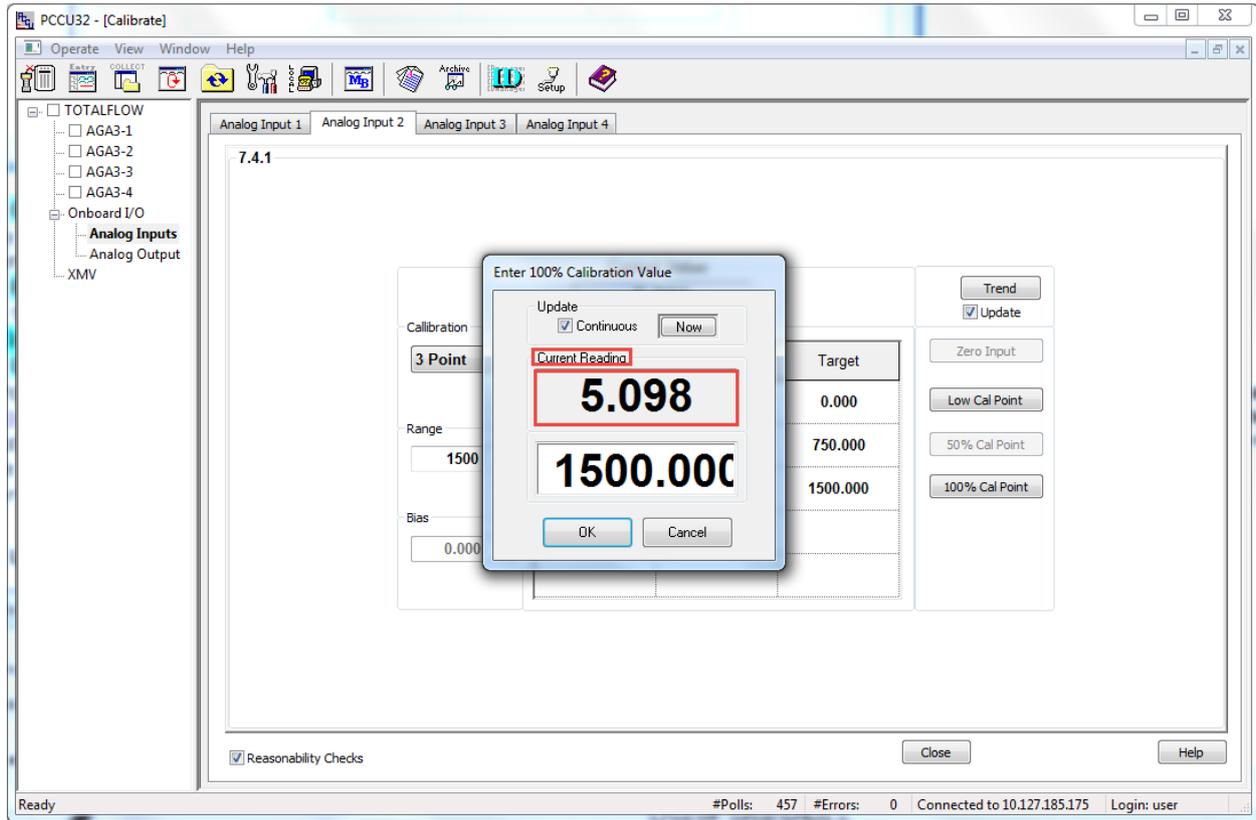
20. Click **100% Cal Point**. The Enter 100% Calibration Value box displays (Figure 7-28).
21. Type the range high value into the entry field. (1500.000 in this example).

Figure 7-28: High (100%) Calibration value entry field



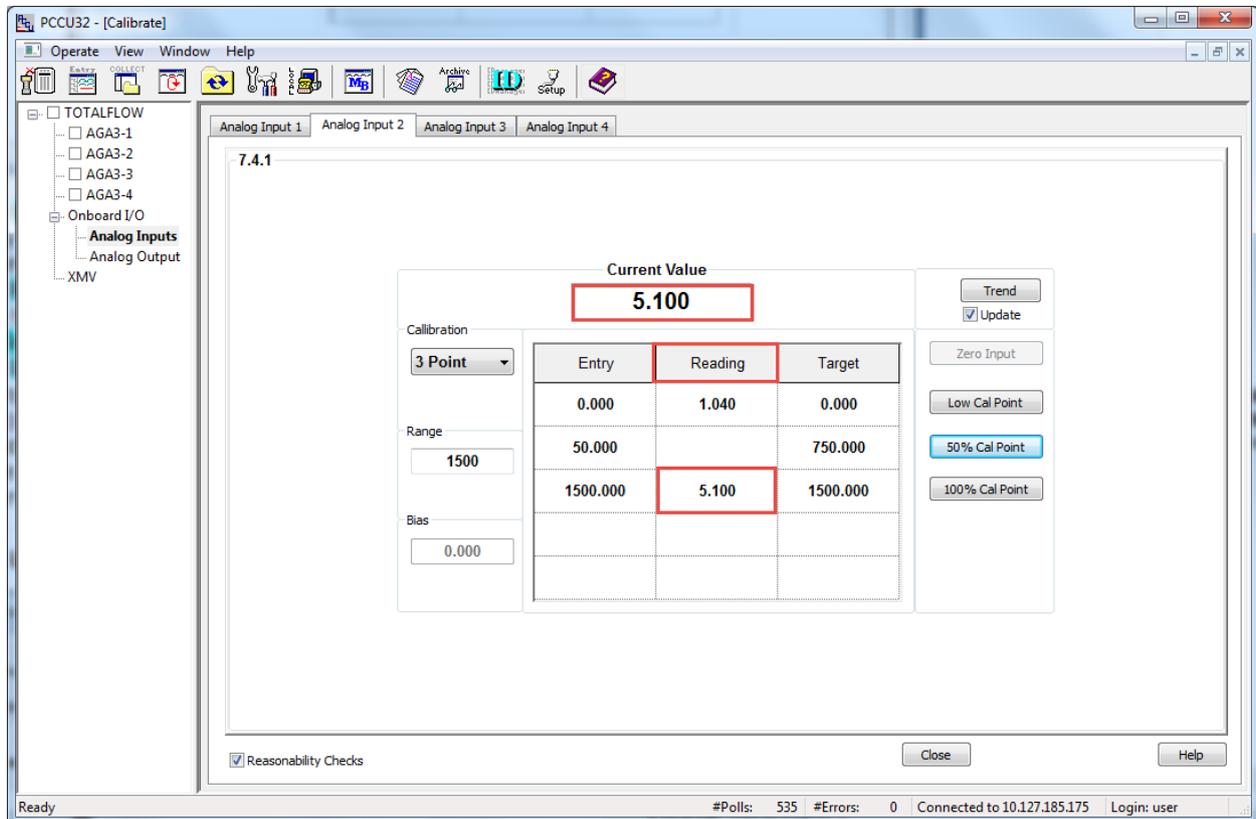
22. Adjust the calibrator to apply the high value (100%) of the signal range. For example, if the signal range of the external device is 4 to 20 mA, apply 20 mA.
23. Observe the value in the Current Reading field (Figure 7-29). The expected voltage value for a 20 mA input is approximately 5 Vdc ($0.02 * 250 = 5$ Vdc).

Figure 7-29: High (100%) calibration value reading



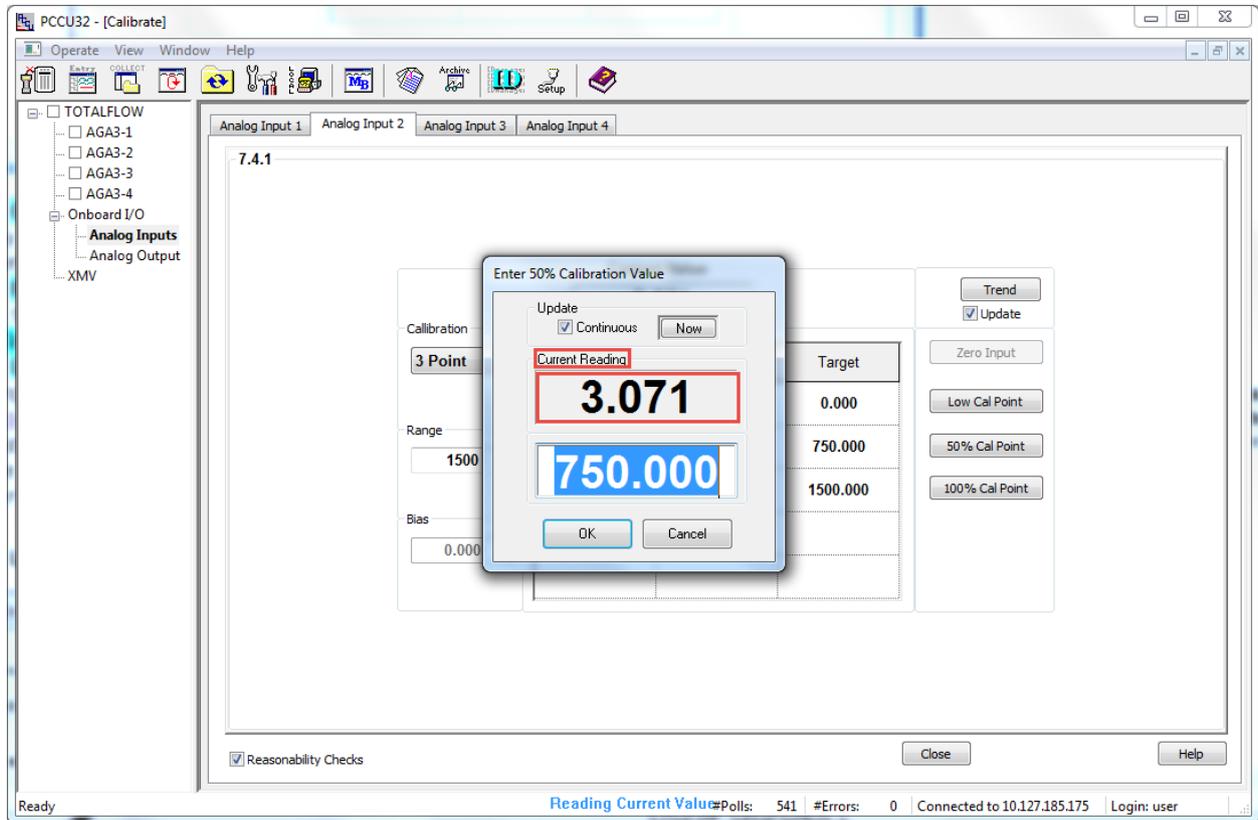
24. Wait for the Current Reading value to stabilize. Then click **OK**.
25. Verify that the Reading value column updates for the high range value (Figure 7-30).

Figure 7-30: Analog Input 2 High (100%) range value reading



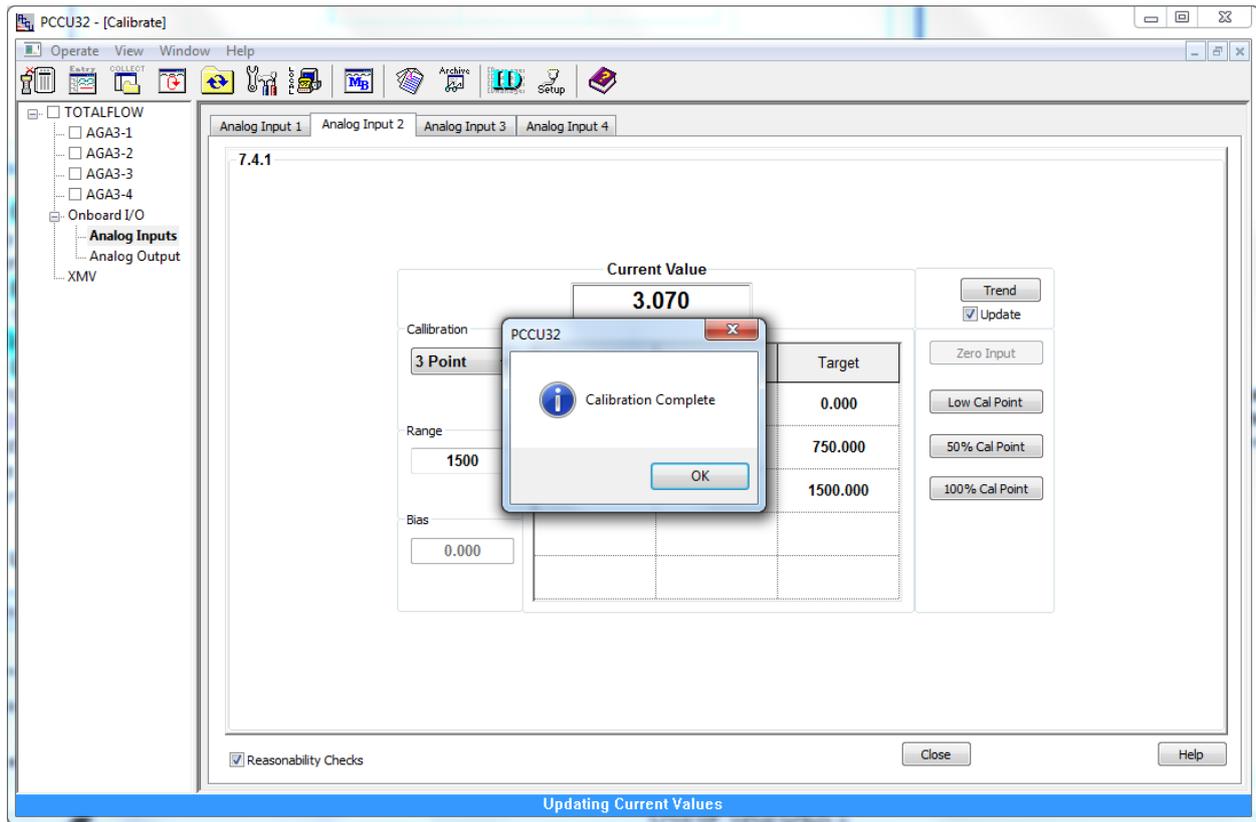
26. Click **50% Cal Point**. The Enter 50% Calibration Value dialog displays with the target mid value automatically calculated. For example, 750.000 for the range value of 1500 ([Figure 7-31](#)).
27. Adjust the calibrator to apply the mid-range value (50%) of the signal range. For example, if the signal range of the external device is 4 to 20 mA, apply 12 mA.
28. Observe the value in the Current Reading field ([Figure 7-31](#)). The displayed voltage value for 12 mA is approximately 3 Vdc. When the value stabilizes, click **OK**.

Figure 7-31: Mid (50%) calibration value



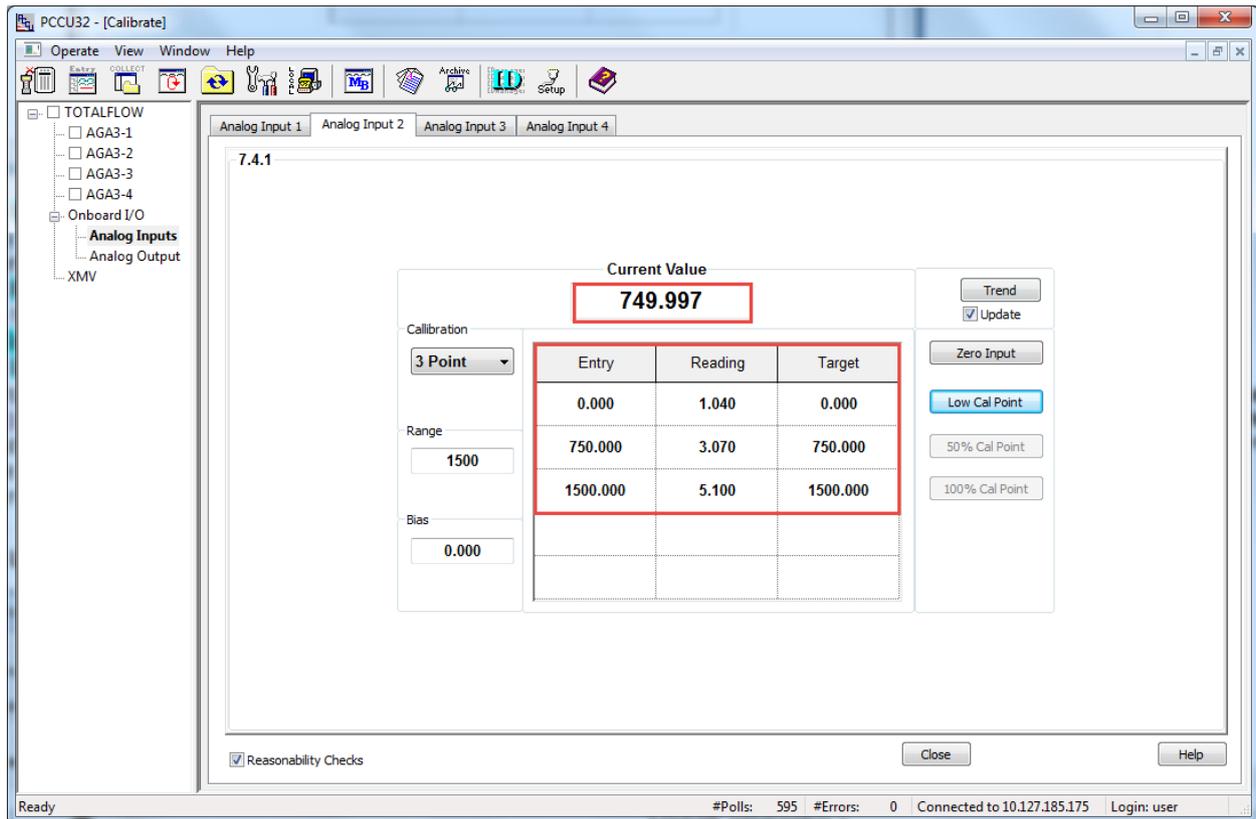
29. Click **OK** when the Calibration Complete message displays ([Figure 7-32](#)).

Figure 7-32: Calibration complete



30. Verify that the Entry, Reading, and Target values update, and the Current Value field displays the calibrated value based on the defined range (Figure 7-33). In this example the input signal from the calibrator is 12 mA. This value represents 750 PSI.

Figure 7-33: Calibrated AI 2 example (current mode)



31. Remain on the Calibrate screen and keep the calibrator connected to the AI.
32. To verify the calibration, proceed to section 7.1.4, Verify analog input calibration.

7.1.4 Verify analog input calibration

After calibration completes, the Current Value field displays the calibrated values based on the defined range. Continue to use the calibrator to apply different input signal values to the AI and verify that the value in the Current Value field reflects the expected calibration range values.

The instructions in this procedure apply to both current and voltage modes. The example in these instructions is current mode.

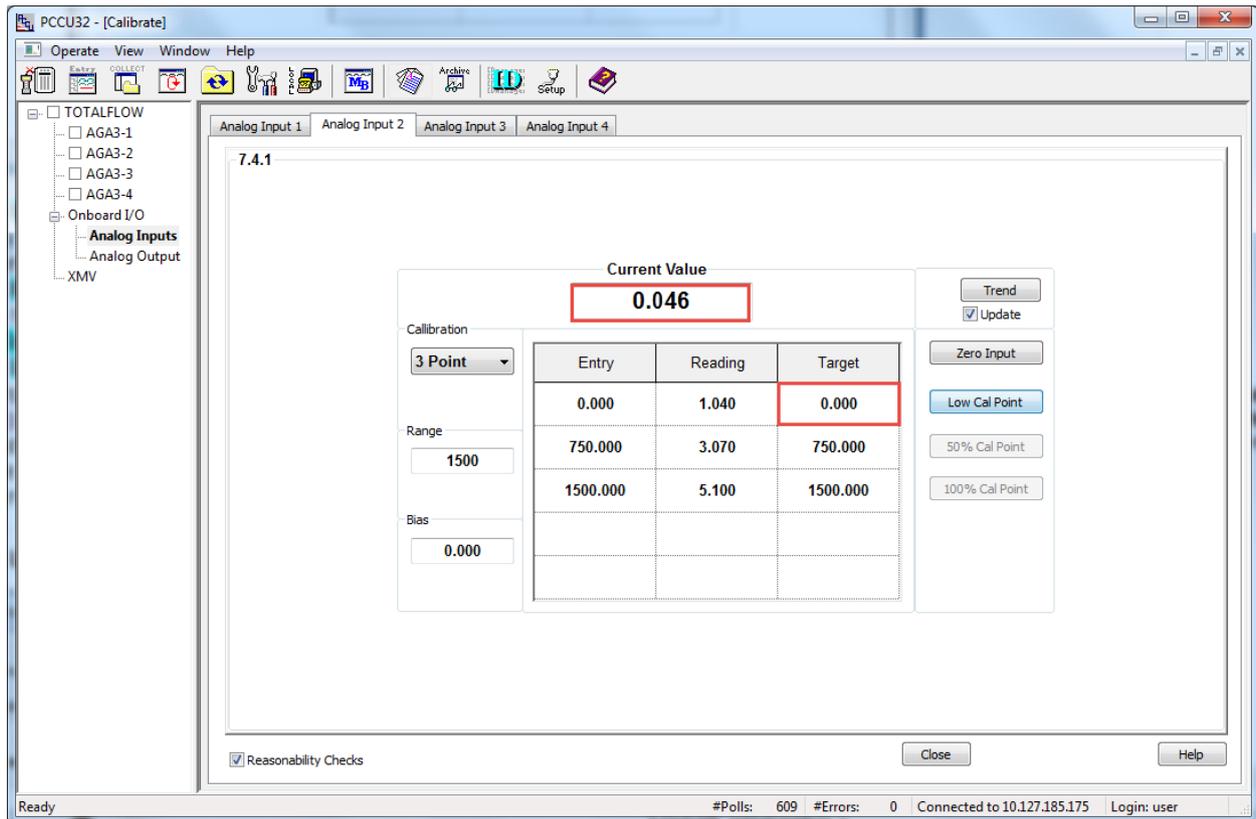


IMPORTANT NOTE: Perform this procedure immediately when calibration completes for each AI. Verify that the calibrator is set to the correct signal type.

To verify the analog input calibration:

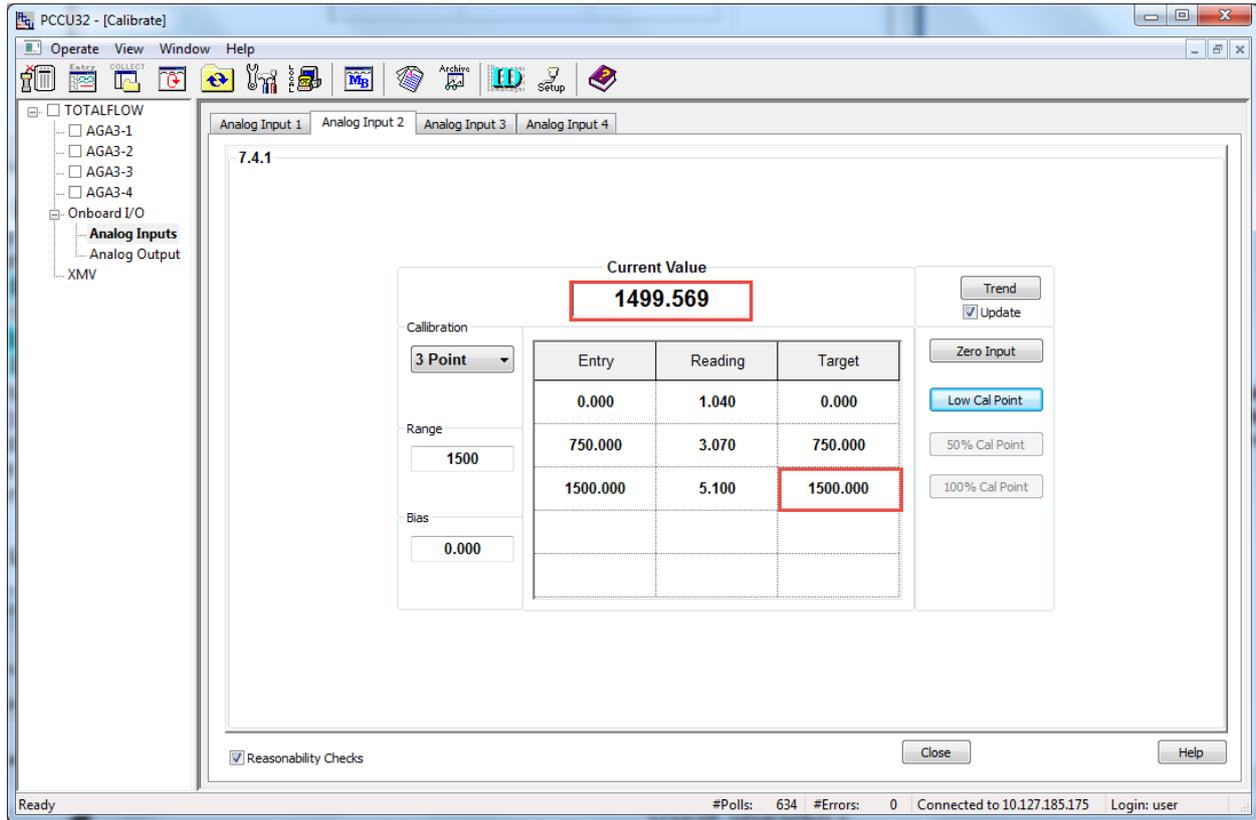
1. Adjust the calibrator to apply the minimum (low) value of the signal range. Wait for the value in the Current Value field to stabilize (Figure 7-34).
2. Verify that Current Value displays a value equal or close to the target range low (0%) value (Figure 7-34).

Figure 7-34: Low range value verification



3. Adjust the calibrator to apply the high (100%) value of the signal range.
4. Wait for the value in Current Value to stabilize ([Figure 7-35](#)).
5. Verify that Current Value displays a value equal or close to the target range high (100%) value ([Figure 7-35](#)).

Figure 7-35: High range value verification



6. Adjust the calibrator to supply additional input values, if necessary.
7. Calibrate the next AI or click **Close** to exit the Calibration screen.
8. Proceed to section [7.1.5](#) and repeat calibration if there are errors.
9. Remove power from the controller, remove the calibrator, and reconnect the external device when calibration successfully completes for all AIs.

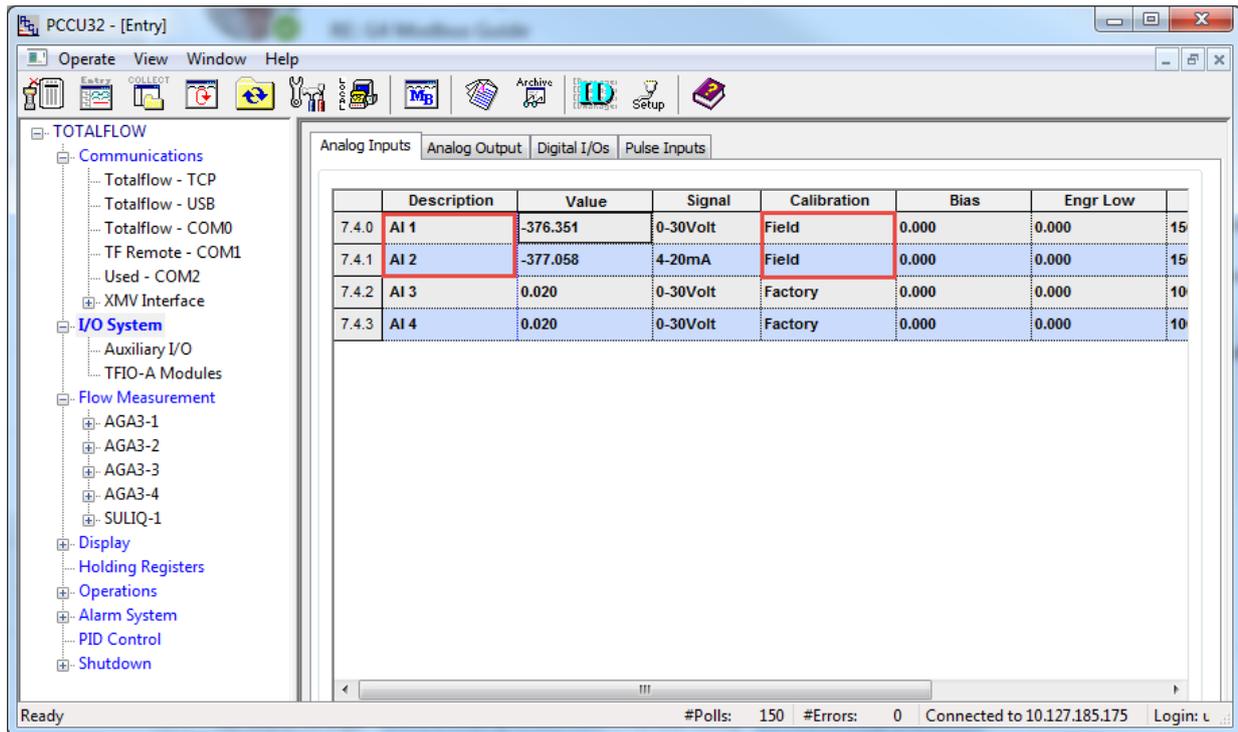
7.1.5 Repeat calibration in case of errors

The calibration might not be correct if the displayed values are invalid or do not stabilize. Perform this procedure before recalibrating.

To set the AI back to default factory values:

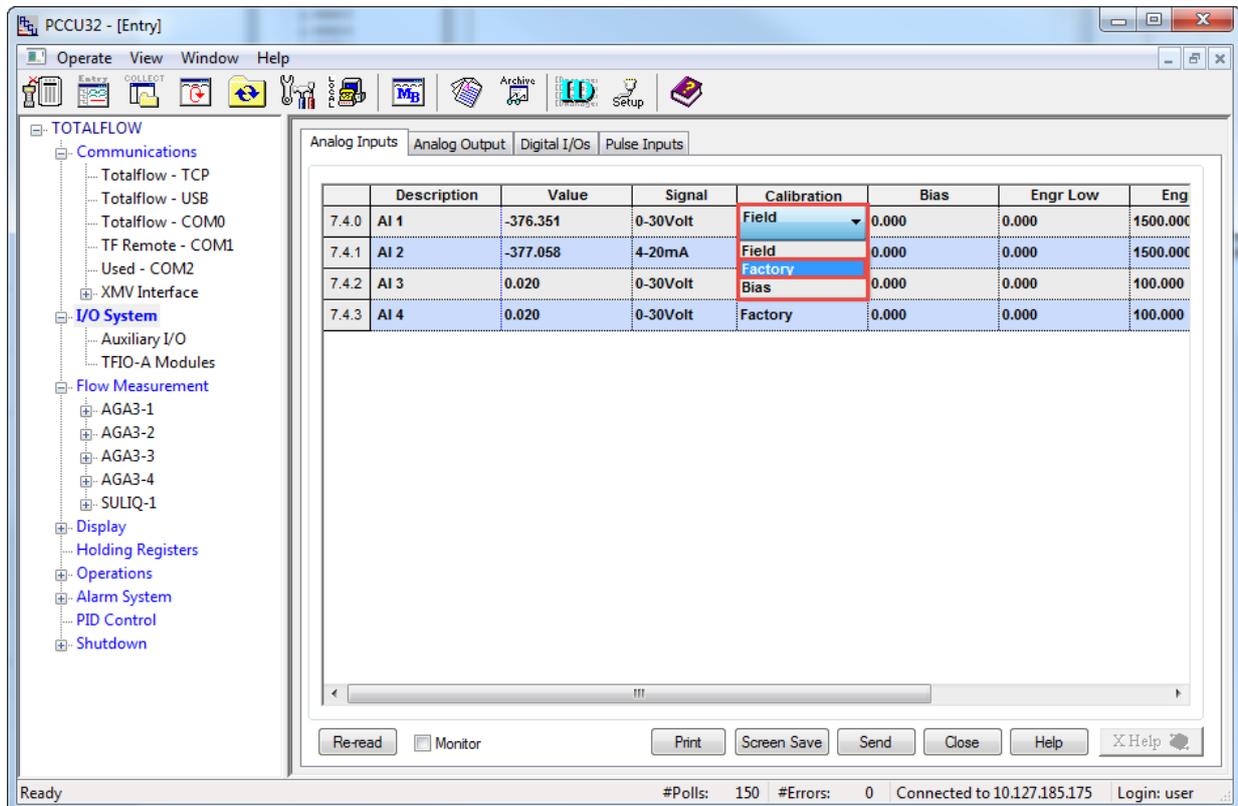
1. Click **Close** to exit calibration.
2. Click the Entry icon on the PCCU toolbar.
3. Click I/O System on the navigation tree. The Analog Inputs tab identifies the user-calibrated inputs (see AI 1 and AI 2 with calibration status set at Field [\(Figure 7-36\)](#)).

Figure 7-36: Analog inputs 1 and 2 after calibration



4. Select **Factory** from the Calibration drop-down list for the appropriate AI ([Figure 7-37](#)).

Figure 7-37: Reset AI calibration back to factory defaults

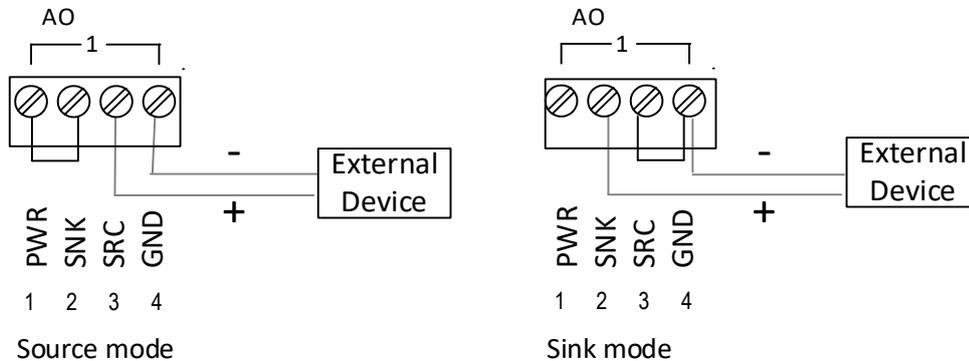


5. Click **Send**.
6. Repeat the calibration procedure in section [7.1.2](#), Analog input calibration (voltage mode), or section [7.1.3](#), Analog input calibration (current mode).

7.2 Analog output calibration

Calibration of the analog output (Analog Output, AO) ensures that the output signal matches the requirements of the external device. External devices can connect to the AO in sink or source mode. AO calibration measures the output signal for either mode of connection and assigns the appropriate engineering units to the signal range.

Figure 7-38: AO connection modes



IMPORTANT NOTE: Verify that the signal type of the external device is compatible with the controller AO. The AO can provide 4-20 mA output through the sink and source pins. For more details on the AO specifications, see section [2.2.3.2 Analog output](#).

7.2.1 Connect the calibration equipment

The calibration requires only an ammeter or multimeter capable of measuring electrical current in milliamps (mA). The AO signal is measured with or without the external device attached to the AO.

When the AO has no external device (no load) the ammeter connects based on the mode, either across the source and ground pins, or across the sink and ground pins.

Connect the ammeter in series with the device to measure the AO with the external device attached (with load).



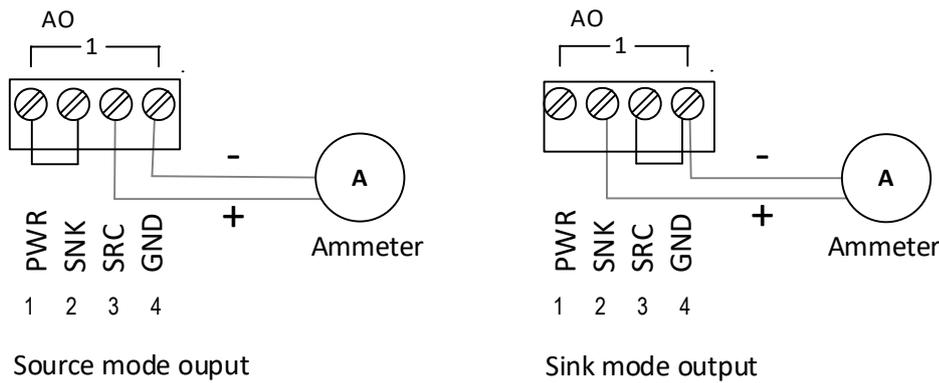
IMPORTANT NOTE: The procedures in this manual describe the calibration for the no-load option. Contact technical support to calibrate with the external device attached.

7.2.1.1 No load connected to the AO

To connect the ammeter or multimeter only:

1. Power off the RMC.
2. Disconnect all the wires from the external device.
3. Connect the ammeter or multimeter to the external device's wire ends ([Figure 7-39](#)). Observe the polarity and connect to the correct wire: positive probe to the source (SRC) or sink (SNK) signal wire, and negative probe to the negative or ground (GND) wire.

Figure 7-39: AO measurement for calibration



4. Connect or apply power to the RMC.
5. Verify that the multimeter is set to measure current in mA.
6. Turn on the ammeter or multimeter and proceed with calibration.

7.2.2 Analog output calibration with no load

Follow this calibration procedure when the external device is not connected to the AO. This applies to both the sink and source connection modes.

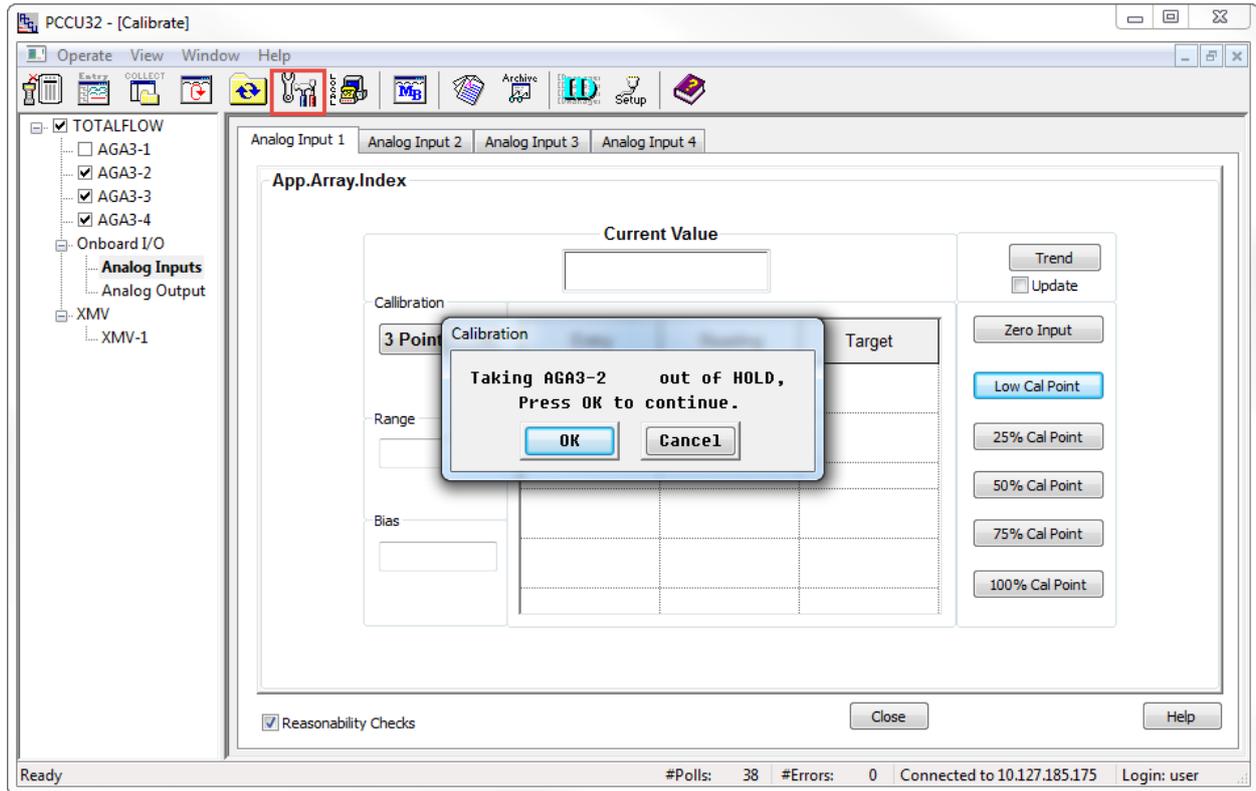
To calibrate the AO:

1. Connect the PC or laptop running PCCU32 to the controller. Launch PCCU32 and click the Entry icon on the toolbar.
2. Click the Calibrate icon on the toolbar. The Analog Input 1 screen displays with a request take an application (tube) out of HOLD (See Calibration dialog box in [Figure 7-40](#)).



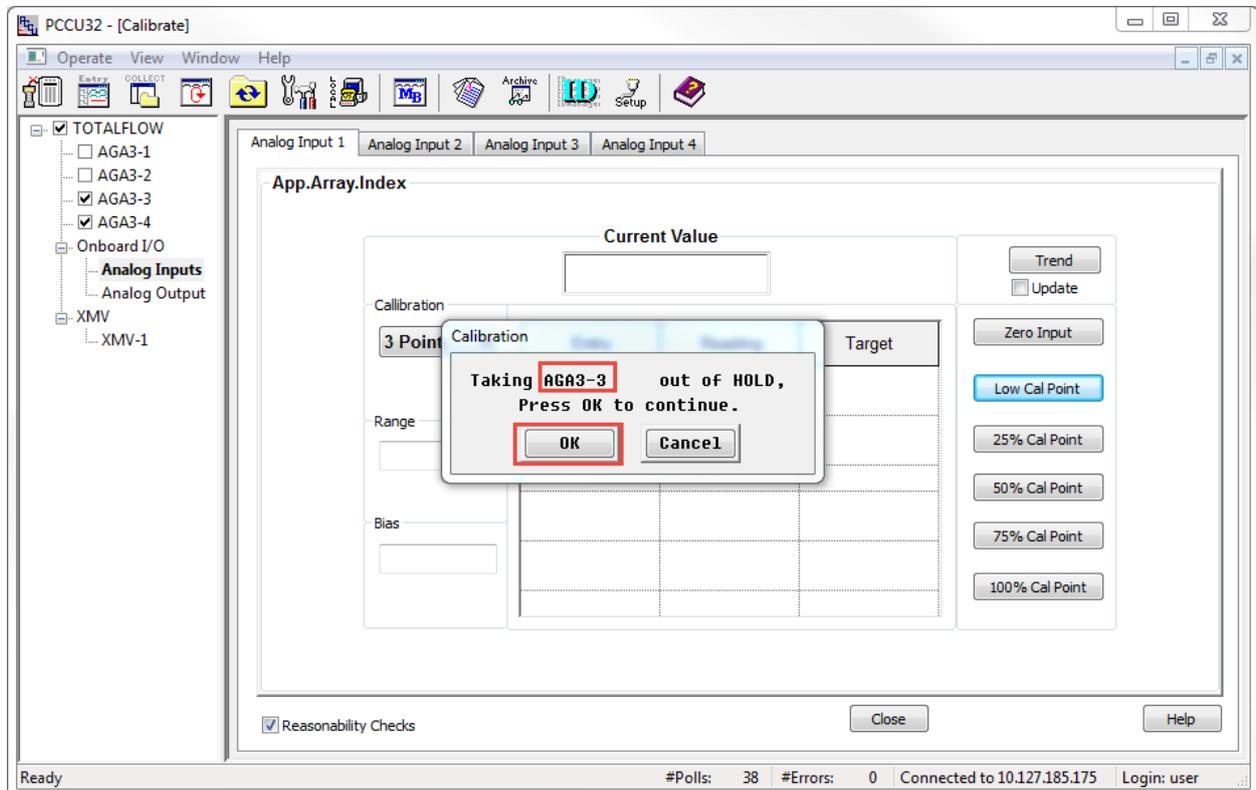
IMPORTANT NOTE: The displayed screen after entering calibration mode depends on the last I/O calibration type. This procedure assumes first-time analog input calibration was completed prior to analog output calibration. Analog Inputs display as default.

Figure 7-40: Calibration request to take application out of hold mode



3. Click **OK**. The calibration dialog box repeats the request for the next application. In this example, the AGA3-3 tube (Figure 7-41).

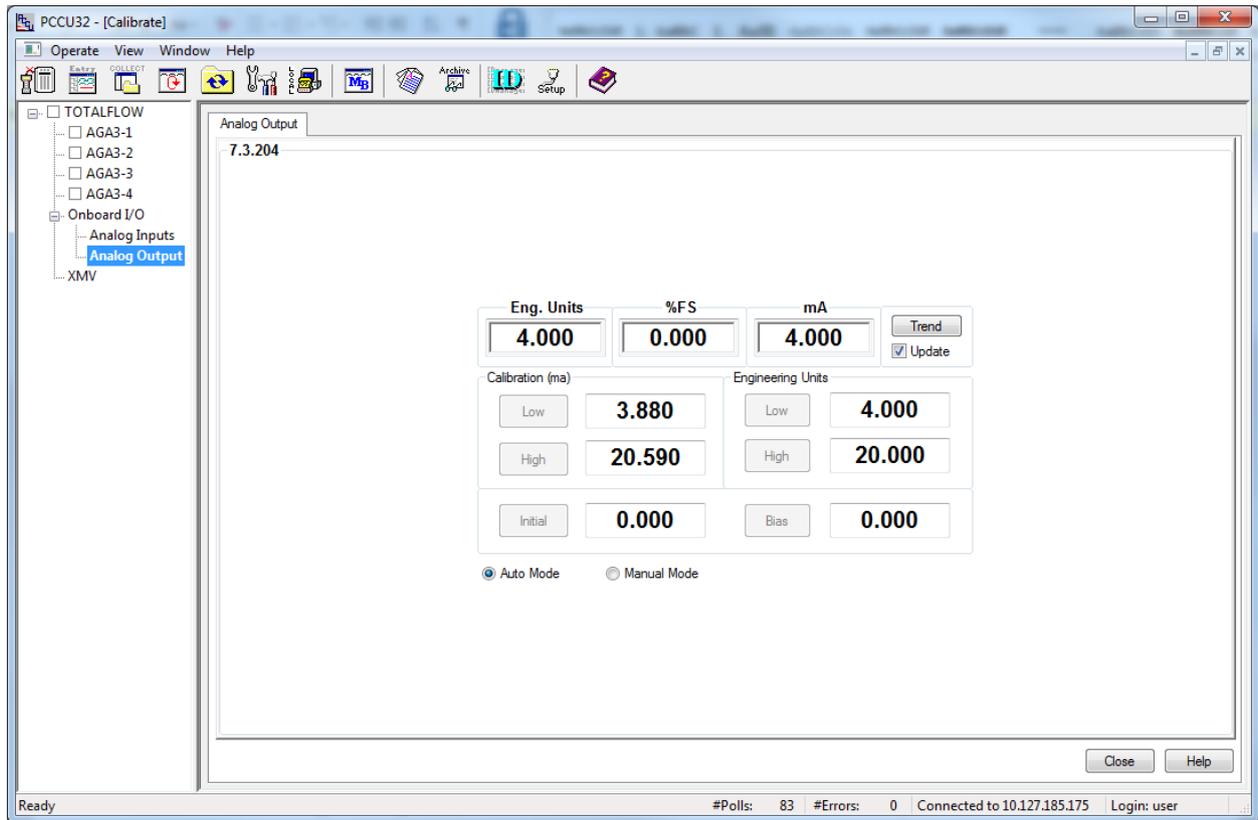
Figure 7-41: Calibration request to take additional application out of hold mode



4. Click **OK** for this and all additional requests. The calibration dialog stops displaying after the last application is out of hold.

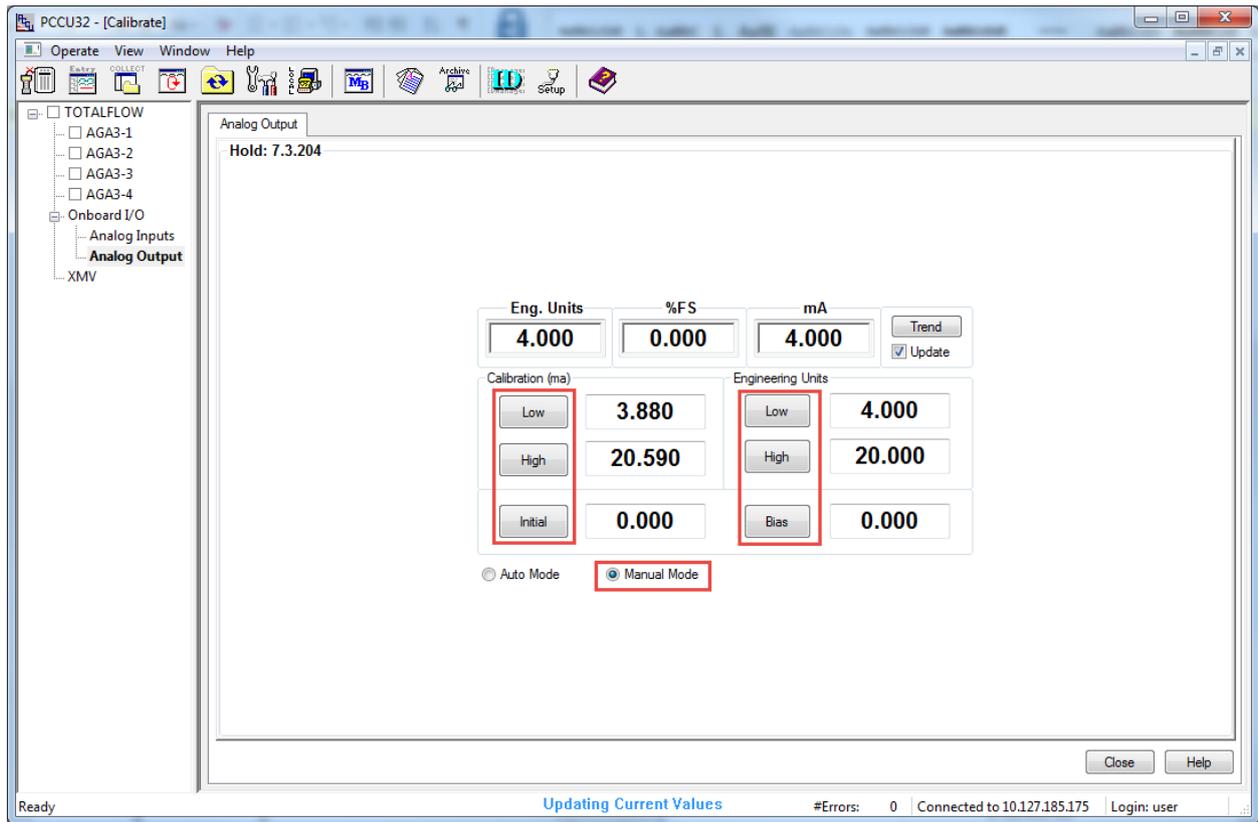
5. Click **Onboard I/O**, then **Analog Output** in the navigation tree. The Analog Output screen displays in Auto Mode.

Figure 7-42: Analog Output auto mode



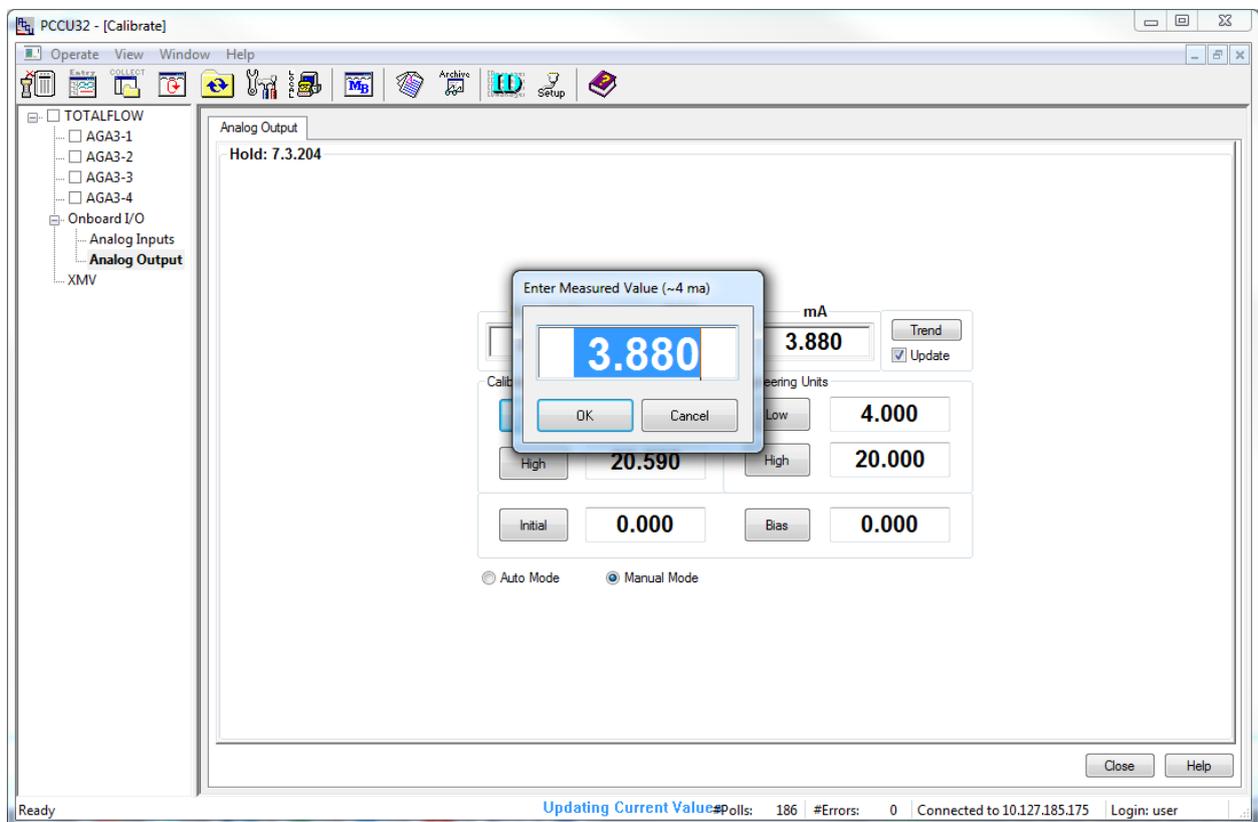
6. Click **Manual Mode** (Figure 7-43). The Calibration and Engineering Units buttons activate.

Figure 7-43: Analog output manual mode



7. Click **Low** in the Calibration (mA) column. The Enter Measured Value dialog displays.

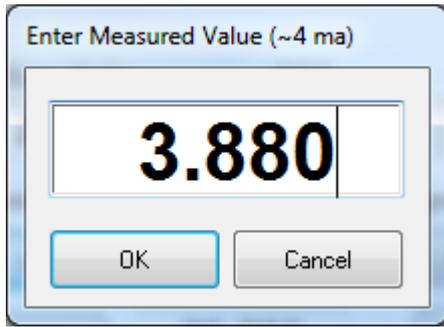
Figure 7-44: Display low AO measured value entry box



8. Check the reading on the ammeter. The value should be approximately 4 mA.

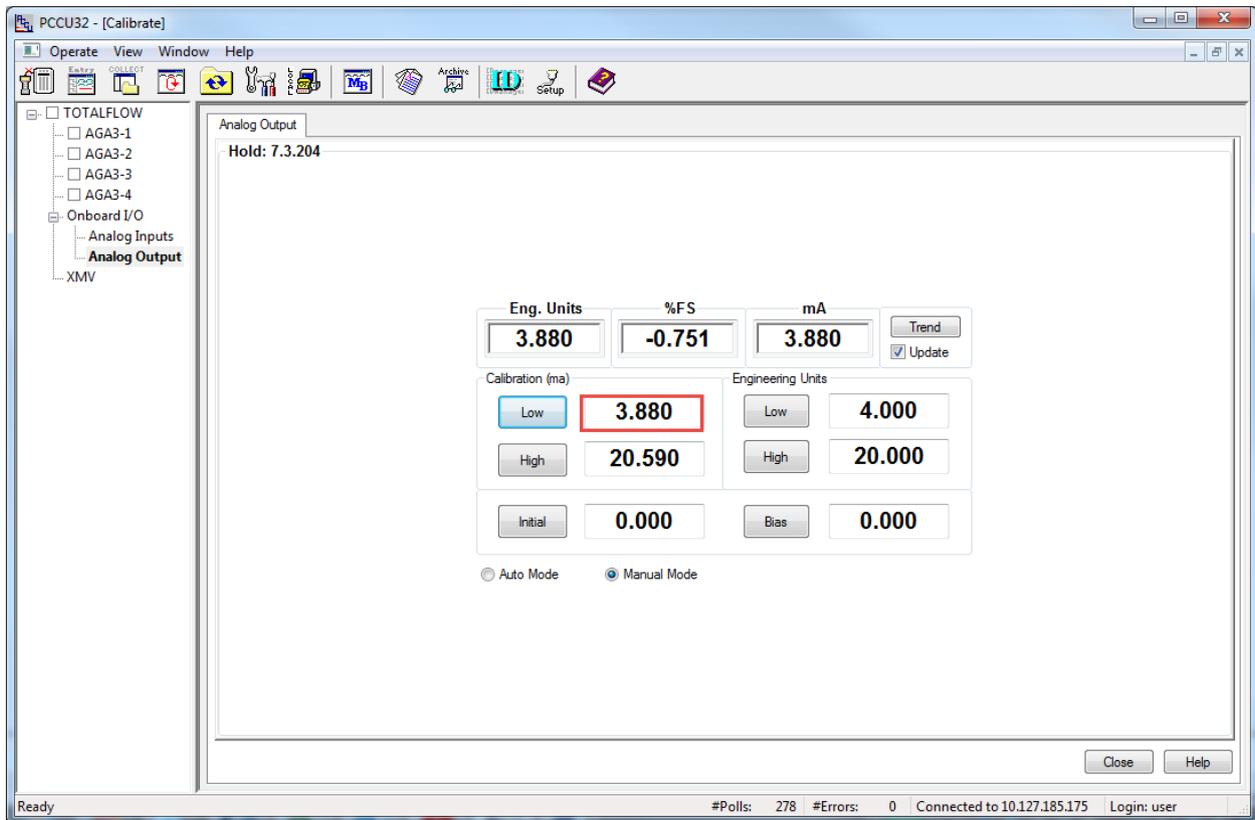
9. Type the ammeter's measured value into the entry field ([Figure 7-45](#)).

Figure 7-45: Type low AO measured value



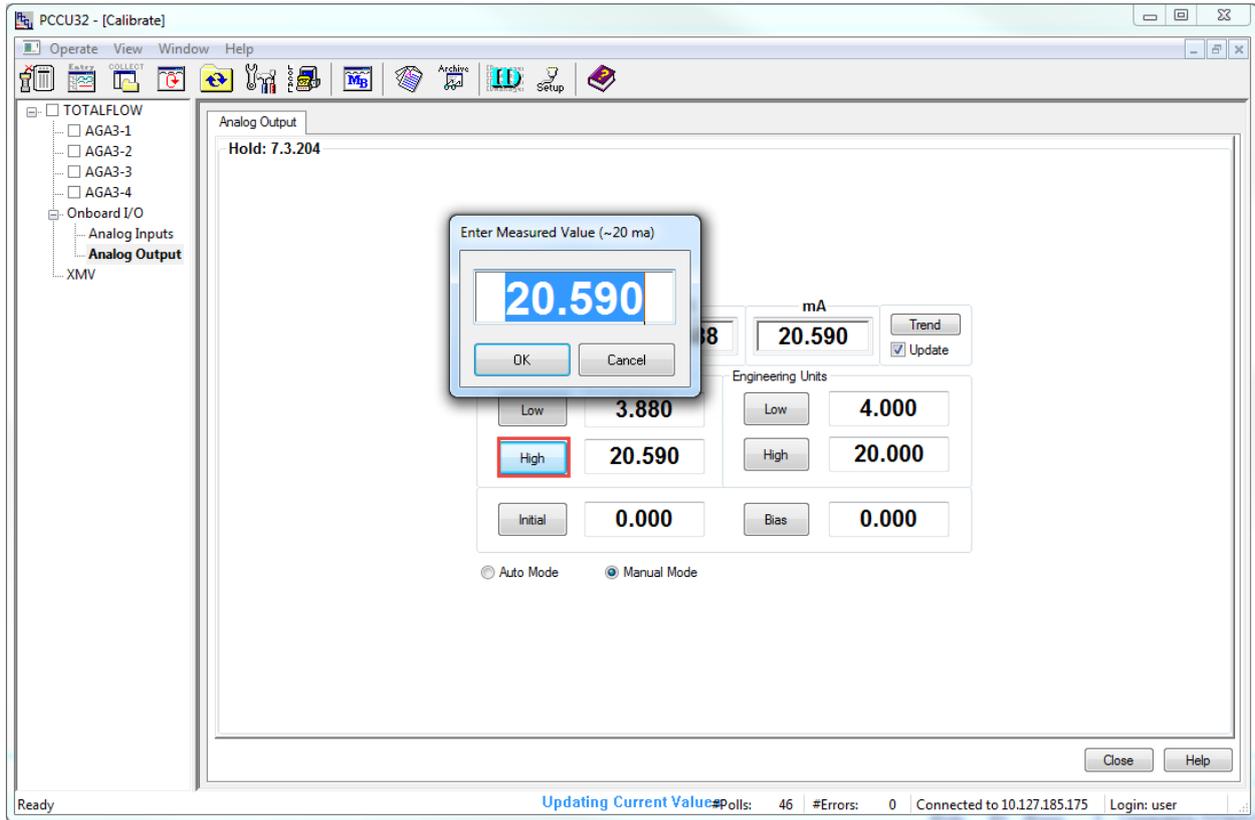
10. Click **OK**. The Calibration Low value field displays the measured value.

Figure 7-46: Updated low AO measured value



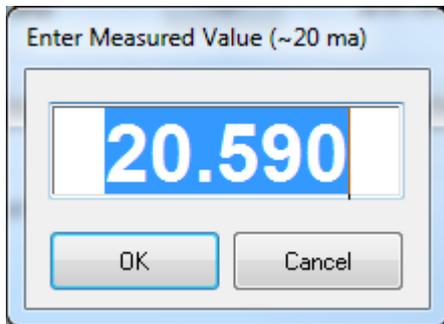
11. Click **High** in the Calibration (mA) column. The Enter Measured Value dialog displays ([Figure 7-47](#)).

Figure 7-47: Display high AO measured value entry box



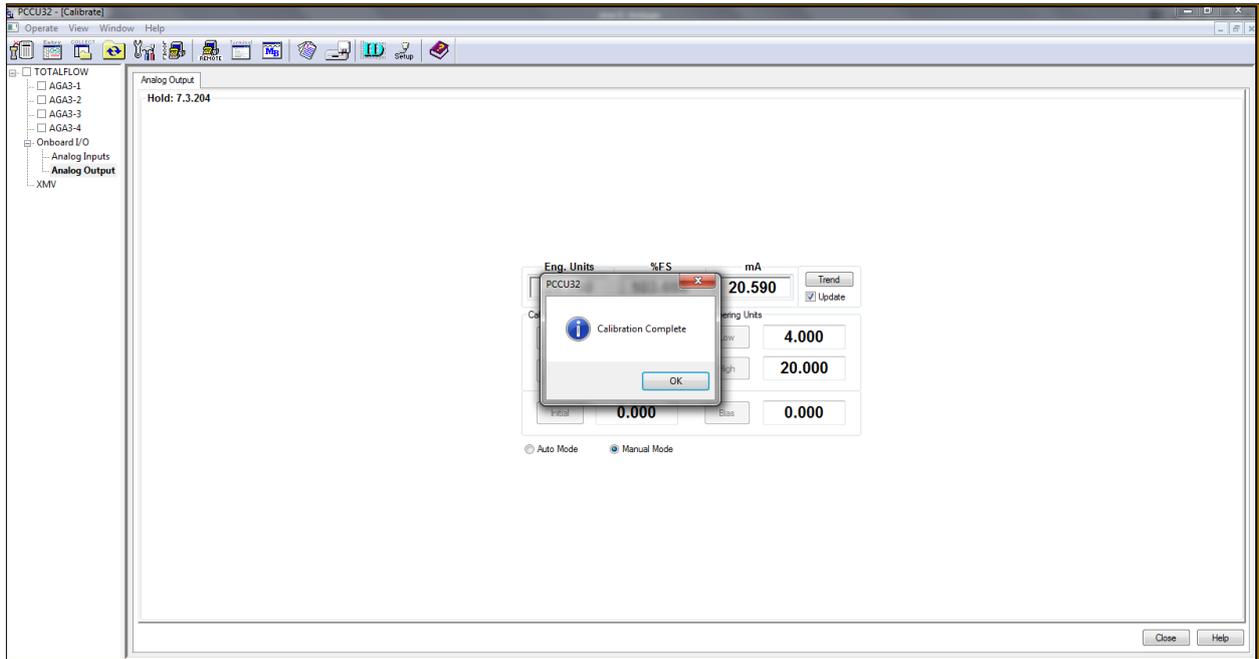
12. Check the ammeter reading. The displayed value should be approximately 20 mA.
13. Type the ammeter's measured value into the entry field (Figure 7-48).

Figure 7-48: Type high AO measured value



14. Click **OK**. The Calibration Complete message displays (Figure 7-49).

Figure 7-49: Analog Output calibration complete

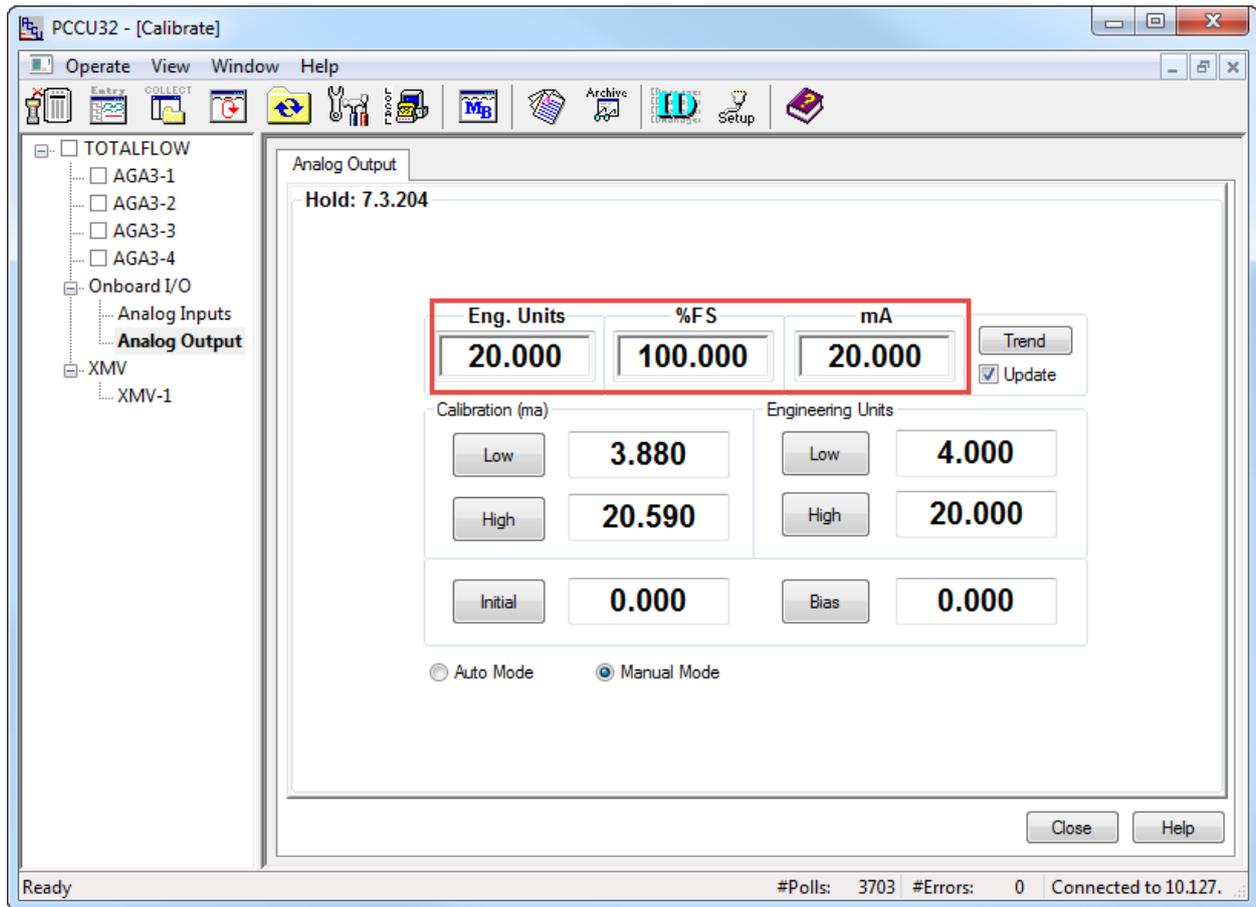


15. Click **OK**. The Eng. Units, %FS, and mA fields should display full scale values (Figure 7-50). The mA field displays the high value of the AO signal. This is 20 mA or 100% of the output signal.



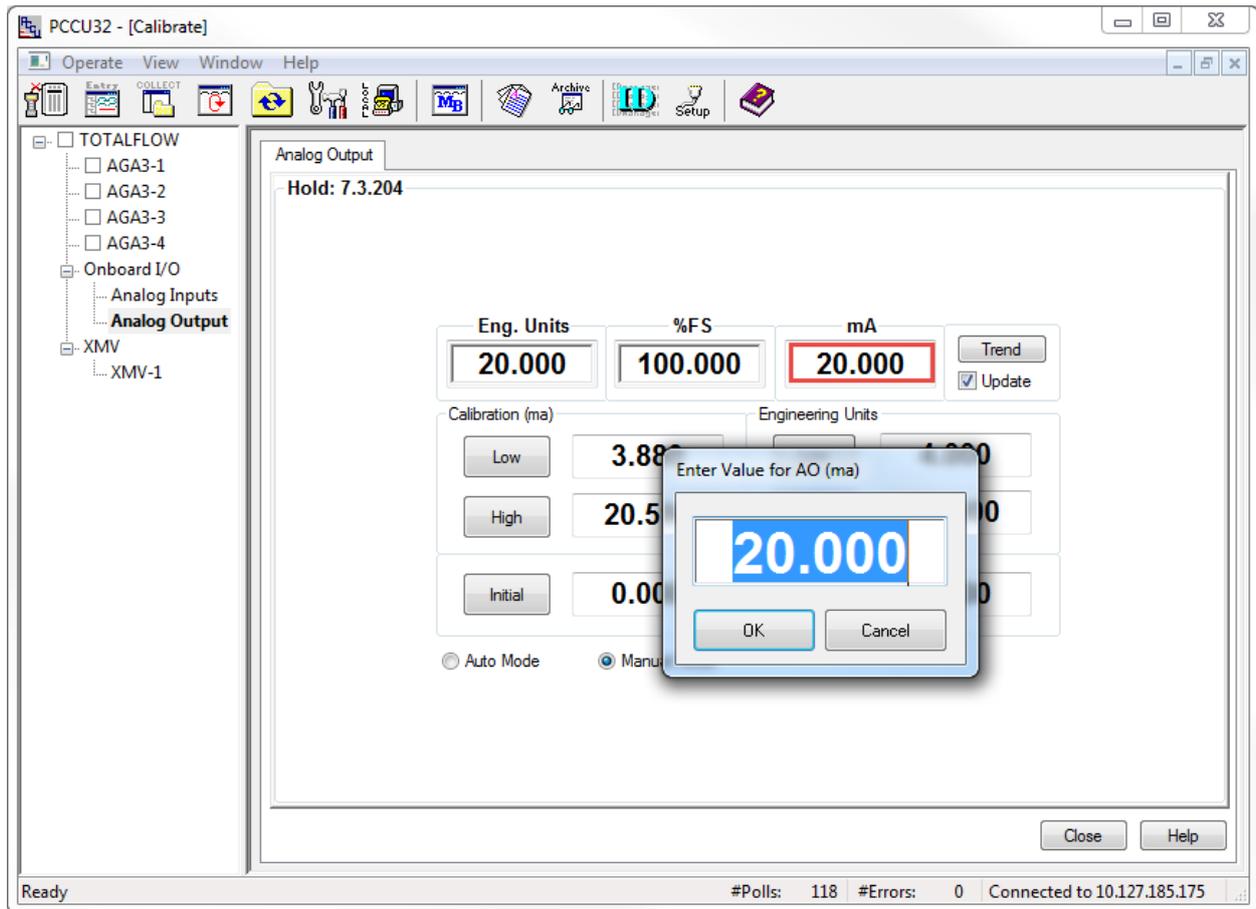
IMPORTANT NOTE: The Eng. Units field value matches the mA field value when the Engineering unit range is the default, 4 -20 mA. With non-default ranges (see section 7.2.3 Define engineering unit range) the Eng. Units field value is different from the AO signal value.

Figure 7-50: Calibrated AO example



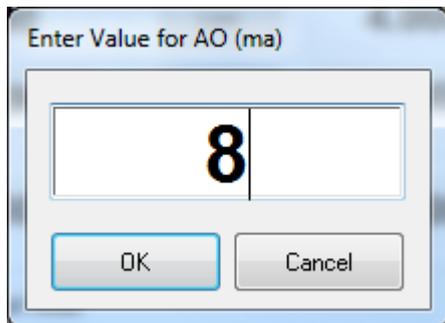
16. Type different values into the %FS or mA fields to verify the calibration. The controller produces the specified current output at the AO. For example:
 - a. Select the **mA** field. The Enter Value for AO (mA) box displays ([Figure 7-51](#)).

Figure 7-51: Display Enter Value for AO (ma) entry field



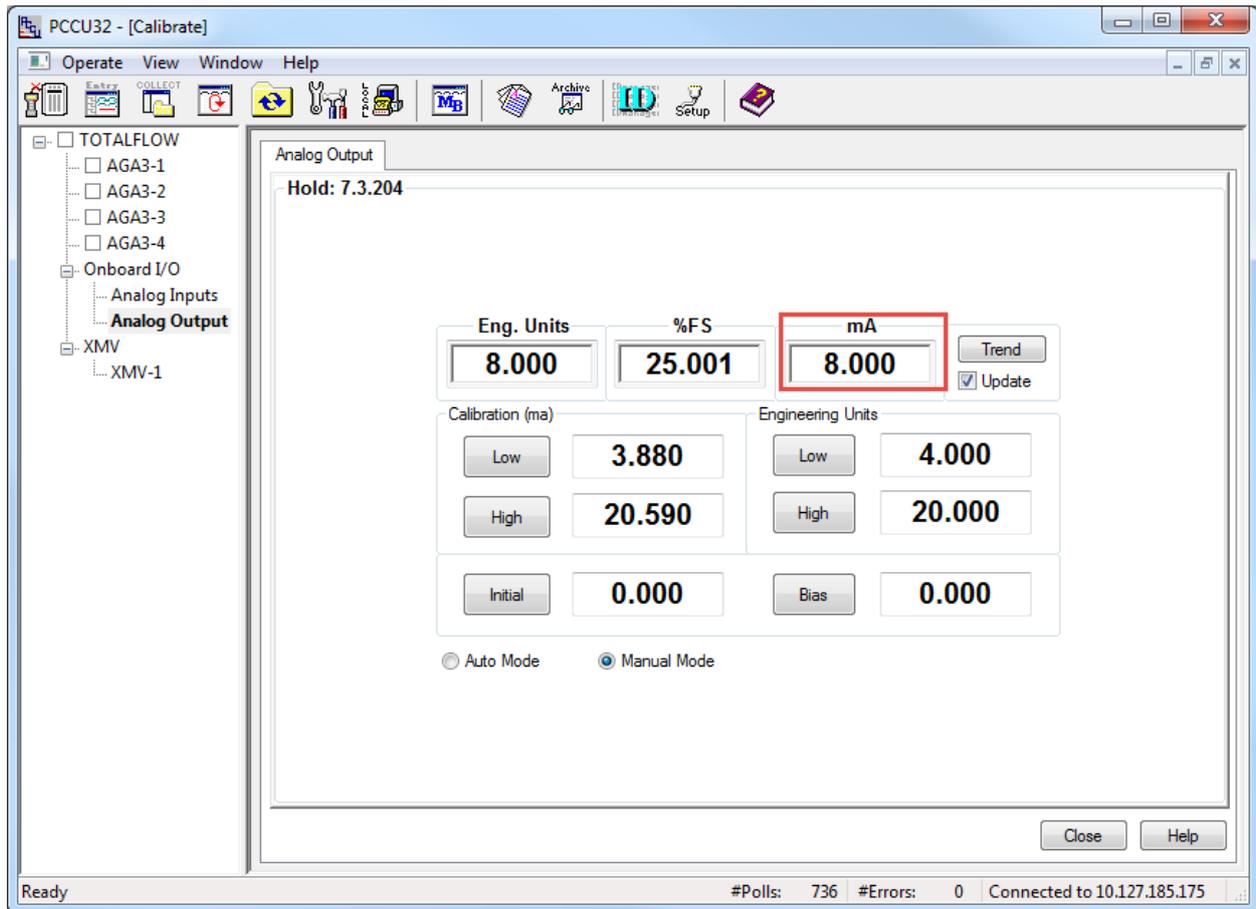
- b. Type a value from the 4 mA to 20 mA range. For example, 8 mA ([Figure 7-52](#)).

Figure 7-52: Type new value for AO current in mA



- c. Click **OK**. The mA field updates to reflect the typed value and the RMC produces 8 mA at the AO ([Figure 7-53](#)).

Figure 7-53: AO current value set to 8 mA



- d. Verify that the measured value on the ammeter matches or is approximately the typed value in the mA field.
- e. Re-verify with additional values, if necessary.
17. Proceed to section [7.2.3](#), Define engineering unit if the AO must reflect different engineering units.
18. If keeping the default engineering unit range (4-20 mA) click **Auto Mode** and **Close** to exit calibration.



IMPORTANT NOTE: Auto Mode takes the AO out of hold to resume normal operation.

7.2.3 Define engineering unit range

The engineering units fields permit a scale that is different from the default 4-20 mA range. This means that the AO values do not display in electrical current values, but in user-specified units. The values represent engineering units scaled across the 4-20 mA range. For example, the default output range can represent a pressure measurement value range of 0 to 100 PSI where 4 mA represents 0 and 20mA represents 100. The engineering units and range associated with the analog outputs depend on the external device specifications or the application driving the AO.

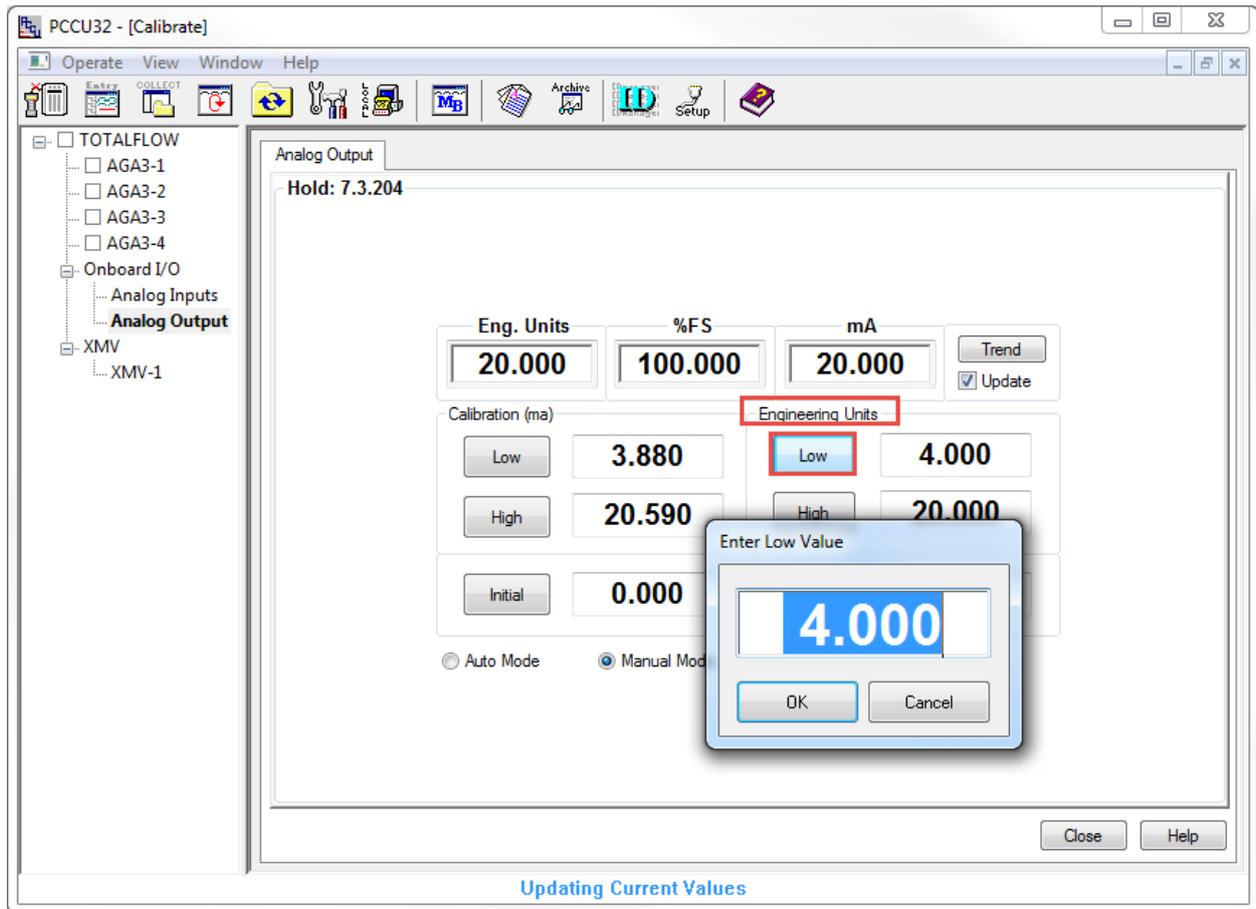


IMPORTANT NOTE: Define the engineering units after calibration and while the analog output screen is still in manual mode. This procedure defines an engineering unit range of 0-100 PSI. Different applications might require different ranges or units. Use values that are appropriate for your specific scenario and the external equipment specifications.

To define the engineering unit range:

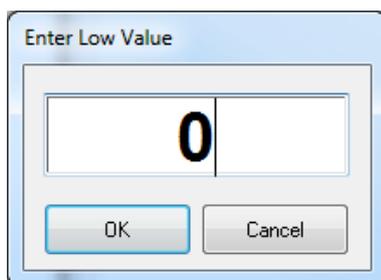
1. Click **Manual Mode**.
2. Click **Low** in the Engineering Units column. The Enter Low Value dialog displays ([Figure 7-54](#)).

Figure 7-54: Engineering unit range low value entry field



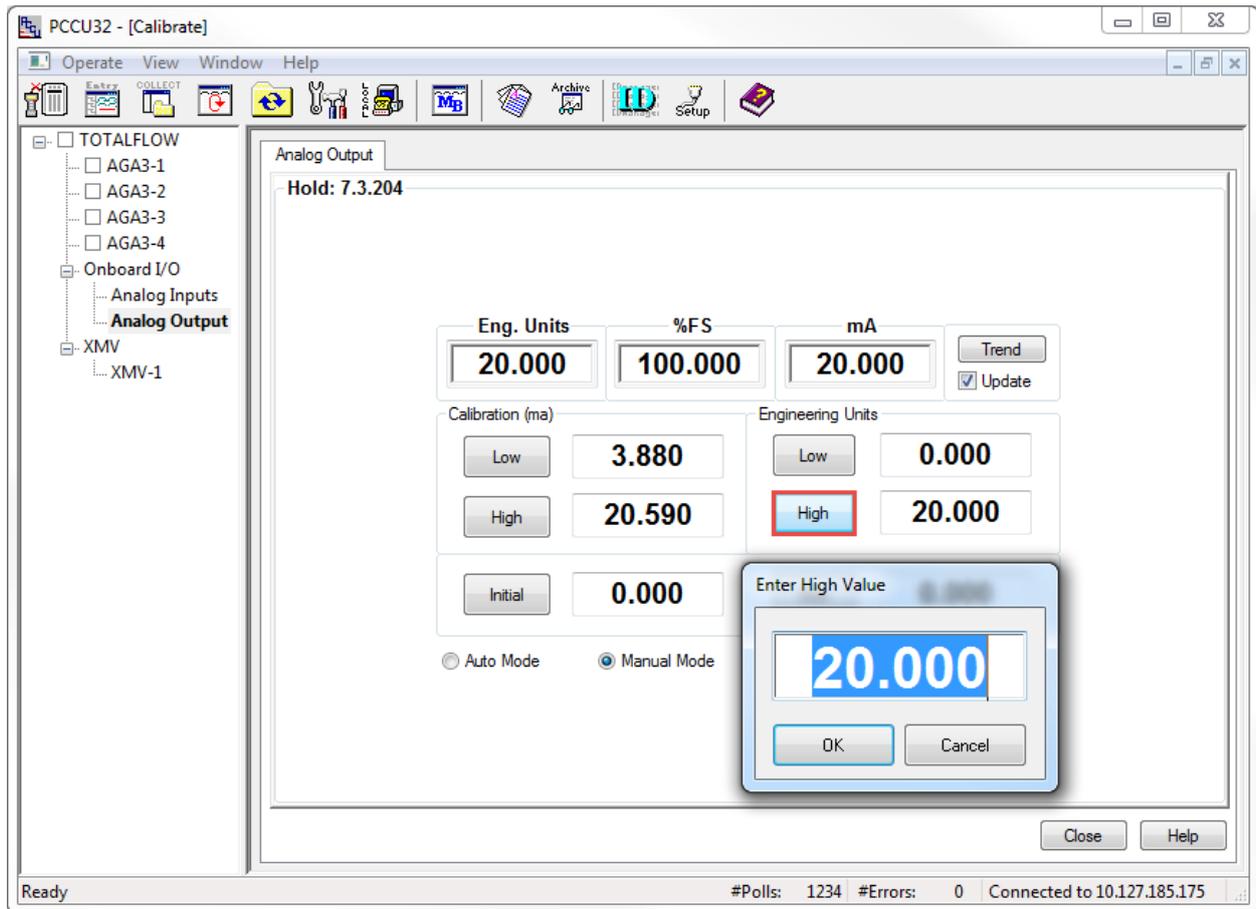
3. Type the value that represents zero (0) or the low end of the range. In this example the low value is 0 PSI ([Figure 7-55](#)).

Figure 7-55: Type engineering unit range low value



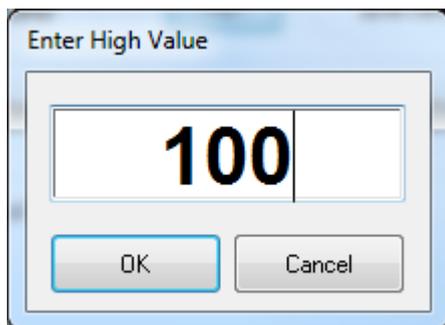
4. Click **OK**.
5. Click **High** in the Engineering Units column ([Figure 7-56](#)). The Enter High Value dialog displays.

Figure 7-56: Display engineering unit range high value entry field



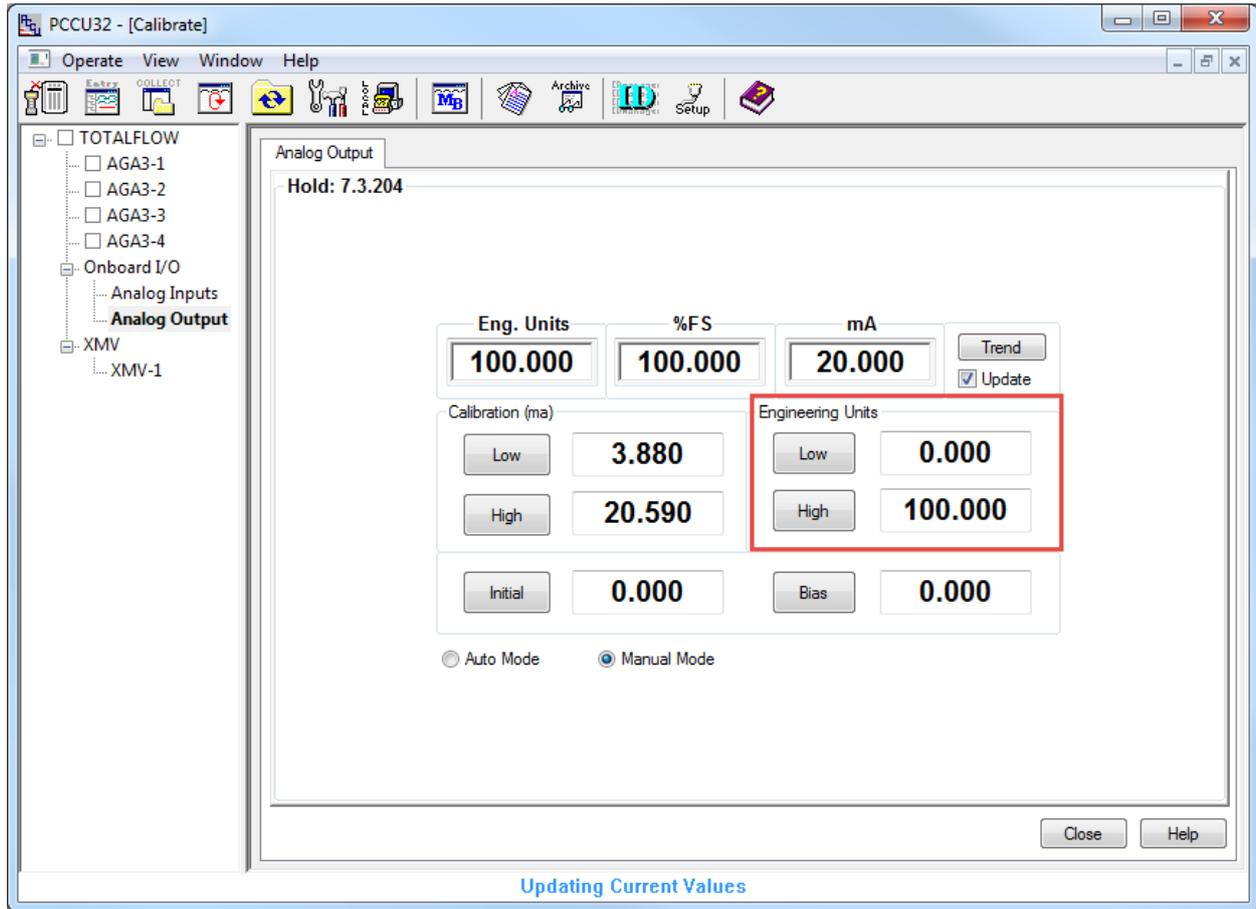
6. Type the value that represents the full scale, or the high end of the range into the entry field. In this example the high value is 100 PSI ([Figure 7-57](#)).

Figure 7-57: Type Engineering unit range high value



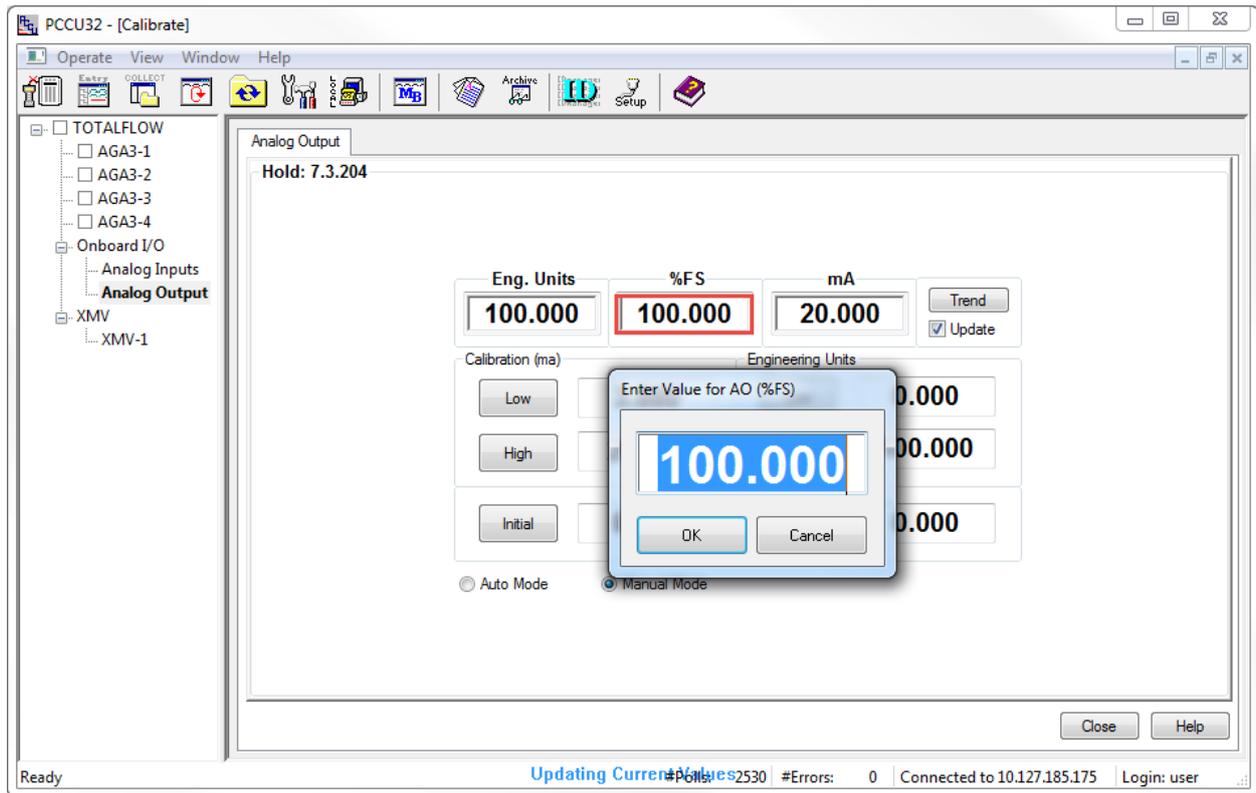
7. Click **OK**. The Engineering Unit values update to the user-defined range ([Figure 7-58](#)).

Figure 7-58: AO example user-defined engineering unit range



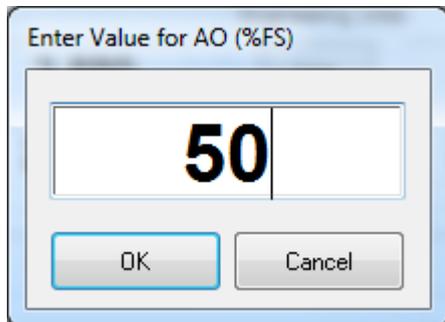
8. Type different values into the %FS or mA fields and verify that the Eng. Units field reflects values based on the defined range. For example:
 - a. Click the **%FS** field. The Enter Value for AO (%FS) dialog displays (Figure 7-59).

Figure 7-59: AO full scale percentage (%FS) entry field



- b. Type **50** to produce 50% of the AO full scale current value ([Figure 7-60](#)).

Figure 7-60: Type 50% of full scale AO

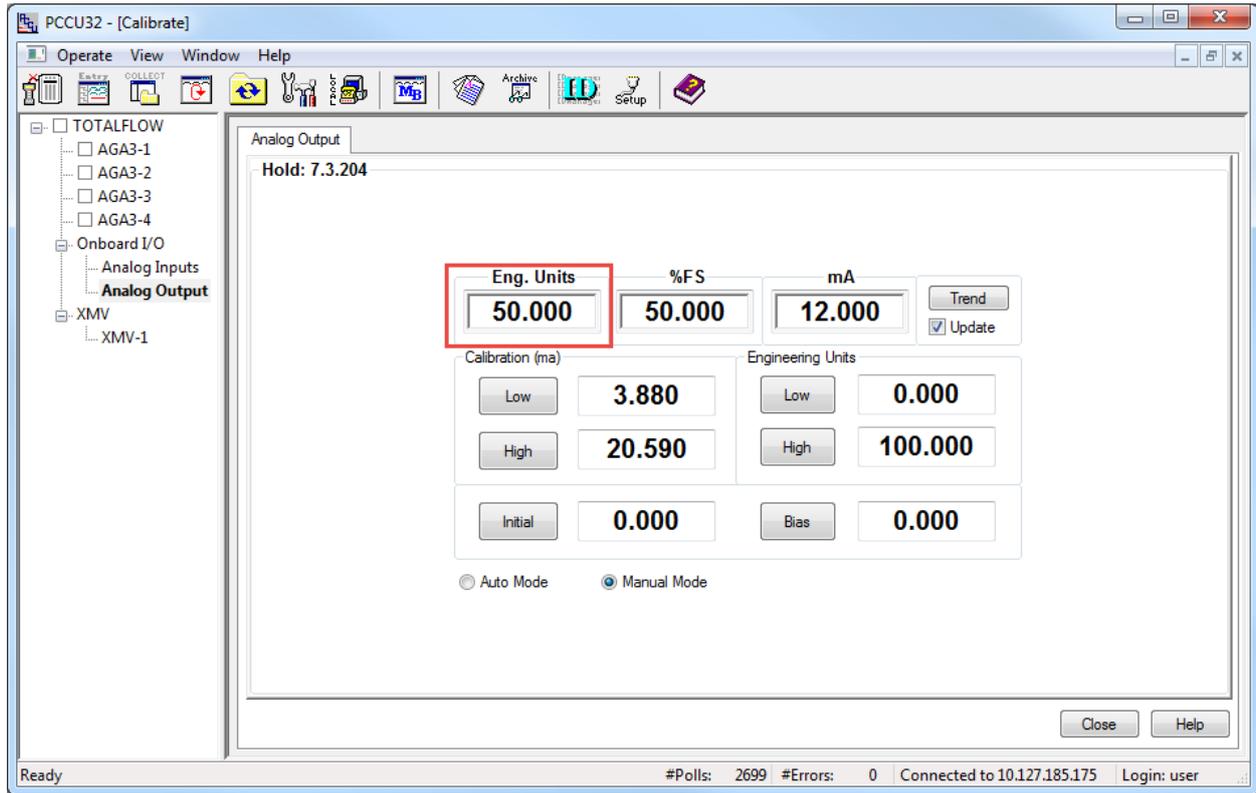


- 9. Click **OK**. The %FS field reflects 50% and the Eng. Units field reflects the half scale value of the 0-100 PSI range (50 PSI) ([Figure 7-61](#)).



IMPORTANT NOTE: The AO current value at 50% of the full scale is 12 mA (see mA field in [Figure 7-61](#)). For AO current values at other percentages of full scale, see [Table 7-2](#).

Figure 7-61: Eng. Units at 50% of full AO scale



10. Type additional values if necessary.
11. Click **Close** to exit the Calibration screen.

7.2.4 Drive the AO from a register

Use one Periodic option from the Operations application to drive analog outputs from a register. One of the Periodic options is (R1 -> Out). The value in the register, specified by R1, writes to the Out register at a specified time interval. For the R1 register, specify a register that contains the data to drive the AO. For the Out register, use the AO register. The AO register displays in the upper-left corner of the AO Calibration screen. From Entry mode, the AO register is the Engineering Units register on the Analog Output screen. For more information about configuring the controller to drive the AO from a register or another application, contact technical support at the phone number on the last page of this manual.

8 Service and maintenance

The Service and maintenance chapter provides:

- Standard maintenance procedures, including software backup, restoration and upgrade
- Instructions to remove and install spare parts for the RMC
- Additional procedures that are required before or after a maintenance procedure



DANGER – Serious damage to health / risk to life. Do not perform maintenance when an explosive atmosphere is present.



WARNING – Bodily injury. Remove power from the RMC if unit servicing requires removal or disconnection of cables or wires. Failure to remove power during service can cause bodily injury or equipment damage. Review warnings in Potential safety hazards.



NOTICE – Loss of data. Collect the measurement data and back up the configuration before performing any service on the controller. Failure to collect data and save the configuration can result in a loss of measurement data and require a complete system configuration.



IMPORTANT NOTE: When the controller is powered by a battery with a solar panel charger, it is very important to keep the face of the solar panel clean. Dirt and debris that cover photovoltaic cells reduce the charging ability of the panel. Develop a regularly scheduled maintenance program and maintain a selection of spare components to minimize downtime.



NOTICE – Equipment damage. The external power/charger and battery connections must be removed before removing all other cables, boards, and field connections. Connecting or disconnecting cables and wires on the RMC while power is applied can damage the electronic components.

Do not reconnect the external power/charger and battery connections until all other cables, boards and field connections have been reconnected.

8.1 Preserve data and configuration

It is very important to preserve data and configuration files before performing any maintenance procedure or software upgrade. Follow the procedures in this section to ensure that backups of the data and device configuration are available in a location separate from the controller. You can move collected data files to other systems for safekeeping or import into customer databases as necessary.

Saved configuration files preserve the configuration of all the applications operating in the controller. Save the configuration in a location separate from the controller to restore or reuse. This can save a considerable amount of time if configurations are complex and avoids having to configure a controller from scratch.

The procedure includes:

- Collect data
- Update startup (cold) configuration
- Save startup (cold) configuration

8.1.1 Collect data

This procedure collects and saves the measurement data to a file on a PC or laptop so the measurement data in a controller that has been in operation is not lost.

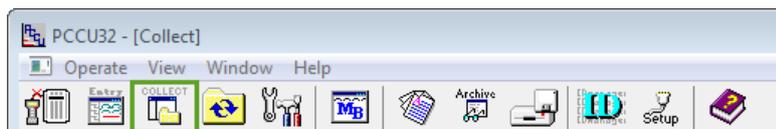


IMPORTANT NOTE: Before collection, select from the several output types for the collected data, including displaying the data on the screen. Regardless of the output type selected, the system automatically creates a file containing the collected data and saves it in the PC or laptop performing the collection. The default location of this file is the **ppcudata** folder in the PCCU32 installation directory. The name of the collection file is the controller station ID. Data or laptop files contain the collected data.

To collect the data from the controller:

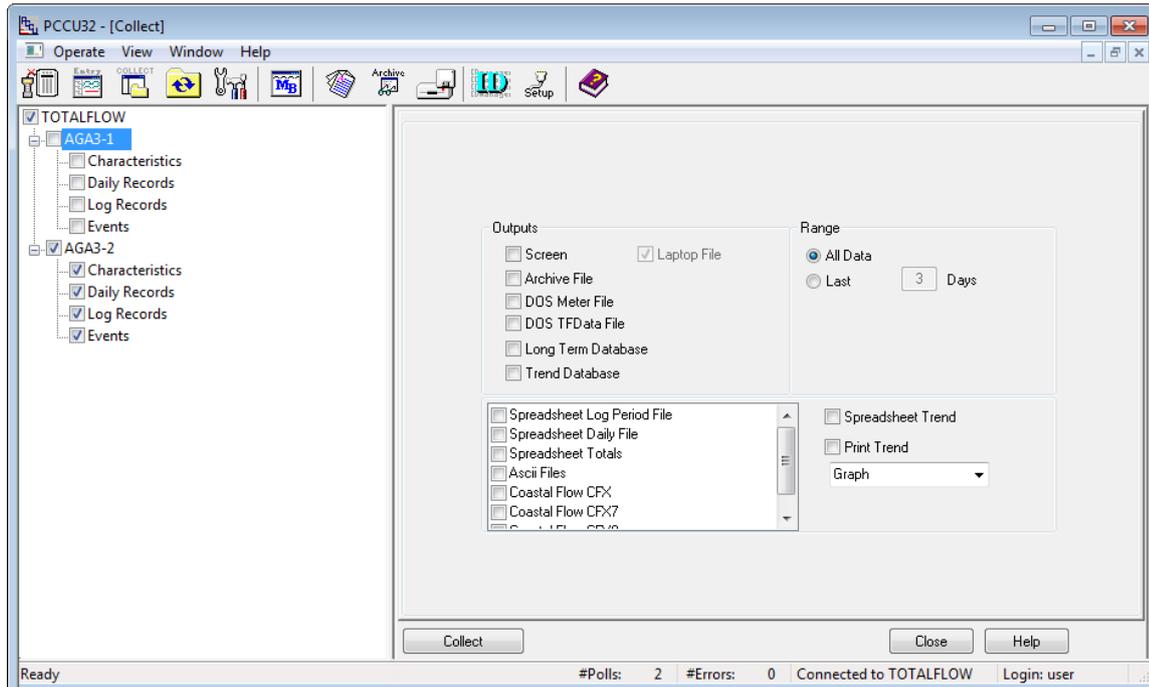
1. Connect the PC or laptop to the controller (local communication) and launch PCCU32.
2. Click the **Collect** icon on the PCCU toolbar ([Figure 8-1](#)). The Collect screen displays ([Figure 8-2](#)).

Figure 8-1: Collect icon



3. Click one or more applications on the navigation tree to select them for data collection.
4. Click **Help** on the Collect screen for additional information.

Figure 8-2: Collect screen

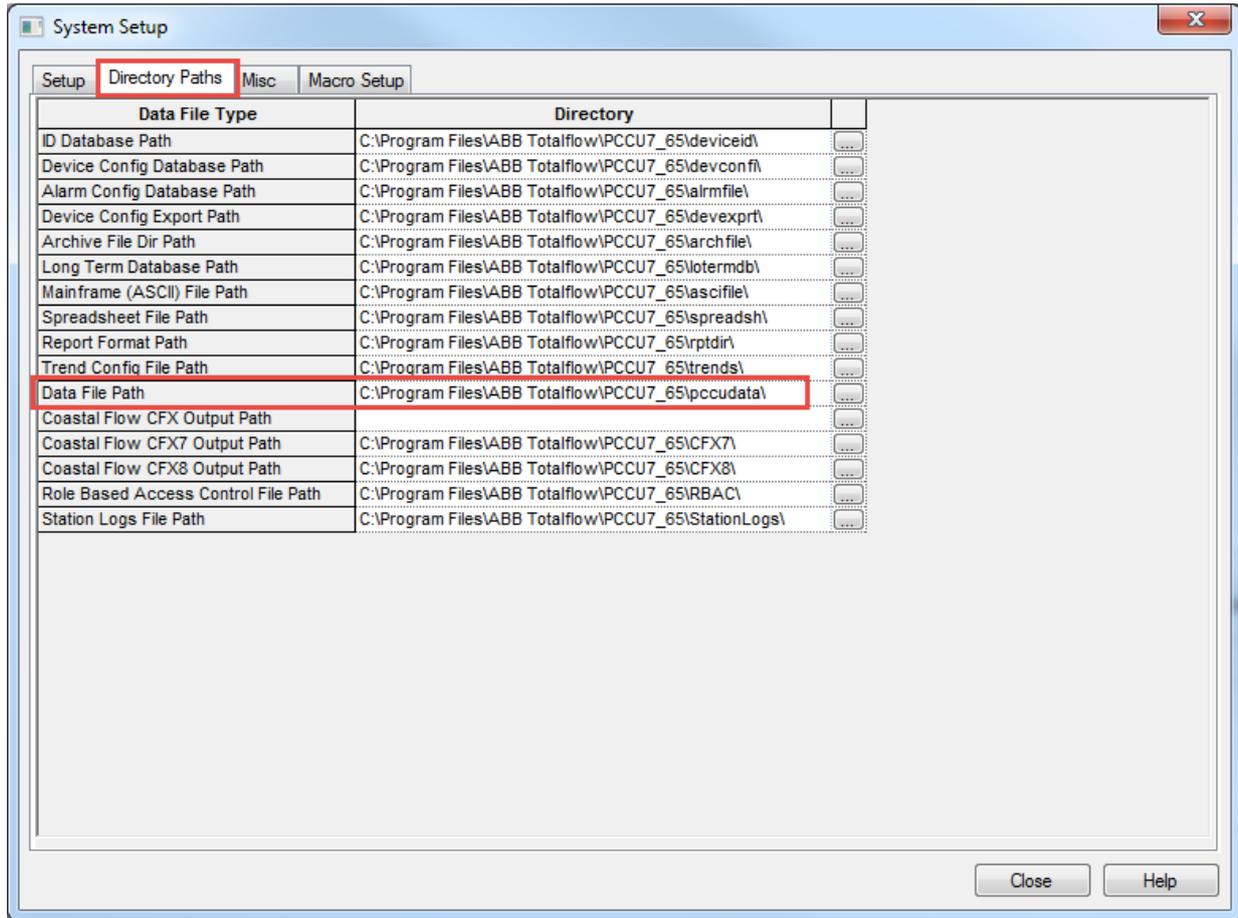


5. Click one or more output types from the Outputs list to send the data to other locations in addition to the laptop. The option to display the data on the screen is automatically selected.
6. Select the range of data to be collected.
7. Click **Collect**.
8. Click **Close** to close the output screen if it displays.
9. Click **Close** to exit the Collect screen.
10. Navigate to the collected data file on your laptop.



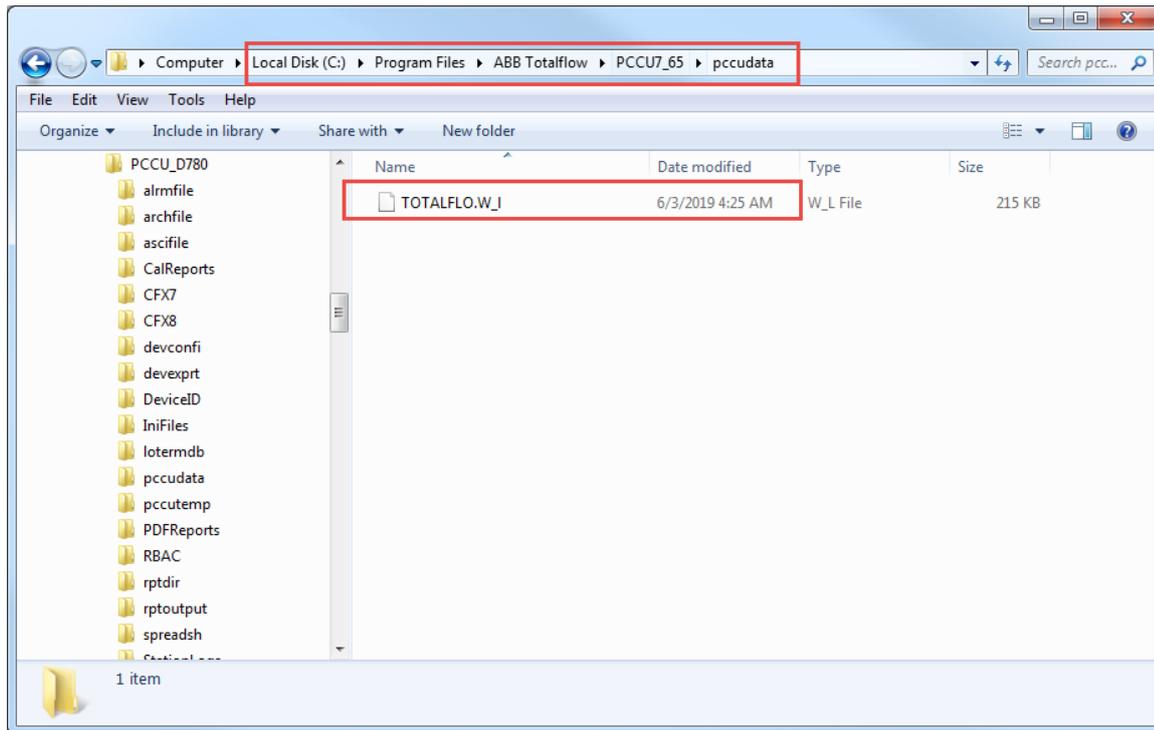
IMPORTANT NOTE: The data file might be in a default or user-defined location based on the PCCU directory path setup ([Figure 8-3](#)). The path for collected data is the Data File Path. The default location for data or laptop files is the pccudata directory in PCCU the installation directory.

Figure 8-3: Data file path



- a. Open File Explorer.
- b. Navigate to the data file path ([Figure 8-4](#)).
- c. Locate the data file. The data file is named with the device's station ID.

Figure 8-4: Locate laptop file (collected data)



IMPORTANT NOTE: PCCU creates a new laptop file the first time it collects data from a device. PCCU overwrites the data on the existing laptop file in subsequent collections from the same device. If you wish to preserve the laptop file for each collection, move and store the file in a safe location as soon as you complete a collection.

8.1.2 Save the device configuration

The following procedures are required to save the configuration of the Totalflow device for backup purposes. The device stores a running (warm) and a startup (cold) configuration that contain configuration files for all enabled and active applications. Any configuration performed after the device starts for the first time continues to run in the running configuration. The startup configuration does not automatically update to reflect those configuration changes.

To perform a backup of the most up-to-date configuration, you must update the startup configuration first, and then save it on a laptop or PC.

You can use backup configuration files to restore service in the event of equipment failure, part replacement, or to replicate the configuration in other devices.



IMPORTANT NOTE: tfData and tfCold, warm and cold, are terms used to refer to the running and startup configuration respectively.

8.1.2.1 Update the startup (cold) configuration

This procedure saves the running (warm) configuration to the startup (cold) configuration. With this procedure both the startup and the running configuration reflect the most current configuration. A cold restart event with the most-up-to-date configuration resumes device operation without the need to reconfigure the device. The update is a manually triggered action.



IMPORTANT NOTE: This procedure only updates the startup configuration on the controller. It does not create a configuration package in a separate location from the controller.

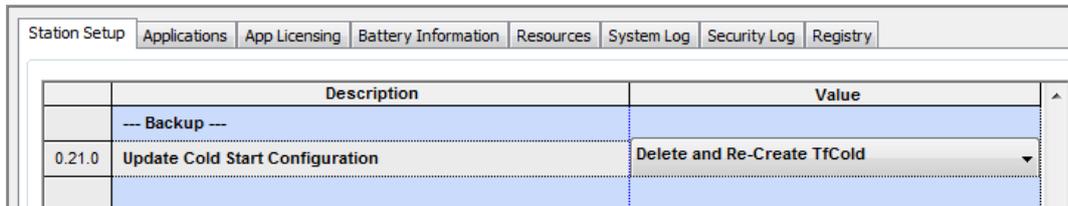
Perform this procedure whenever there are configuration changes so that the startup configuration always contains the most up-to-date configuration.

The running (warm) might contain calibration files. These files also save to the startup configuration during the update. Calibration files link with the device's electronic board serial number and do not apply to any other device.

To update the startup configuration:

1. Launch PCCU32 and click the Entry icon on the toolbar.
2. Click the top item on the navigation tree. The Station Setup tab displays.
3. Scroll down to the Backup section ([Figure 8-5](#)).

Figure 8-5: Update cold start configuration



4. Click the **Update Cold Start Configuration Value** cell and select **Delete and Re-create TfCold** from the drop-down list.
5. Click **Send**.
6. Click **Close** to exit the Station Setup screen and Entry Setup mode.
7. Click **Close** to disconnect PCCU32 from the controller.
8. Proceed to [section 8.1.2.2, Save the startup \(cold\) configuration to the PC or laptop](#).

8.1.2.2 Save the startup (cold) configuration to the PC or laptop

This procedure saves the startup (cold) configuration from the device to a laptop or PC using the 32-Bit Loader. This requires a separate connection established from the loader, not from entry mode.



IMPORTANT NOTE: If calibration files are in the startup configuration, they are automatically in the configuration package.

The saved calibration files link to the device's electronic board serial number and do not apply to any other device.

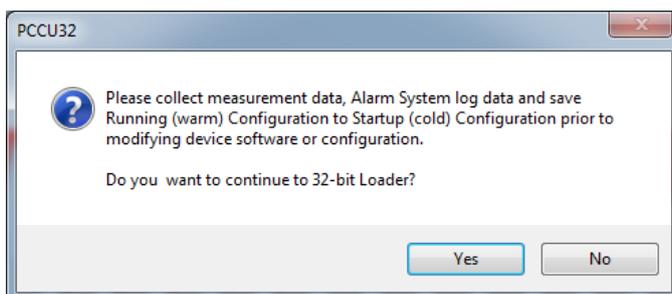
To save the device configuration:

1. Verify that PCCU32 is not connected to the controller. If it is still connected, click the Disconnect icon on the toolbar.
2. Click the **32-Bit Loader** icon in the toolbar ([Figure 8-6](#)). A message box displays ([Figure 8-7](#)).

Figure 8-6: 32 Bit Loader icon

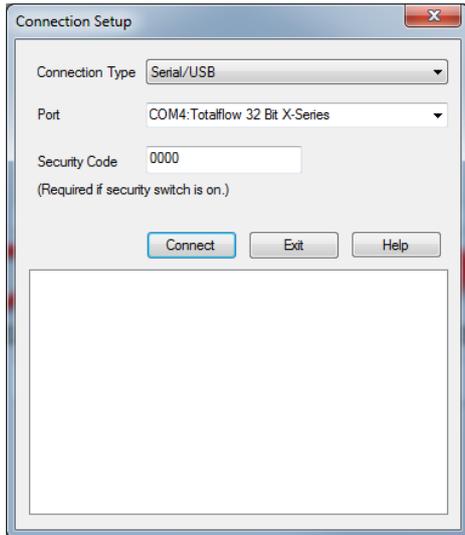


Figure 8-7: Warning to collect data and update configuration



3. Click **Yes**. The Connection Setup dialog displays ([Figure 8-8](#)).

Figure 8-8: Device loader connection setup

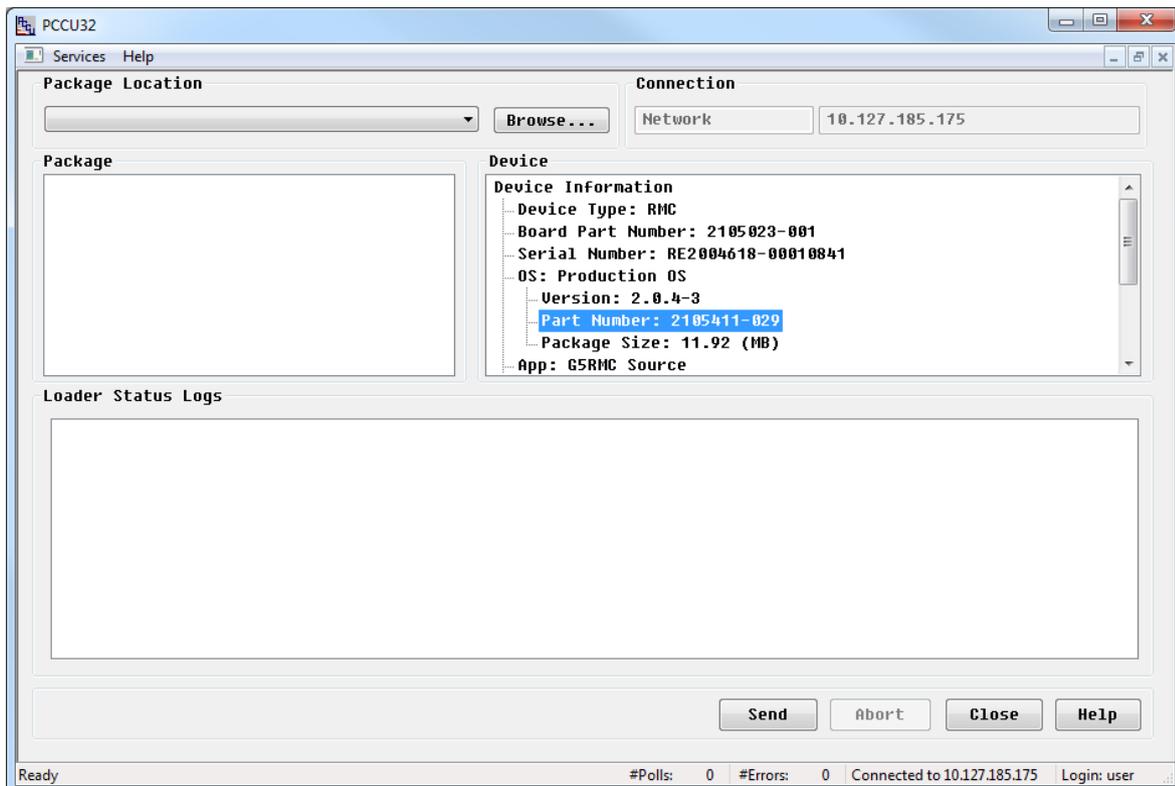


4. Verify or type the connection setup parameters and click Connect. When the controller connects, the main loader screen displays (Figure 8-9).



IMPORTANT NOTE: Click **Help** on the 32-Bit Loader screens for additional details.

Figure 8-9: Device loader



5. On the loader screen, click **Services** on the menu bar. Then click **Save...** (Figure 8-10). The Save Software From Device dialog displays (Figure 8-11).

Figure 8-10: Device loader Save service

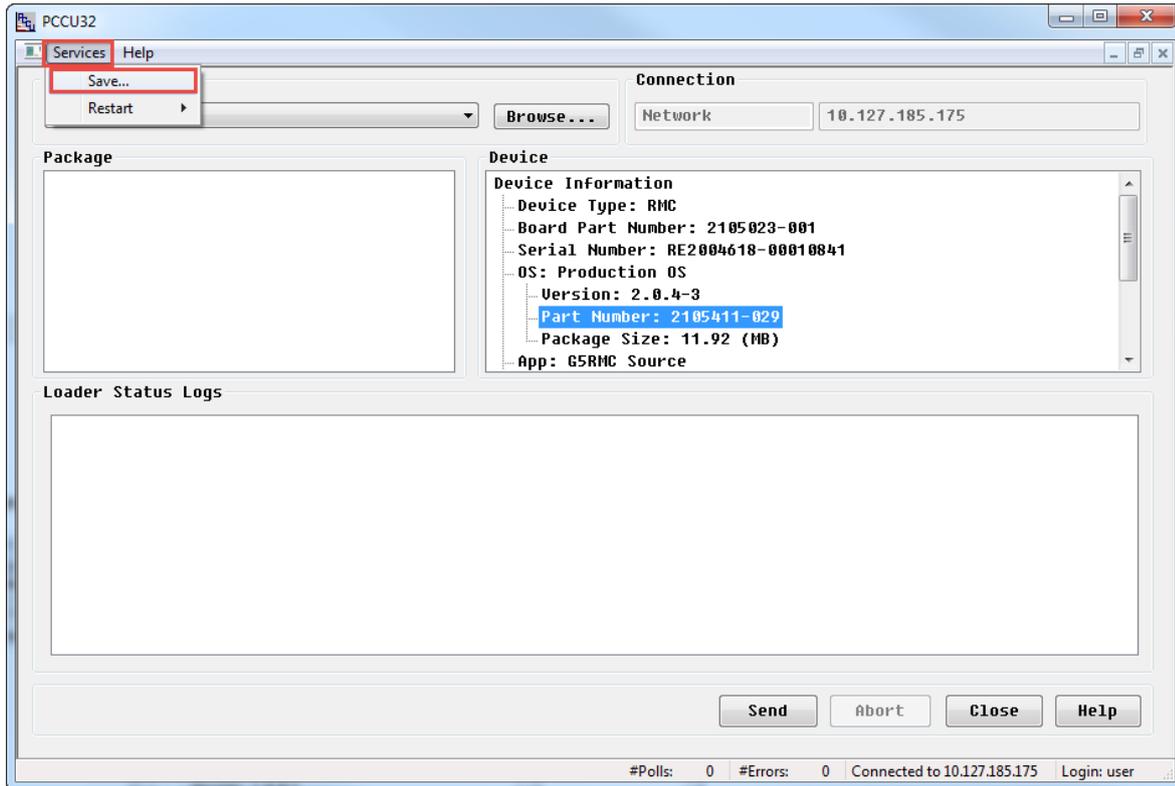
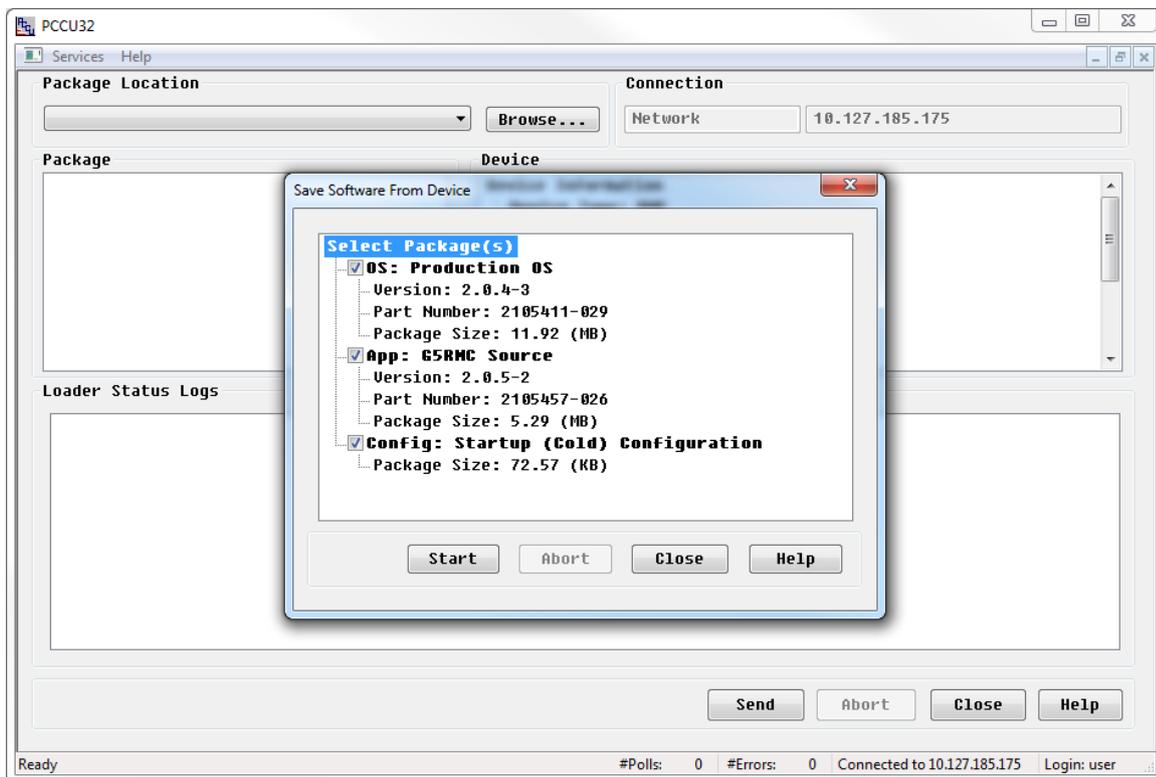
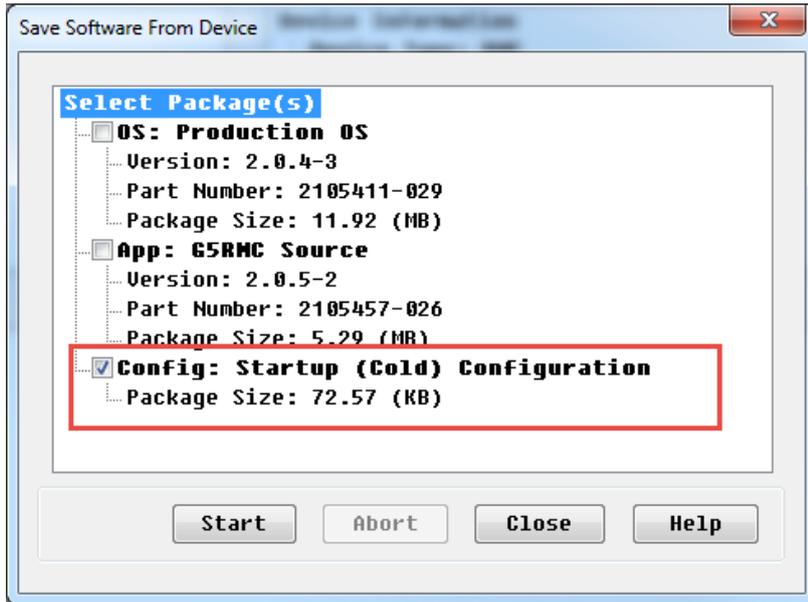


Figure 8-11: Save Software from Device Dialog



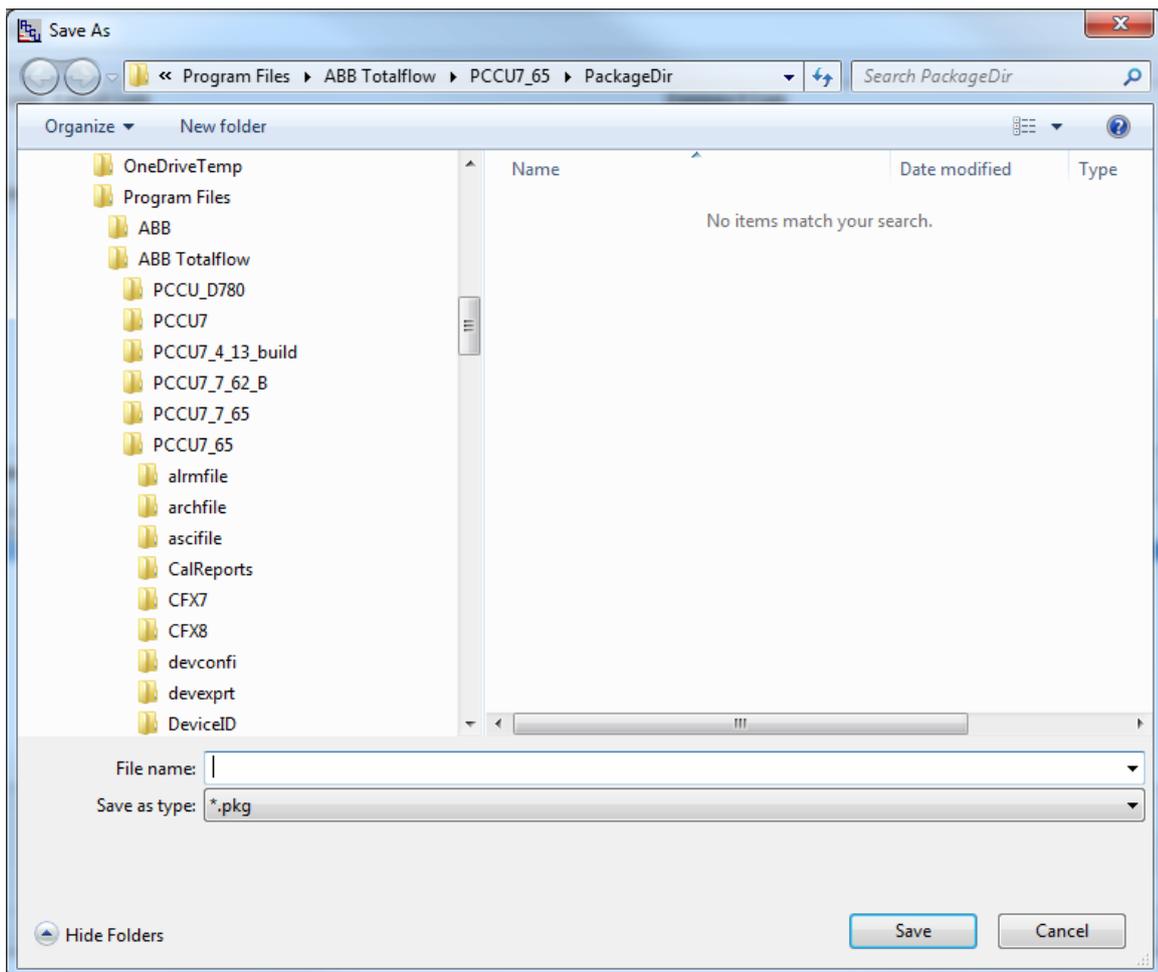
6. Click the **Config** checkbox. Clear the other checkboxes ([Figure 8-12](#)).

Figure 8-12: Save the startup (cold) configuration from the loader



7. Click **Start**. The Save As window displays.

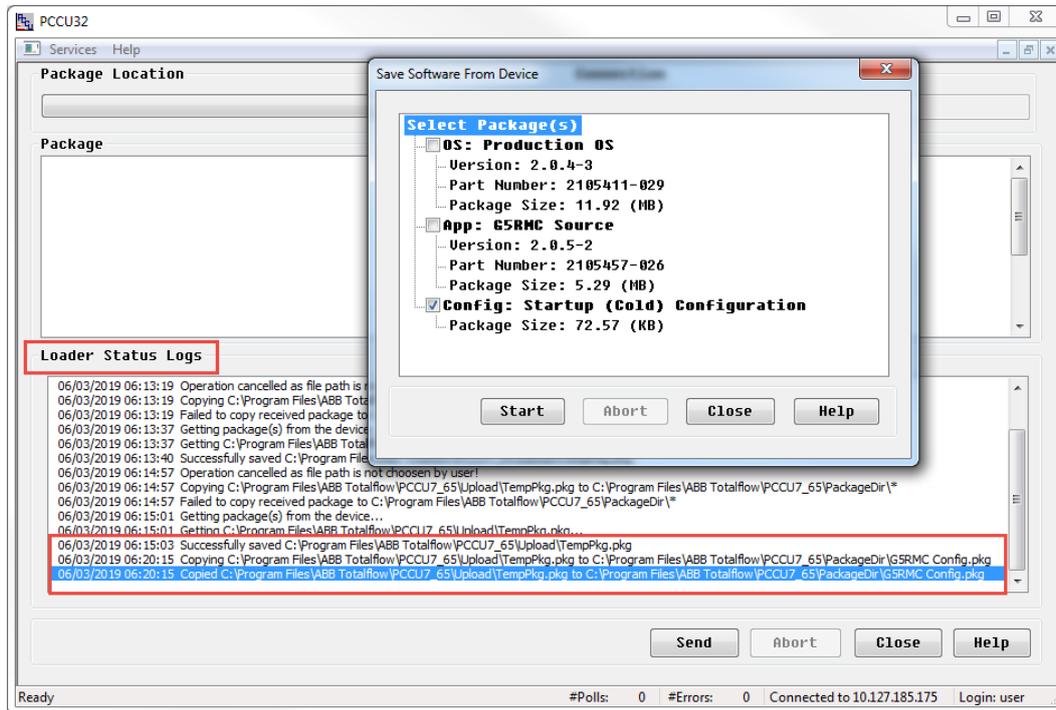
Figure 8-13: Default destination folder to save configuration (PackageDir)



8. Type the file name and click **Save**. The loader assigns the .pkg extension automatically. The default location is the PackageDir folder in the PCCU installation directory.

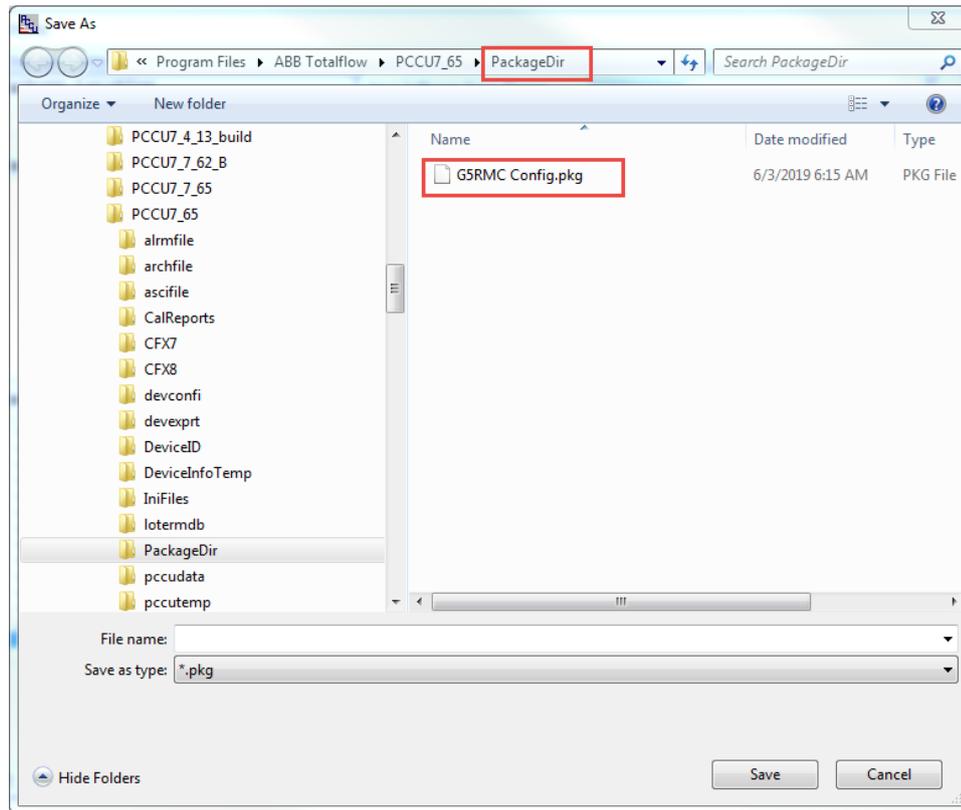
9. View the Loader Status Logs field for status messages. When the configuration is successfully saved several messages display to indicate that the configuration came from the device and that it successfully copied to the correct destination folder.

Figure 8-14: Loader status logs – config file save successful



10. Click **Close** on the Save Software From Device window to return to the loader main screen.
11. Click **Close** to exit the device loader.
12. Locate the saved package in the destination folder. The file name format is <user-defined-name>.pkg (Figure 8-15).

Figure 8-15: Locate the saved configuration (default directory)



8.2 Restore the device configuration

Use the device loader to restore the configuration on the controller with a previously saved configuration package. Verify that the configuration package originated from the same unit. Then restore the device in the event of file corruption or other problems.



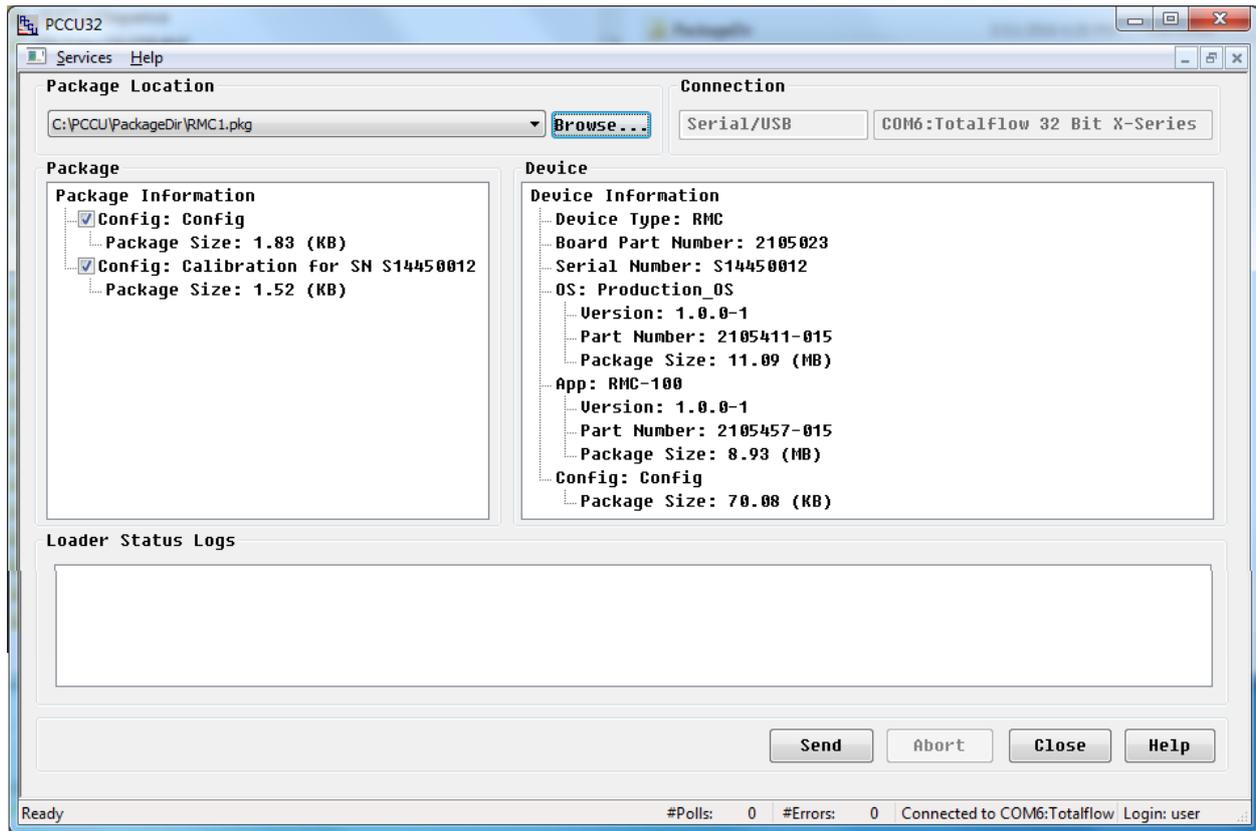
NOTICE –Loss of data. When you restore the configuration, the loader sends the configuration package to replace the controller's existing startup configuration. The controller automatically uses the new startup configuration to restart (cold restart) and removes the previous startup configuration.

Before restoring the configuration on the controller, perform the procedure in section [8.1.1](#) Collect data to collect the measurement data and avoid data loss. It might be necessary to preserve the existing configuration if technical support needs to troubleshoot configuration issues. If necessary, perform the procedures in section [8.1.2.1](#) Update the startup (cold) configuration and section [8.1.2.2](#) Save the startup (cold) configuration to the PC or laptop.

To restore the device configuration file:

1. Verify that PCCU32 is not connected to the controller. If it is still connected, click the Disconnect icon on the toolbar.
2. Click the 32 Bit Loader icon in the toolbar. A warning dialog to collect data displays.
3. Click **Yes**. The Connection Setup dialog displays.
4. Verify, select or type the connection setup parameters into the entry fields and click **Connect**. The main loader screen displays when the controller connects.
5. Click **Browse**.
6. Locate and select the configuration file package, then click **Open**. The package details display in the Package field ([Figure 8-16](#)).

Figure 8-16: Loader screen configuration package to restore



7. Click the **Config package** checkbox if it does not already contain a checkmark.
8. Click **Config: Config** if the configuration file contains calibration files.



NOTICE – Tainted results. Do not select the calibration configuration in the Package field if the configuration package came from another RMC. Calibration files from a different device corrupt the last calibration records and skew the results. Only restore calibration files to the unit that created them.

9. Click **Send**.
10. View the status messages in the Loader Status Logs. When the configuration file upload is successful, messages display to indicate the package was sent, the system restarted, and the new configuration is active. The "Device info updated" message displays when the configuration update successfully completes.
11. Verify that the Device field displays the new configuration package information.

8.3 Use the configuration from another RMC

This procedure uses the device loader to copy a configuration saved from one controller to another unit. Use this procedure when the configuration in several controllers is similar.



IMPORTANT NOTE: Do not use calibration data in a configuration package that was generated from another controller. Calibration data is specific to each device and links to a device's electronic board serial number.

To send the device configuration:

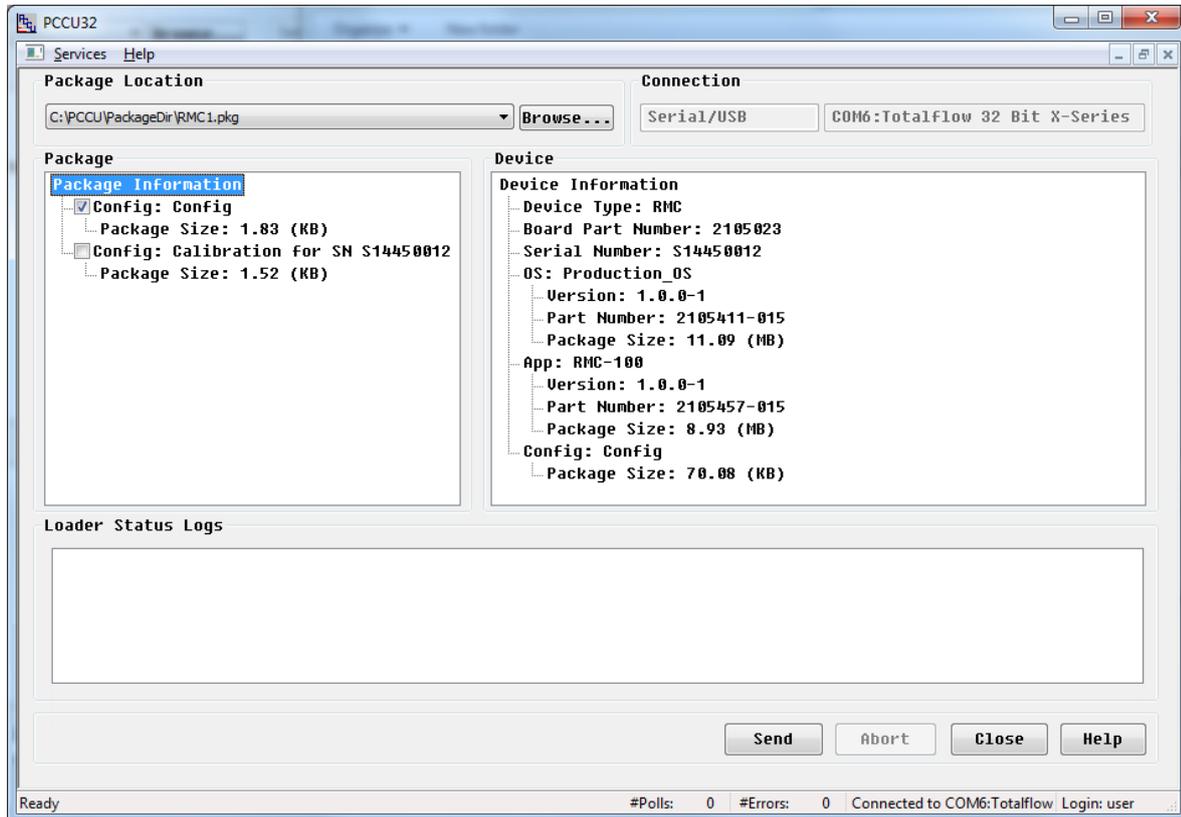


IMPORTANT NOTE: Loss of data. When the loader replaces the controller's existing package with the configuration package from another unit, the controller automatically uses the new startup configuration to restart (cold restart). It removes the previous startup configuration.

Perform the procedures in section [8.1](#), Preserve data and configuration, to collect the measurement data before sending a new configuration to the controller. This avoids loss of the data and the need for a complete system reconfiguration.

1. Verify that PCCU32 is not connected to the controller. If it is still connected, click the Disconnect icon on the toolbar.
2. Click the 32 Bit Loader icon in the toolbar. A warning dialog to collect data displays.
3. Click Yes. The Connection Setup dialog displays.
4. Verify, select, or type the connection setup parameters into the entry fields and click Connect. The main loader screen displays when the controller connects.
5. Click Browse.
6. Locate and select the configuration file package then click **Open**. The package details display in the Package field ([Figure 8-17](#)).

Figure 8-17: Loader screen configuration package from another RMC



7. Verify that the Config: Config checkbox contains a checkmark.
8. Clear the calibration files checkbox so only Config: Config is selected.



NOTICE – Tainted results. Do not select the calibration configuration in the Package field if the configuration package came from another RMC. Calibration files from a different device corrupt the last calibration records and skew the results. Only restore calibration files to the unit that created them.

9. Click **Send**.
10. View the status messages in the Loader Status logs to verify that the package was sent successfully, the system restarted, and the new configuration is active. The "Device info updated" message displays when the configuration update successfully completes.
11. Verify that the Device field displays the new configuration package information.

8.4 Update device software

ABB Totalflow periodically releases software update packages. Use the device loader to update the controller with new software packages when required.

8.4.1 When to upgrade

Software updates occur when:

- New major functionality or applications are added.
- Enhancements to existing application are added.
- Software bugs are fixed.



IMPORTANT NOTE: Devices might not require an update every time a new software package is released. Review the release notes to determine if an update is appropriate for your scenario and application requirements. In the case of critical bug fixes, a technical bulletin might be issued to indicate that an update is required. Technical bulletins identify the product hardware or software versions impacted.

Follow your company policies for the evaluation or testing of software updates before updating devices already in service.

8.4.2 Software update packages for the RMC

Software packages typically contain the main Totalflow application (Totalflow.exe, also referred to as flash in our download sites). If the main application also requires an updated version of the operating system (OS) or boot software, a package also includes the boot and OS software.

Software updates should not affect the configuration of a device. However, always collect data and save the configuration before any updates



IMPORTANT NOTE: If you attempt an application-only (flash) update when an OS/boot update is also required, the loader rejects the update until you use the correct package and select all required items. The loader determines if the flash is compatible with the OS/Boot software currently in the device. See the Loader help topics in PCCU for additional details.

Software packages are available for download at www.abb.com/upstream. Software packages have a base part number followed by 3 digits to indicate the build version of the package. For example, the number of the Standard RMC package containing both OS and Flash is 2105452. A package numbered 2105452-029 reflects (build) version 29 of that package type. Typically, the latest version is the only one available, but if there are additional versions on the site, select the one required after you carefully review the release notes.

Package part numbers are different for the RMC Standard (720 MHz) or LITE (300 MHz) options. The (OS+Flash) package numbers are 2105452 for the standard option and 2106260 for the LITE option. Make sure to download the correct package for your system. [Table 8-1](#) and [Table 8-2](#) show the part numbers included in each package. Note that the Operating System (OS) is the same for both options. These part numbers are also obtained from PCCU when connected to the device.

Table 8-1: Software included in customer package 2105452 (Standard RMC: 720 MHz)

Component	Part number
Operating System (OS)	2106487-xxx
Flash	2105457-xxx

Table 8-2: Software included in customer package 2106260 (RMC-LITE: 300 MHz)

Component	Part number
Operating System (OS)	2106487-xxx
Flash	2106229-xxx



IMPORTANT NOTE: If you have any questions or are unable to locate or download any software update package, call Technical Support. See the last page of this manual for contact information.

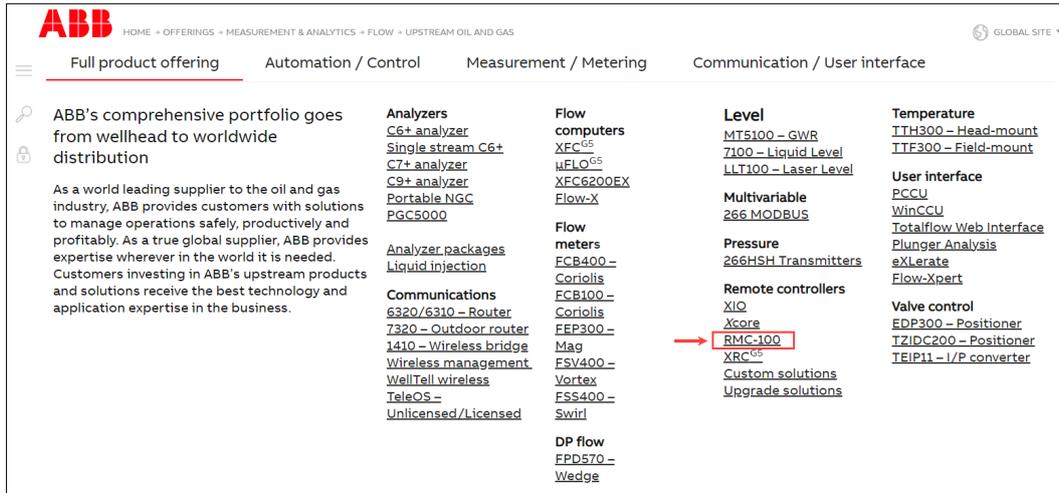
8.4.3 Download software from the ABB website

The latest RMC embedded software is available on the ABB product website.

To download:

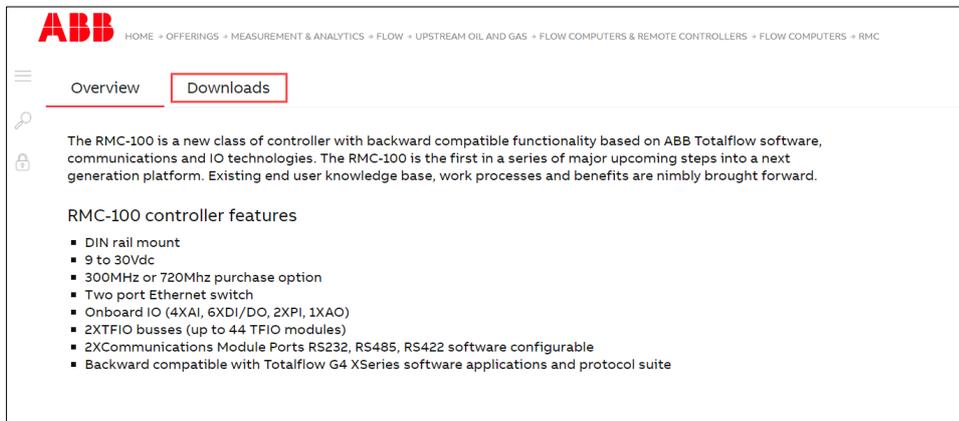
1. Go to www.abb.com/upstream
2. Scroll down the page to locate the product list and select the **RMC-100**.

Figure 8-18: ABB main product page



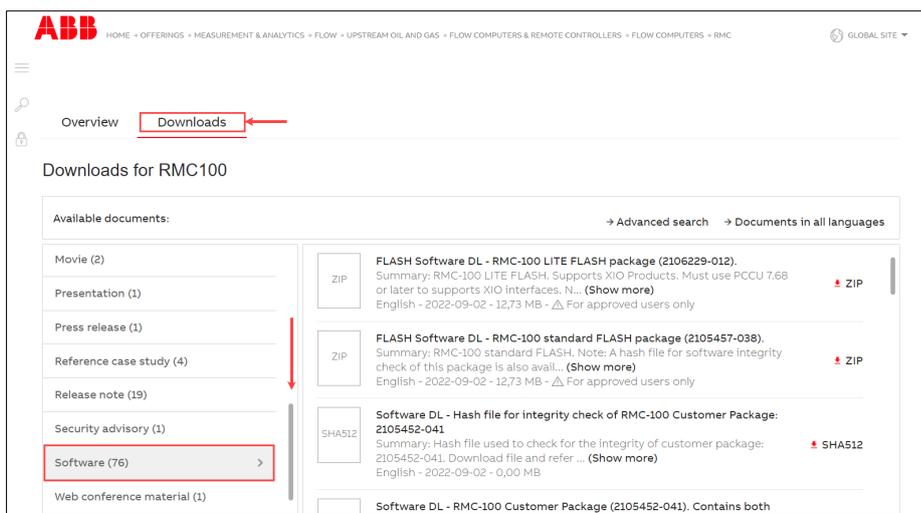
3. Scroll down the RMC page, locate and select the **Downloads** tab.

Figure 8-19: RMC product page - Downloads



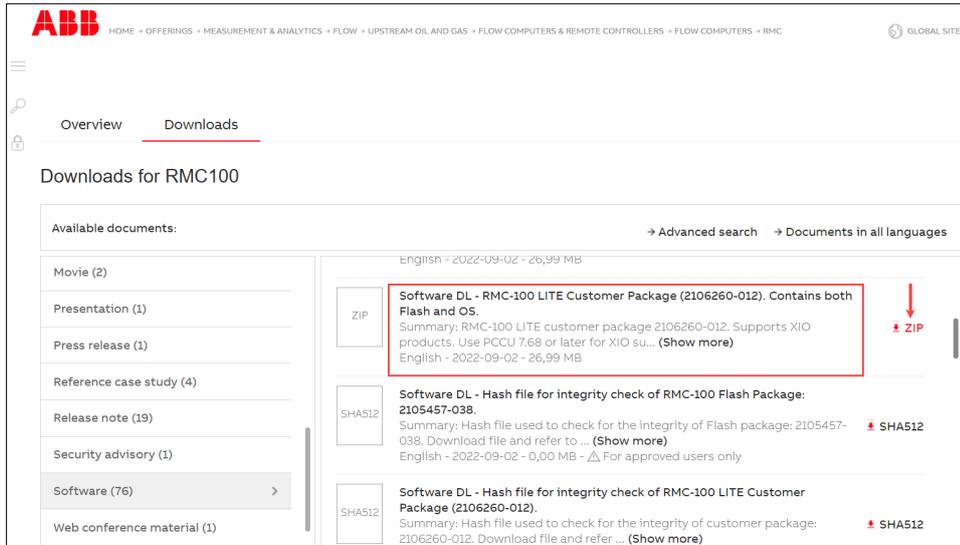
4. Scroll down the **Available Documents** navigation tree (left), locate and select **Software**.

Figure 8-20: Locate available RMC software



5. Locate desired software and select the **ZIP** icon to download on your local PC/laptop.

Figure 8-21: Locate and download RMC software customer package



6. Take note of the location of the downloaded software on your local PC/Laptop.
7. Unzip file when ready to perform system update.



IMPORTANT NOTE: If you have any questions or are unable to locate or download any software update package, call Technical Support. See the last page of this manual for contact information.

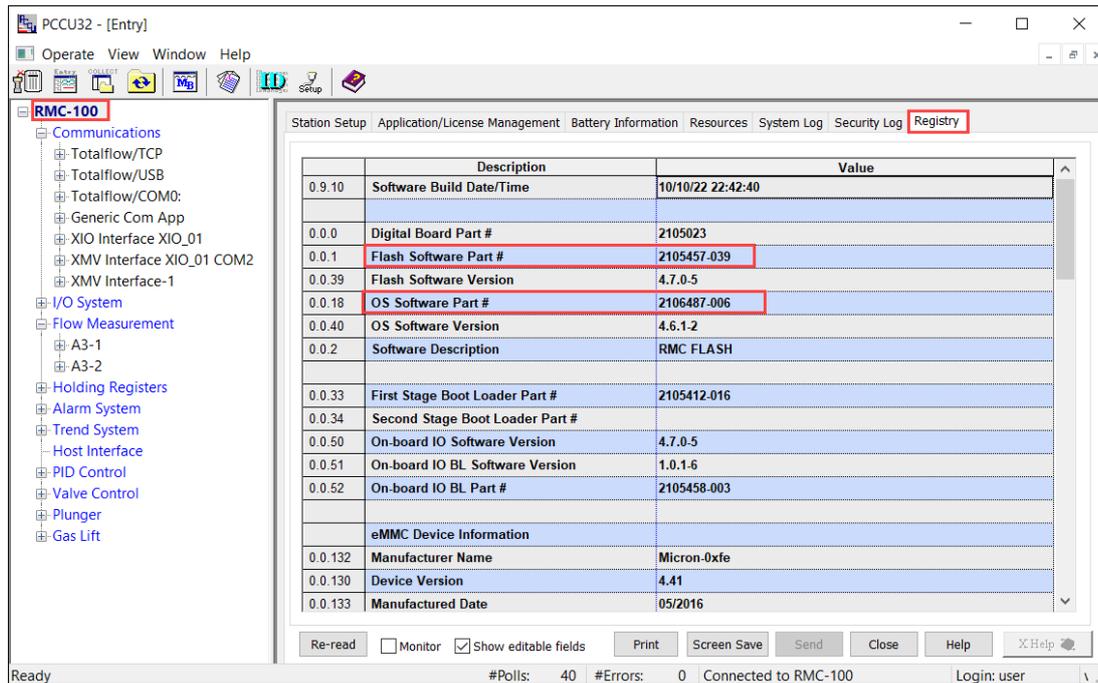
8.4.4 Determine device software part number/version

This procedure describes how to determine the part numbers of the software from PCCU. You might need this information to determine if updates are necessary, or when ABB technical support requests them during troubleshooting.

To determine the current software on the device:

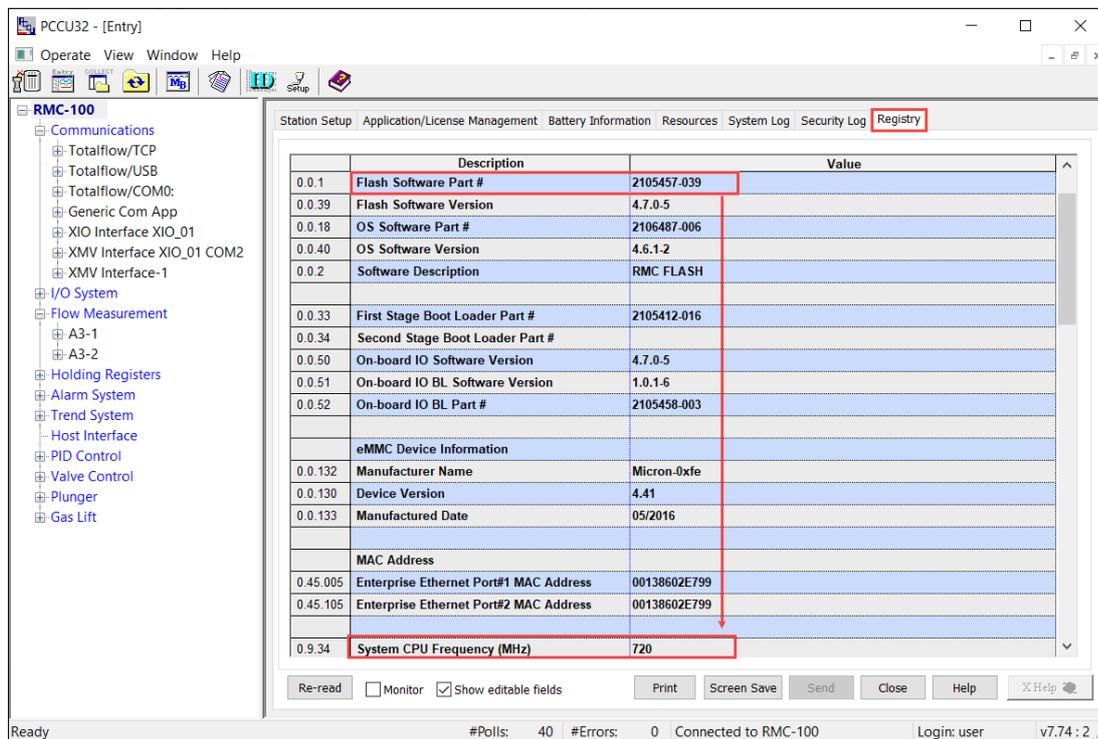
1. Connect to the device in PCCU entry mode.
2. Select the Station ID at the top of the navigation tree. It displays the Station Setup screen.
3. Select the **Registry** tab (Figure 8-22).
4. View and take note of the current part numbers and versions in the Value column. Part numbers in this list match the software packages numbers released by ABB. Different numbers may apply for packages that combine more than one component (OS + Flash). Carefully review software release notes to determine what to download.

Figure 8-22: RMC registry tab (Standard RMC-100 system)



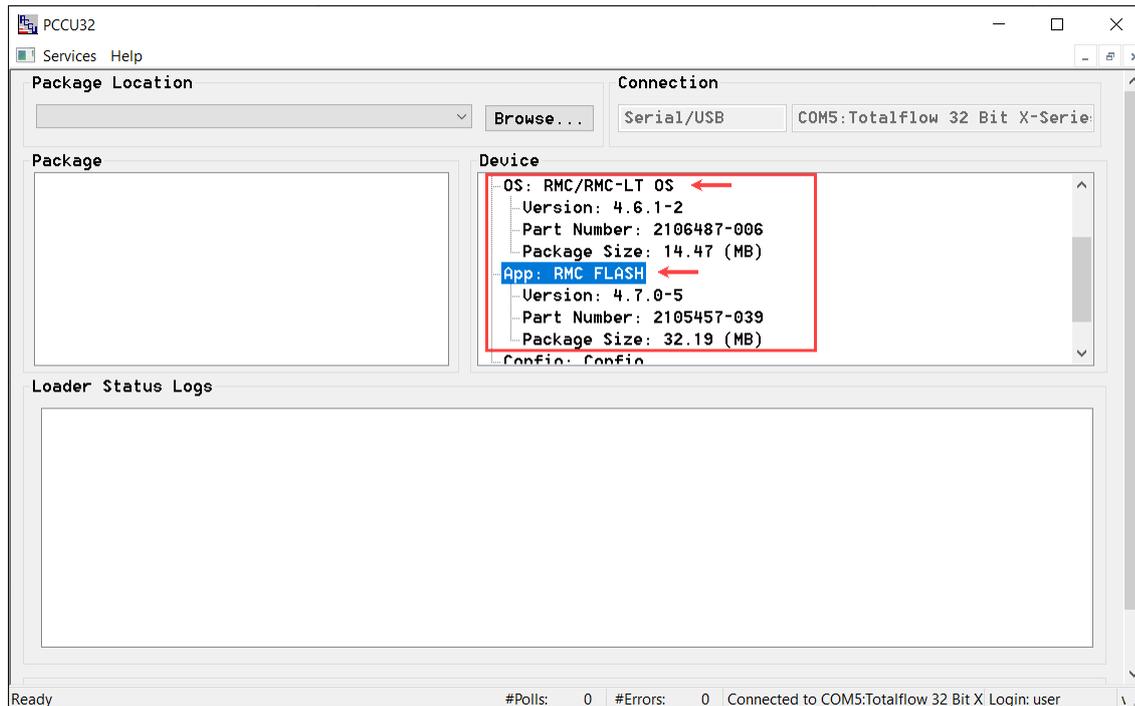
5. Scroll down and locate the **System CPU Frequency (MHZ)** to determine the RMC speed. [Figure 8-23](#) shows the standard RMC speed (720 MHZ) and its associated flash part number.

Figure 8-23: Determine RMC processor speed



IMPORTANT NOTE: Software part number/version information is also available from the loader. The loader screens use “App” to refer to the “flash”. Note that the OS part number is the same for both Standard and LITE options (indicated by **OS: RMC/RMC-LT** onscreen). See [\(Figure 8-24\)](#).

Figure 8-24: RMC software part numbers from the Loader



8.4.5 Load the update software package

The RMC can have a full update (OS and Flash) or a Flash-only update, depending on the changes in a particular software release. Review the software release notes carefully to determine if a full or flash-only update is required. The customer software packages available on the ABB website contain both the OS and Flash, but the loader does offer the option to select only the desired component.

8.4.5.1 Shut down the Totalflow application

System shutdown may be required before loading new software on the RMC. Call technical support if you have questions or need assistance.



NOTICE – Service disruption. The update of the RMC’s embedded software requires the shutdown of the Totalflow application (Flash). This will interrupt device operation. If possible, perform upgrade within an authorized maintenance window. Follow your company guidelines for the appropriate process for system shutdown and upgrade.

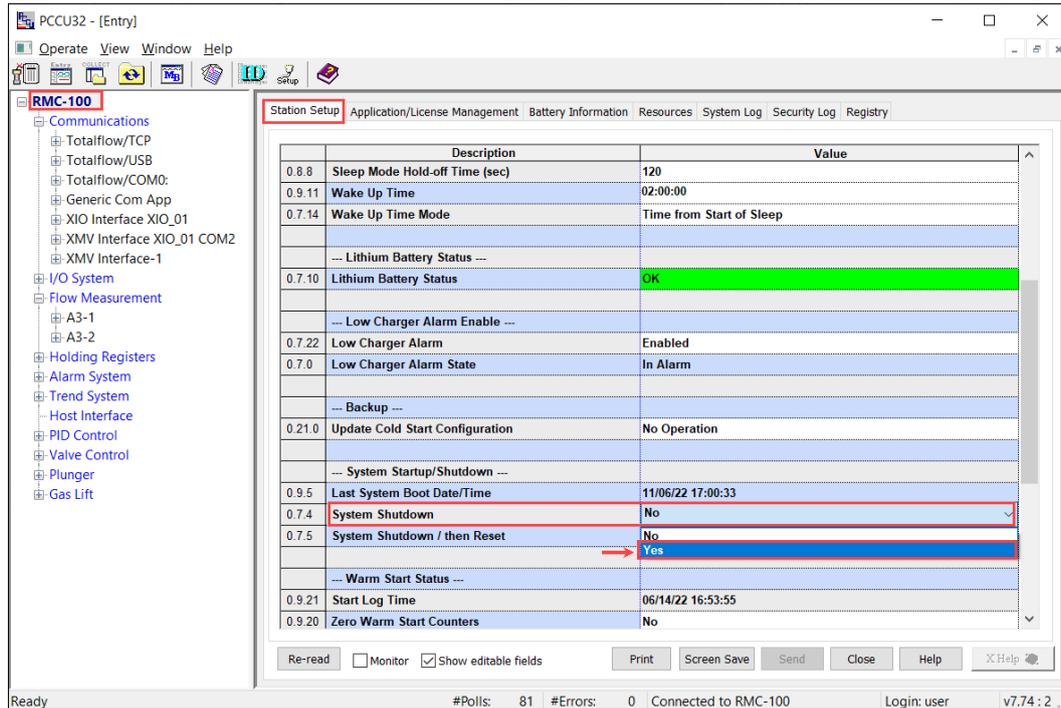


IMPORTANT NOTE: Ensure device and measurement data are saved or backed up before software updates.

To perform the RMC system shutdown:

1. Start PCCU and connect to the device in Entry mode.
2. From the top menu, select **View** and then, select **Expert**.
3. Click **Yes** to confirm view change.
4. On the navigation tree, select the top node or station name.
5. On the **Station Setup** tab, scroll down to the **System Startup/Shutdown** section.
6. Click the value field next to **System Shutdown** and then, select **Yes** ([Figure 8-25](#)).

Figure 8-25: RMC System shutdown to prepare for software upgrade



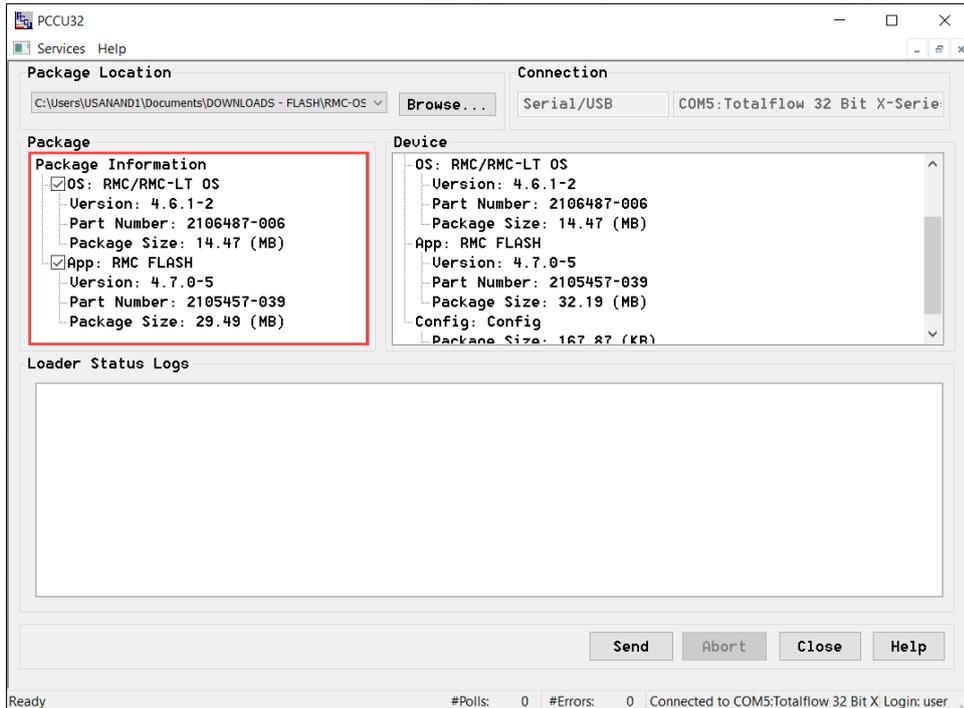
7. Click **Send** to shut down the Totalflow application.
8. Click **Yes** to confirm shutdown.
9. Observe the RMC LCD screen. The screen displays: **ABB Device Loader**. This indicates that the device is ready for the upgrade.
10. Proceed to section [8.4.5.2 Load the update package](#) for the upgrade.

8.4.5.2 Load the update package

This procedure assumes you have downloaded and unzipped the correct software package for your system. Locate the package on the PC/Laptop used to connect to the RMC for the upgrade. To update the RMC software:

1. Launch PCCU32 and click the **32-Bit Loader** icon in the toolbar. A message to remind you to back up the data and configuration displays.
2. Click **Yes**.
3. Verify or type the connection setup parameters into the entry fields and click **Connect**. The Loader screen displays.
4. Click **Browse**. The browser window displays.
5. Locate and select the software package and click **Open**. The package details display in the **Package** field ([Figure 8-26](#)).

Figure 8-26: Update device software with package information



6. View under **Package Information** to verify that the RMC-100 package version is the required version for the update.
7. For full update (OS and Flash):
 - a. Verify that the **OS: RMC/RMC-LT OS** checkbox is selected.
 - b. Verify that the **App: RMC FLASH** checkbox is selected.
8. For Flash-only update:
 - a. Verify that the **App: RMC FLASH** checkbox is selected.
 - b. Clear any other unnecessary items in the package.
9. Click **Send**.
10. View the status messages in the **Loader Status Logs** field. When the update is complete, the "Device info updated" message displays indicating that the software has been sent and activated successfully.



IMPORTANT NOTE: Updates to the main application (App) might require an update to PCCU32. In these cases, download a new version of PCCU32. Review embedded software and PCCU release notes for details. Select PCCU from the main ABB product website ([Figure 8-27](#)) then, locate and download the latest PCCU version ([Figure 8-28](#)).

Figure 8-27: PCCU in the main ABB website - Product Listing

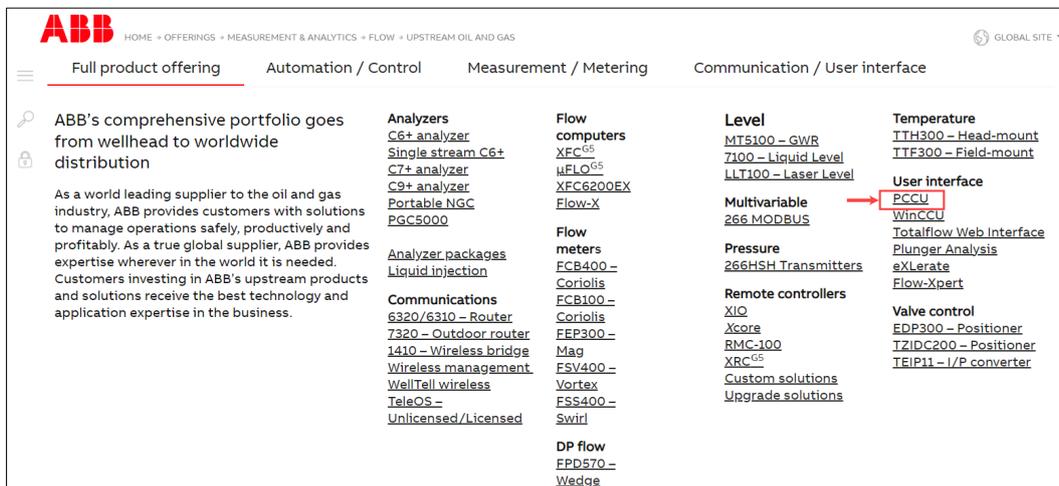
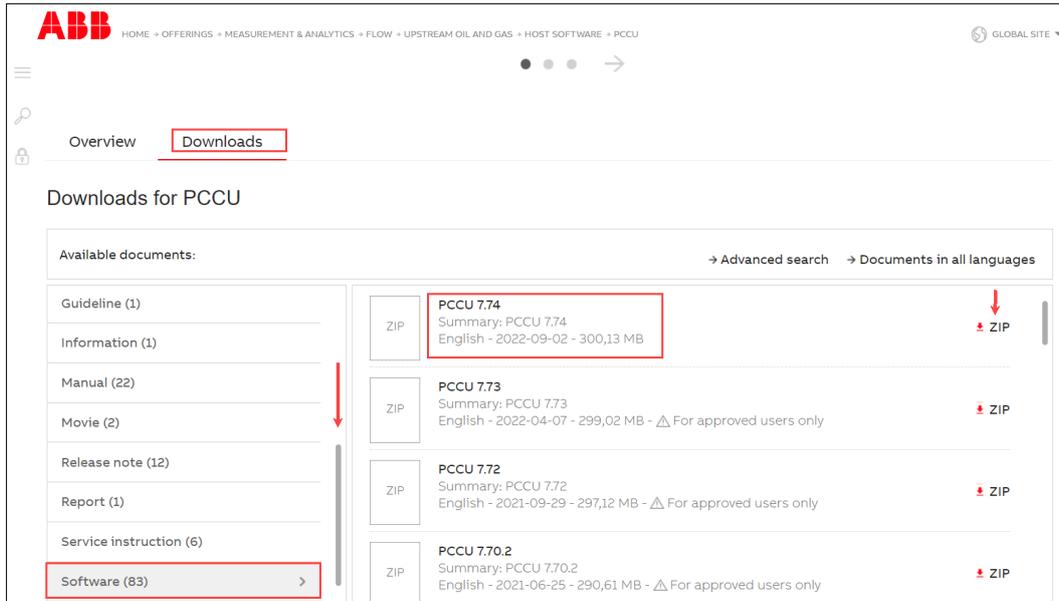


Figure 8-28: Locate and download latest PCCU version from the PCCU product page



8.5 System restart

The RMC has several options for restart. This section provides an overview of those options and the corresponding procedures for manually triggered restarts.



NOTICE – Loss of data. Some of the restart procedures in this section cause customer data, device configuration or calibration data loss. Backup data and configuration is in section [8.1](#) Preserve data and configuration.

8.5.1 Restart type overview

There are several ways to restart an RMC. Restarts can be manually triggered, or performed automatically after software updates, power removal, or other system events. Perform manually triggered restarts onboard or from the user interface (PCCU).

[Table 8-3](#) describes device restarts. Review the implications of each restart type carefully to select the appropriate method. There might be several methods for the same type of restart.



IMPORTANT NOTE: While there are several methods for the warm and cold restarts, ABB recommends restarts from PCCU32 (Entry mode or device loader).

Table 8-3: Restart types

Restart type	Description	Use	User-triggered restart Procedure
Warm restart	<p>The device:</p> <ul style="list-style-type: none"> – Shuts down all applications. – Backs up the running data, configuration, and logs to persistent memory. – Restarts with running (warm) configuration. 	<p>Automatic trigger:</p> <ul style="list-style-type: none"> – After software update <p>Manual trigger:</p> <ul style="list-style-type: none"> – A warm restart might be required as part of general installation, maintenance or troubleshooting procedures. For example, a warm restart restores operation if the device locks up due to power or communication interruption. 	<p>8.5.2 Warm restart with the RESET button</p> <p>8.5.3 Warm restart from the device loader</p> <p>8.5.4 Warm restart from PCCU Entry mode</p> <p>8.5.5 Warm restart from terminal mode</p>
Cold restart	<p>The device:</p> <ul style="list-style-type: none"> – Shuts down all applications. – Deletes the running configuration and repopulates it using the startup (cold) configuration. – Restarts with startup (cold) configuration. 	<p>Automatic trigger:</p> <ul style="list-style-type: none"> – Following a startup configuration update <p>Manual trigger:</p> <ul style="list-style-type: none"> – Only as part of a service or maintenance procedure or when ABB technical support specifically directs it. <p>A cold restart causes running configuration loss (this might also include calibration files). To back up before restart, follow procedures in section 8.4.5 Load the update software package.</p>	<p>8.5.6 Cold restart from the device loader</p> <p>8.5.7 Cold restart from terminal mode</p>
Factory restart	<p>The device:</p> <ul style="list-style-type: none"> – Shuts down all applications. – Deletes the running configuration and repopulates it using the factory configuration. – Restarts with factory defaults 	<p>Manual trigger:</p> <ul style="list-style-type: none"> – Use Factory Restart when it is necessary or desirable to return the flow computer to the original configuration as shipped from the factory. For example, do this when the device is relocated, or to start a configuration from scratch after file corruption or failed update. <p>A reset to factory defaults causes data, running, and startup configuration loss (this might also include calibration files). To back up before going back to factory defaults, follow procedures in section 8.4.5 Load the update software.</p>	<p>8.5.8 Restart using factory configuration</p>
Restart due to Power loss	<p>All data logs and configurations within the current minute are lost.</p>	<p>Ensure the Lithium battery is enabled</p>	<p>Power removal is not a recommended method for restart.</p>

8.5.2 Warm restart with the RESET button

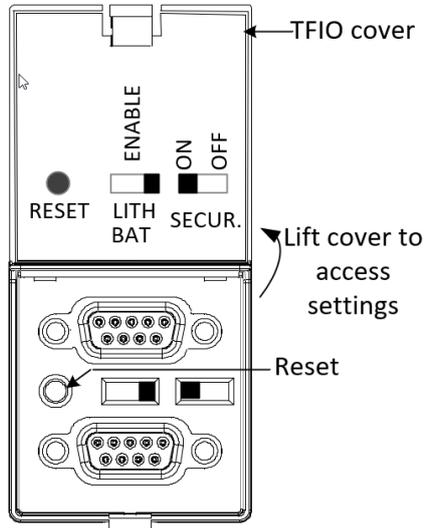
The warm restart resets the RMC microprocessor. Use a warm restart to take the RMC out of service for maintenance or troubleshooting. Only use a warm restart when a power or communication interruption causes the microprocessor to lock up.

This procedure uses the RESET button on the RMC to restart the device. It causes the device to restart with the running (warm) configuration. If the RMC is installed inside an enclosure, you must have access to the interior of the enclosure to access the RMC switch.

To complete a warm restart using the reset button:

1. Lift the cover over the TFIO ports.
2. Press and release the Reset button ([Figure 8-29](#)).

Figure 8-29: Reset button



Observe the display. The LCD shows that the unit is shutting down and restarting.



IMPORTANT NOTE: If the RMC seems does not restart, press and hold the **Reset** button for eight seconds.

8.5.3 Warm restart from the device loader

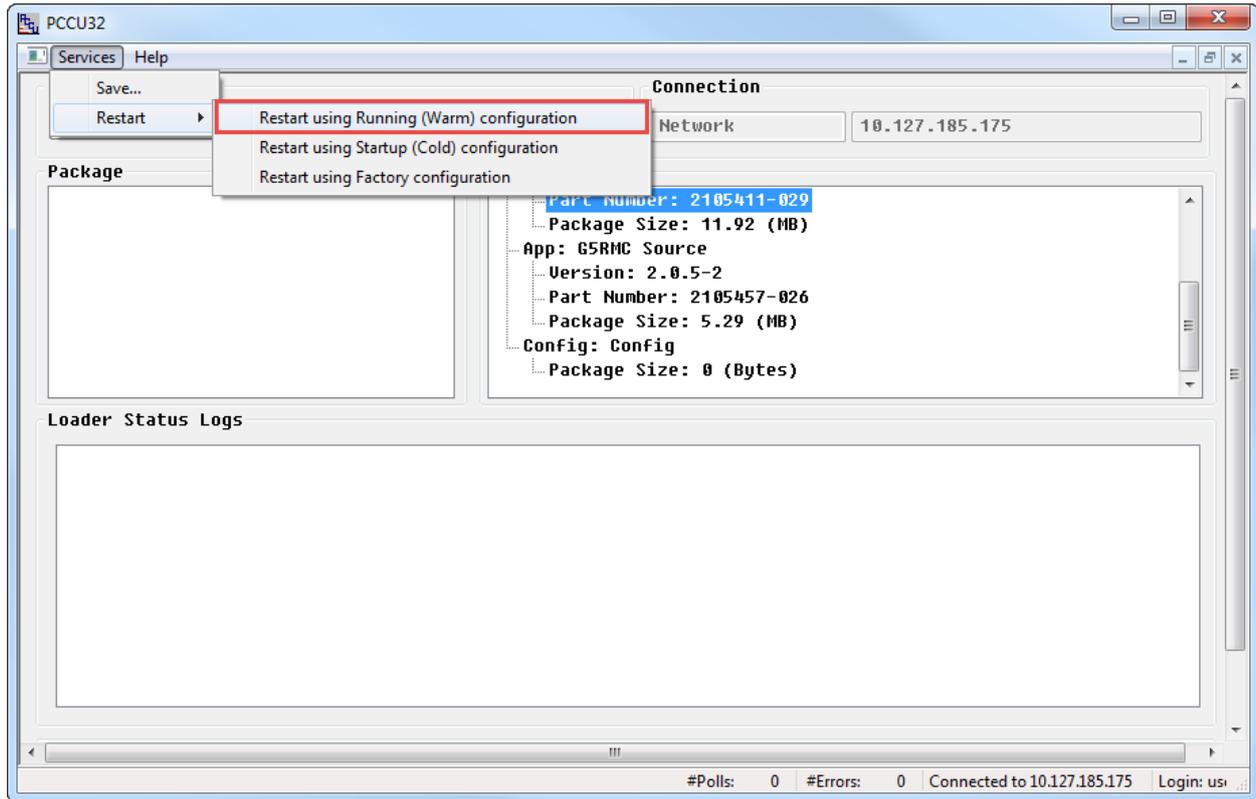
This procedure performs the warm restart from the 32-bit loader. The procedure can be performed while on a local or remote Loader connection.

The procedure causes the device to restart with the running (warm) configuration.

To complete a warm restart from the device loader:

1. Launch PCCU.
2. Click the **32 Bit Loader** icon in the toolbar. A message box displays.
3. Click **Yes**.
4. Verify or type the connection setup parameters and click **Connect**. The Loader screen displays.
5. Click **Services>Restart**. Select **Restart using Running (Warm) configuration** from the drop-down list ([Figure 8-30](#)).

Figure 8-30: Warm restart with device loader



6. Click **Help** for more information.

8.5.4 Warm restart from PCCU Entry mode

To restart the controller from PCCU Entry mode:

1. Launch PCCU32 and click **Entry**.
2. Click **View** on the PCCU32 menu and select **Expert** from the drop-down list.
3. Click the Station ID at the top of the navigation tree. The Station Setup tab displays.
4. Scroll down to System Startup/Shutdown ([Figure 8-31](#)).
5. Select **Yes** from the System Shutdown / then Reset drop-down list.
6. Click **Send**.
7. Click **OK** to confirm.

Figure 8-31: Warm restart on the Station Setup tab (Expert view)

Station Setup		Applications	App Licensing	Selectable Units Setup	Battery Information	Resources	System Log	Security Log	Registry
	Description	Value							
	--- System Startup/Shutdown ---								
0.9.5	Last System Boot Date/Time	02/26/16 09:05:23							
0.7.4	System Shutdown	No							
0.7.5	System Shutdown / then Reset	Yes							

8.5.5 Warm restart from terminal mode

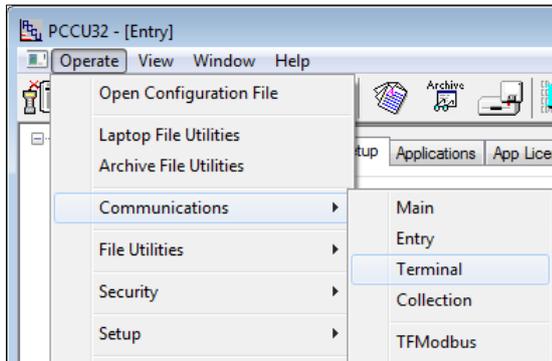
This procedure performs the warm restart from the terminal mode. It causes the device to restart with the running (warm) configuration.

Follow this procedure remotely, or while physically connected to the device. Invoke Terminal mode from entry mode or from the PCCU splash (main) screen. This method of warm restart requires you to type a command.

To restart the controller using terminal mode:

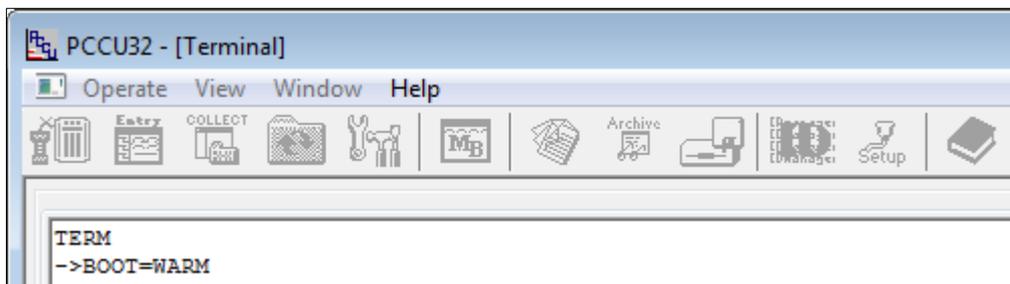
1. Launch PCCU32.
2. Click the **Entry** icon.
3. Click **Operate>Communications** and select **Terminal** from the drop-down list ([Figure 8-32](#)). The Terminal screen displays.

Figure 8-32: Terminal menu option



4. Type the **BOOT=WARM** command at the terminal prompt (->) ([Figure 8-33](#)).

Figure 8-33: Terminal mode warm restart



5. Press **Enter**.

8.5.6 Cold restart from the device loader

This procedure performs the cold start from the 32-bit loader. Follow this procedure on a local or remote Loader connection. However, ABB highly recommends performing the cold restart locally. The cold restart causes the device to restart using the startup (cold) configuration.

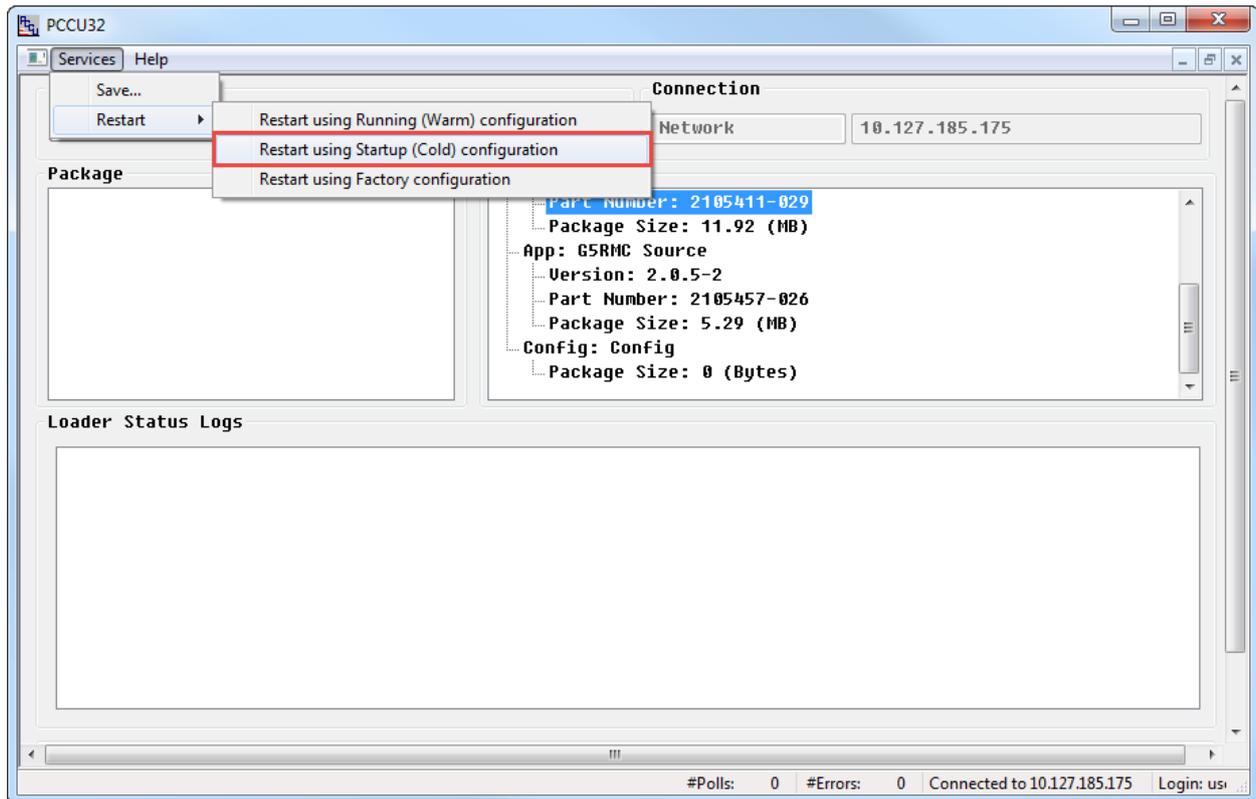


NOTICE –Loss of data. Perform the procedures in section [8.1](#) Preserve data and configuration before a cold start. This avoids loss of the data and the need for a complete system reconfiguration. If the startup (cold) configuration does not have the latest network connection configuration, the restart causes loss of network connectivity. Updating the startup configuration (tfCold) avoids loss of network connection and reconfiguration.

To complete a cold restart using the startup (cold) configuration:

1. Launch PCCU.
2. Click the **32 Bit Loader** icon in the toolbar. A message box displays.
3. Click **Yes**.
4. Verify or type the connection setup parameters and click Connect. The Loader screen displays.
5. Click **Services>Restart** in the menu bar, and select **Restart using Startup (Cold) configuration** from the drop-down list ([Figure 8-34](#)).

Figure 8-34: Cold restart using the device loader



6. Click **Help** for more information.

8.5.7 Cold restart from terminal mode

This procedure performs the cold start from the terminal mode. It causes the device to restart using the startup (cold) configuration.

Perform the procedure on either a local or remote connection. However, ABB highly recommends local cold restarts with this method. Invoke Terminal mode from entry mode or from the PCCU splash (main) screen. This method of cold restart requires you to type a command.

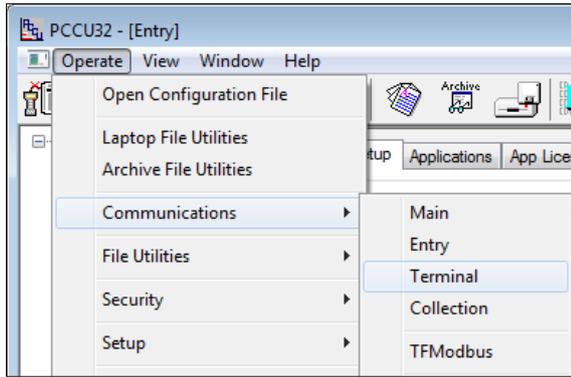


NOTICE – Loss of data. Perform the procedures in section [8.1](#) Preserve data and configuration before a cold start. This avoids loss of the data and the need for a complete system reconfiguration. If the startup (cold) configuration does not have the latest network connection configuration, the restart causes loss of network connectivity. Updating the startup configuration (tfCold) avoids loss of network connection and reconfiguration.

To restart from terminal mode:

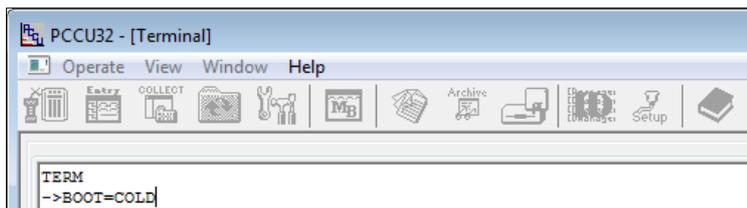
1. Launch PCCU.
2. Click the **Entry** icon in the toolbar. The Entry screen displays.
3. Click **Operate** in the menu bar and select **Communications>Terminal** from the drop-down list ([Figure 8-35](#)). The Terminal screen displays.

Figure 8-35: Terminal menu option



4. Type the command **BOOT=COLD** at the terminal prompt (->) ([Figure 8-36](#)).

Figure 8-36: Terminal screen – cold boot



5. Press **Enter**.

8.5.8 Restart using factory configuration

This procedure uses the 32-bit loader to restore the device's startup configuration to its factory defaults. Factory defaults can include a generic base configuration or a custom configuration. Customers can request custom configurations to address specific requirements in addition to the basic configuration.

Restoring to factory configuration on a device already in service causes service disruption and loss of network connectivity.

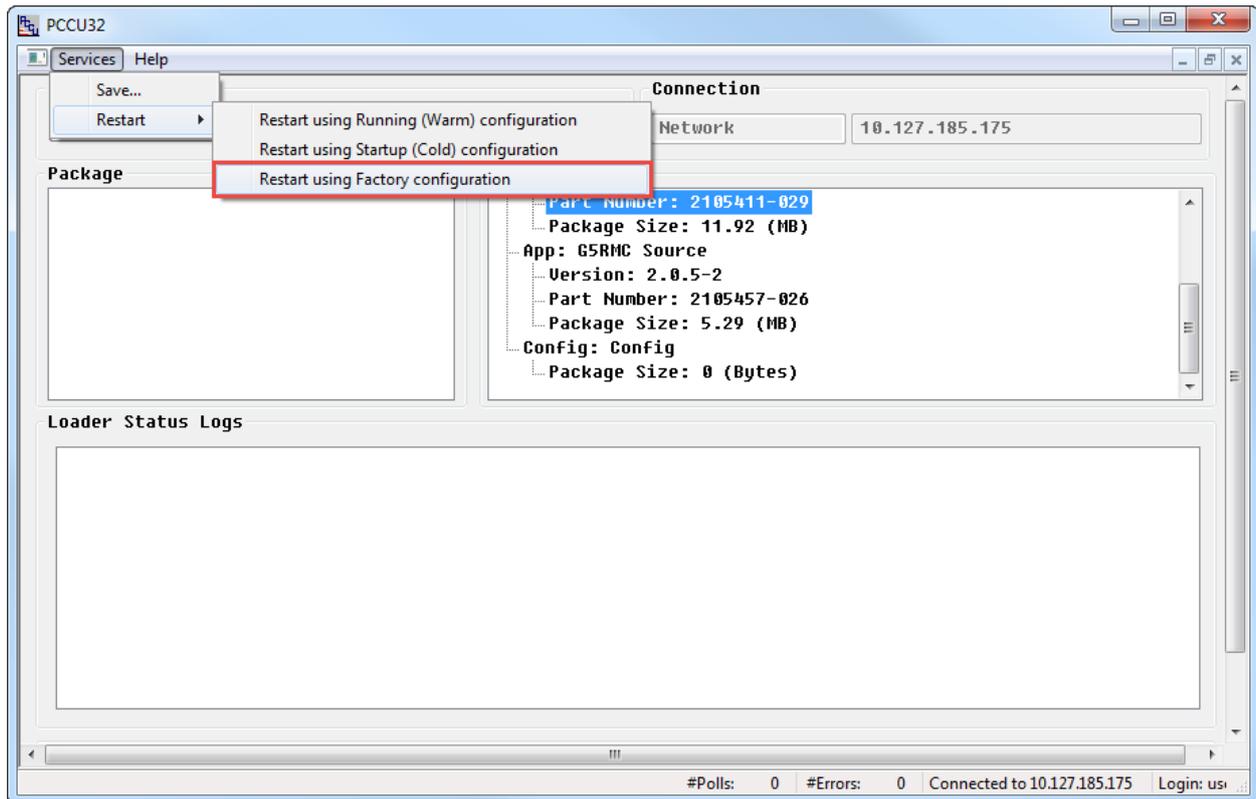


NOTICE – Loss of data. A restart with factory defaults deletes all data and previous configurations. Current startup and running configurations are lost. Network communication parameters are overwritten with factory defaults as well. Perform the procedures in section [8.1](#) Preserve data and configuration before restoring factory defaults. We do not recommend triggering the restart remotely on a network connection because the device might lose connectivity. You must have physical access to the device to reconfigure.

To restore factory configuration:

1. Launch PCCU.
2. Click the **32-Bit Loader** icon in the toolbar. A message box displays.
3. Click **Yes**.
4. Verify the connection setup information and click **Connect**. The Loader screen displays.
5. Click **Services>Restart** in the menu bar and select **Restart using Factory configuration** from the drop-down list ([Figure 8-37](#)).

Figure 8-37: Restart using factory configuration



8.6 Change the clock

When applications are instantiated on the RMC, a change to the clock for daylight savings time, or time drift of the instantiated applications, can affect the time on log period entries. A clock change must preserve the integrity of accounting audit trails. Follow the guidelines for clock changes according to [Table 8-4](#).

Table 8-4: Types of clock changes

Type of clock change	Description
Clock change not crossing an hour boundary	The clock does not change for the next log period entry. Example: If present time is 4:15 p.m. and the clock changes to 4:05 p.m. of the same day, the entry reflects accumulated averages over a 70-minute time-period (15 minutes plus 55 minutes).
Forward clock change crossing an hour boundary	This forces a log period entry for the portion of the hour that accumulated since last hourly entry. The RMC then advances to the newly-defined data flow record boundary and maintains the day's data in the newly defined boundary. Example: If present time is 4:55 p.m. and clock changes to 5:05 p.m. of the same day, the entry reflects only a 55-minute average accumulation. Then a new flow record is written based on a 55-minute accumulation.
Backward clock change crossing an hour boundary	The hourly entry includes the part of the hour that accumulated since the last hourly entry. This is the same as it would be for a forward clock change that crosses an hourly boundary. The RMC advances to a new day's data flow record and maintains the balance of the day's data in the new record. Example: If present time is 5:05 p.m. and clock is changed to 4:55 p.m. of the same day, the log period record entry reflects only a 5-minute average accumulation. Then a new flow record has a 60-minute accumulation.

Make time changes in the Date/Time field on the PCCU Station Setup tab.



IMPORTANT NOTE: A backward clock change uses two records to maintain data integrity to ensure that it does not overwrite previously recorded data. If it is necessary to make small backward time changes of less than one hour, wait until the current hour has progressed far enough to make a change that does not cross an hour boundary.

8.7 Remove and restore power

Remove and restore power in the order that applies to the power mode.



NOTICE – Equipment damage. Remove the external power/charger and battery connections before removing all other cables, boards, and field connections. Connection or disconnection of cables and wires on the electronic board while power is connected can damage the electronic components.

8.7.1 Remove power from the controller

It might be necessary to remove power from a controller for maintenance. This procedure describes the removal of the power port terminal connectors from the RMC. You do not need to remove individual wires.



IMPORTANT NOTE: Do not remove power if the controller does not have the lithium battery enabled or in place. If the lithium battery is not enabled, has failed, or was removed, the clock resets to factory defaults. This requires a change according to section [8.6](#), Change the clock. See section [8.8.5](#), Replace the lithium battery.

Follow the steps based on the type of power mode:



IMPORTANT NOTE: Pry terminal connectors off the electronic board with a slotted screwdriver.

1. For battery mode:
 - a. Remove the CHARGER/EXT PWR terminal connector.
 - b. Remove the BAT port terminal connector (green connector).
2. For external power mode, remove the CHARGER/EXT PWR terminal connector

8.7.2 Reconnect power to the controller

Follow this procedure to reconnect the power port terminal connectors or the power cables back into the RMC. You do not need to rewire if the connectors are not removed from the cables. This procedure assumes wiring was left intact before terminal connector removal.



NOTICE – Equipment damage. Do not reconnect the external power/charger and battery until all service procedures are complete. This includes reconnecting all wires, plugs, terminations, and peripheral equipment. Otherwise, property damage can result. Do not perform this procedure until instructed to do so.

Follow the instructions based on the type of power mode.



WARNING – Bodily injury. Always connect the battery before connecting the charger.

1. For battery mode:
 - a. Reconnect the BAT terminal connector (green connector) on the battery cable into the board.
 - b. Reconnect the CHARGER/ EXT PWR terminal connector on the charger cable into the board.
2. For external power mode, reconnect the CHARGER/ EXT PWR terminal connector on the external power source cable into the board.
3. Observe the power-on sequence information on the LCD to confirm that the controller is receiving power (see details in section [3.7.1](#) Power-on sequence). When DATE/TIME displays, the sequence is complete.

8.8 Part replacement

Follow this procedure to remove and replace parts on the controller. Part replacement might require removal of power and other connections from the unit, so plan any part replacement carefully. Removal of controllers installed in enclosures might require removal of connections to outside ports. Schedule maintenance windows that are appropriate for the procedure.



DANGER – Serious damage to health / risk to life. Do not allow RMC components to have contact with a non-insulated tool or be without a proper grounding device. This could create a static electric discharge resulting in bodily injury and damage to the electronic components. Use properly insulated tools and wear a grounding strap to eliminate static electricity when connecting or disconnecting wires.

WARNING – Bodily injury. Do not separate any energized connectors. This applies to all connectors and connections.



Verify that no hazardous atmosphere is present when performing maintenance on the unit, and that fumes are fully vented.

Determine if field wiring cables and wires are energized from optional power sources other than the RMC. Disconnection of energized cabling or wiring causes a spark that can ignite a hazardous atmosphere, if present.



IMPORTANT NOTE: Pry terminal connectors off the electronic board with a slotted screwdriver for procedures that require removal of terminal connectors from the RMC.

8.8.1 Replacement and spare parts list

[Table 8-5](#) provides the part numbers for spare parts used with the RMC.

Table 8-5: RMC replacement and spare parts

Part Name	Part Number
RMC housing base	2105347-XXX
RMC housing cover	2105349-XXX
RMC electronic board	2105023-XXX
Display assembly	2105041-XXX
Lithium battery	1487010-XXX
Communication module	2105236-XXX

8.8.2 Return parts for repair

Securely wrap the Totalflow component in protective anti-static packaging before returning it for repair. Call the ABB main office number on the last page of this manual, and ask for a Return Authorization number (RA). Affix the number to the outside of the return package. The customer prepays for shipment.

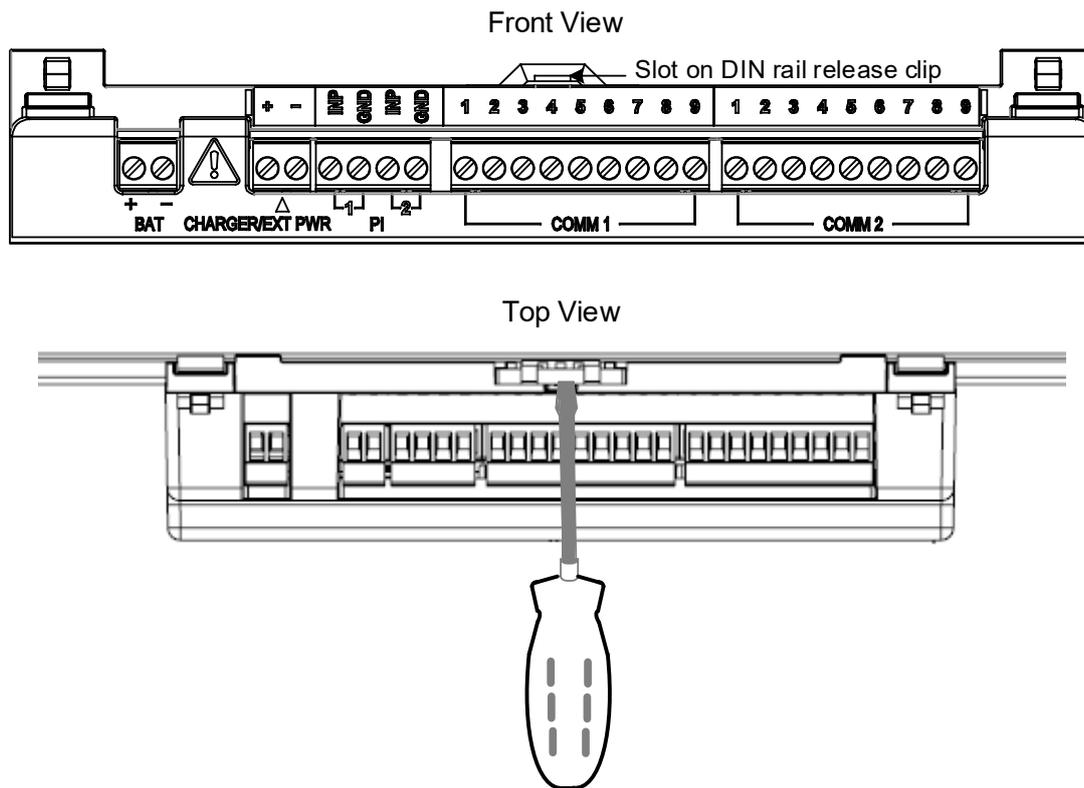
ABB ships any part not covered by the original system warranty to the customer FOB.

8.8.3 Remove the RMC from the DIN rail

To remove the RMC from the DIN rail:

1. Remove terminal connectors from power ports according to section [8.7.1](#), Remove power from the controller.
2. Remove terminal connectors from I/O and COMM ports.
3. Remove cables from communication ports (USB, Ethernet, or MMI).
4. Remove TFIO modules from the TFIO A and B interfaces (if used).
5. Insert a slotted screwdriver into the top slot ([Figure 8-38](#)) of the DIN rail release clip.
6. Push the screwdriver handle down gently to release the clip.
7. Detach the top of the RMC gently and hold it to prevent it from snapping back onto the DIN rail.
8. Insert the slotted screwdriver into the bottom slot of the DIN rail release clip, if necessary.
9. Gently detach the RMC from the DIN rail.

Figure 8-38: DIN rail release clip



8.8.4 Remove the housing cover from the base

Internal parts and lithium battery replacement requires removal of the housing cover.

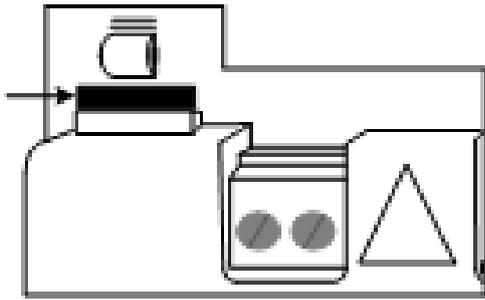


IMPORTANT NOTE: It is possible to remove the housing cover while the RMC is on the DIN rail. However, ABB recommends that you remove the RMC from the DIN rail for optimal positioning of the RMC and better access to the board and its components.

To remove the housing cover from the base:

1. Remove terminal connectors from power ports according to section [8.7.1, Remove power from the controller](#).
2. Remove terminal connectors from I/O and COMM ports.
3. Remove serial communication modules.
4. Remove cables from communication ports (USB, Ethernet, or MMI).
5. Remove TFIO modules from the TFIO A and B interfaces (if used).
6. Remove the RMC from the DIN rail according to section [8.8.3, Remove the RMC from the DIN rail](#).
7. Position the RMC on a flat surface.
8. Insert a slotted screwdriver into the corner slot on the RMC. A slot is located on each corner of the RMC.

Figure 8-39: Front View - Remove top housing from base



9. Push the handle of the screwdriver away from the body of the RMC to gently pry the clip loose from the two top slots. Then push up. From the two bottom slots, push down.
10. Remove the top housing from the base when all four corners are released.

8.8.5 Replace the lithium battery



IMPORTANT NOTE: Perform lithium battery replacement only while the RMC is powered on, so the real time clock continues to run. If the power is off, the real time clock resets to factory defaults and must be changed according to section [8.6, Change the clock](#).

Reconnect the power after removing the cover, and before replacing the battery, to avoid clock reset. Leave the RMC on the DIN rail for ease of access to the power cables in both standalone and enclosure installations.

To replace the lithium battery:

1. Test the new battery to verify that it is fully charged. The battery voltage should be no less than 3.6 Vdc.
2. Remove the housing cover according to section [8.8.4](#). Do not remove the RMC from the DIN rail.
3. Reconnect power to the controller according to section [8.7.2](#).
4. Grasp the existing battery on each side and pull from the bracket.
5. Insert a new lithium battery into the bracket. Observe the polarity (+/-) of the lithium battery and the battery bracket.
6. Remove power from the controller according to section [8.7.1](#).
7. Reinsert the housing cover into the base.
8. Reconnect terminal connectors to I/O and COMM ports.
9. Reinsert serial communication modules.
10. Reconnect cables to communication ports (USB, Ethernet, or MMI).
11. Reconnect TFIO modules to the TFIO A and B interfaces (if used).
12. Reconnect power to the controller according to section [8.7.2](#).
13. Verify on the LCD that the controller's power-on sequence completes.

Because the battery was replaced with the power off, the clock has reset. To change the clock to current date/time:

1. Connect to one of the local communication ports.
2. Establish PCCU connection and click on **Entry**.
3. A message box displays asking to synchronize the date and time.
4. Click **Yes**. The RMC calendar clock synchronizes with the laptop date and time.

8.8.6 Replace the 12 Vdc battery

These instructions describe the removal and replacement of the 12 Vdc battery.



NOTICE –Loss of data. Do not remove the lithium battery from the electronic board (RMC board) when removing the 12 Vdc battery. The lithium battery keeps the real-time clock running.

To replace the 12 Vdc battery:

1. Verify that the LL battery alarm does not display on the LCD. Or measure the lithium battery to verify that it registers more than 3.6 V. If the lithium battery is low, replace the lithium battery first according to section [8.8.5](#).
2. Remove charger and battery cables from the RMC for the battery mode according to section [8.7.1](#).
3. Remove the battery and battery cable from the existing battery.
4. Put a new battery in place.
5. Connect the battery cable to the new battery terminals (observing polarity).
6. Reconnect battery and charger cables to the RMC, as described for the battery mode in section [8.7.2](#).
7. Verify on the LCD that the controller's power-on sequence completes.

8.8.7 Replace the electronic board



NOTICE – Equipment damage. The electronic board inside the RMC housing is susceptible to damage by static electricity or improper handling. Wear a grounding strap when handling the board to prevent this.

A grounding strap is a conductive device that makes a connection between the person handling the board and a high-quality ground point. Wear a ground strap on your body before handling the board, then connect it to a grounded point. This discharges electrical static buildup from the body to the ground and prevents static from discharging to the board.



NOTICE – Loss of data. Perform the procedures in section [8.1, Preserve data and configuration](#) before you replace the electronic board. Collect the measurement data and save the device configuration to avoid data loss.

Restore the saved configuration to the RMC and avoid time-consuming manual reconfiguration of the controller. If it requires a full software restoration, the operating system and firmware must be the same as in the replaced board. Verify that all software is included in the backup package (all software is saved, not only the configuration).

To remove and replace the board:

1. Perform the procedures in section [8.1, Preserve data and configuration](#). Verify that all the software is saved to the backup package.
2. Remove power from the RMC according to section [8.7.1](#).
3. Remove terminal connectors from I/O and COMM ports.
4. Remove serial communication modules.
5. Remove cables from communication ports (USB, Ethernet, or MMI).
6. Remove TFIO modules from the TFIO A and B interfaces (if used).
7. Remove the RMC from the DIN rail according to section [8.8.3](#).
8. Remove the housing cover according to section [8.8.4](#).
9. Remove the screws holding the electronic board to the housing base.
10. Remove the existing board.
11. Position the new electronic board and replace the screws to hold the board to the housing base. Verify that the board has a lithium battery installed. If you use the lithium battery from the board being replaced, test to verify that the voltage is not less than 3.6 Vdc.
12. Reinsert the housing cover.
13. Remount the RMC on the DIN rail.
14. Reconnect terminal connectors to I/O and COMM ports.
15. Reinsert serial communication modules.
16. Reconnect cables to communication ports (USB, Ethernet, or MMI).
17. Reconnect TFIO modules to the TFIO A and B interfaces (if used).
18. Reconnect power to the controller according to section [8.7.2](#).
19. Verify on the LCD that the controller's power-on sequence completes.
20. Set the lithium battery backup switch to Enable. See section [3.8](#).

To set the factory clock setting to current date/time:



IMPORTANT NOTE: The new board requires calibration of AIs and AOs. Do not use calibration files from the saved configuration for the new board. Follow company policies to determine if calibration is necessary before resetting the clock. Setting the clock affects the time stamps assigned to calibration events and files, as well as collection data.

1. Connect to one of the local communication ports.
 2. Establish PCCU connection and click **Entry**. A message box displays, asking to synchronize the date and time.
 3. Click **Yes**. The RMC calendar clock synchronizes with the laptop date and time.
- To restore the configuration or all of the software on the RMC:



IMPORTANT NOTE: The new board might have a version of the operating system and firmware that is different from the version in the previous board. If the board requires the version from the replaced board, update the software on the new board. A complete software update requires a backup package containing all the software.

1. Close the PCCU connection. Remain on the PCCU screen.
2. Use the device loader to restore the configuration according to section [8.2](#).

8.8.8 Replace the LCD assembly

The LCD assembly, consisting of the LCD display and 4 key directional buttons, is mounted on the electronic board. Remove the entire display assembly to replace the LCD board. To remove and replace the display assembly:

1. Perform the procedures in section [8.1, Preserve data and configuration](#).
2. Remove power from the RMC, see section [8.7.1](#).
3. Remove terminal connectors from I/O and COMM ports.
4. Remove serial communication modules.
5. Remove cables from communication ports (USB, Ethernet, or MMI).
6. Remove TFIO modules from the TFIO A and B interfaces (if used).
7. Remove the RMC from the DIN rail according to section [8.8.3](#).
8. Remove the housing cover:
 - a. Remove the four screws holding the display assembly board on the mounting standoffs.
 - b. Lift the display assembly board from the mounted standoffs and gently remove the LCD connector from the connector on the electronic board.
 - c. Press the new LCD connector gently onto the connector on the electronic board.
 - d. Position the new display assembly board and align the screw holes on the board with the standoffs.
 - e. Replace the four screws. Do not over-tighten.
9. Reinsert the housing cover on the RMC.
10. Connect all I/O connections.
11. Reconnect terminal connectors to I/O and COMM ports.
12. Reinsert serial communication modules.
13. Reconnect cables to communication ports (USB, Ethernet, or MMI).
14. Reconnect TFIO modules to the TFIO A and B interfaces (if used).
15. Reconnect power to the controller according to section [8.7.2](#).
16. Verify on the LCD that the controller's power-on sequence completes.

8.9 Maintain cleanliness of the RMC

Controllers installed as standalone should be free of dust and other contaminants. A clean LCD ensures that alarms, system messages and programmed data displays are clearly visible.



NOTICE – Equipment damage. Potential electrostatic charging hazard: Clean only with a damp cloth.

When the controller is installed in an enclosure, keep the enclosure door closed and secured except during maintenance or service procedures that require access to the RMC and other components in the enclosure. Inspect the enclosure, door, and access holes regularly to ensure that all seals and gaskets are clean and intact, and that environmental elements have not reached inside of the enclosure.

Regularly inspect connected cabling to ensure that protective coverings are in place and intact. If the installation includes a solar panel, clean the cell surface of the panel regularly to ensure that dust and

debris are not on the cell surface. Dust and debris inhibit the charging ability of the solar panel. Inspect all other peripheral equipment to ensure that it is properly maintained.

9 Troubleshooting support

For support, call the ABB main office number on the last page of this manual.

Before calling:

- Take note of the model and serial number. The serial number is on a label affixed to the back of the base in the DIN rail slot.
- Prepare a detailed description of the problem for the Technical Support representative.
- Prepare a written description of the problem.
- Take note of any alarms or messages as they appear.
- Know the software version, board number and optional part numbers.

10 Serial port expansion with MOXA® modules

The RMC has two serial ports (serial communication, COMM) to support peripherals with serial interfaces. If you require more serial ports, external third-party Ethernet-to-serial devices can provide extra ports for both Ethernet and serial connection.

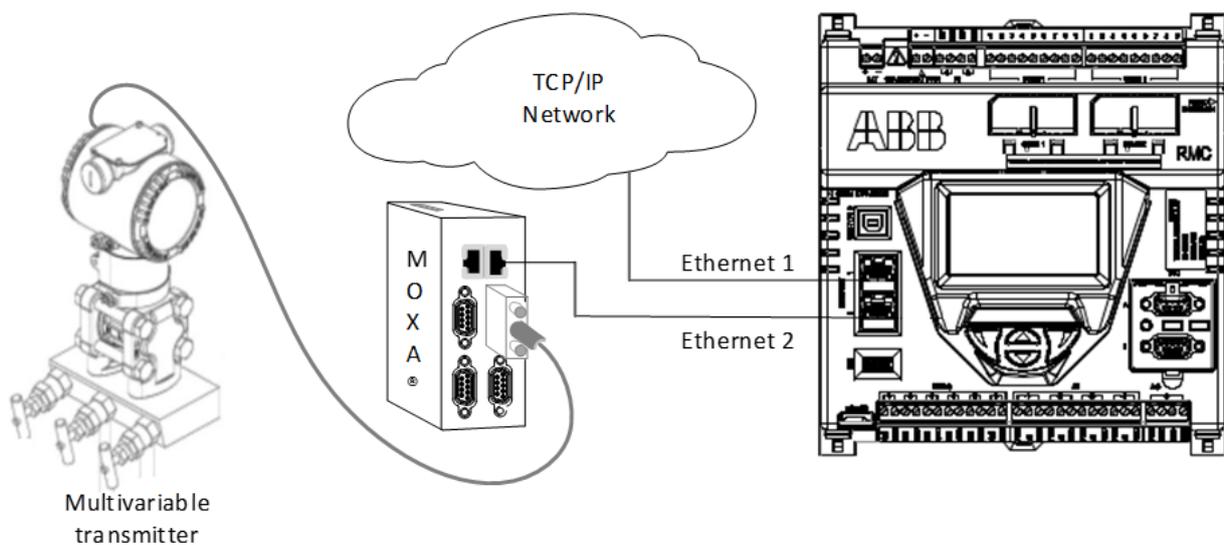
This section describes how to add serial port capacity to the RMC using the MOXA® Module, an Ethernet-serial converter. The module connects to the RMC through Ethernet and to the external measurement devices on its serial ports. Serial communication traffic is carried over the Ethernet connection transparently. From the RMC's perspective, communication with the peripherals on MOXA is as if they were connected directly to its COMM ports.

Use the serial ports on the MOXA® module to connect with any external serial device, such as radios and measurement transmitters. The number of additional serial ports depends on the MOXA® module. [Figure 10-1](#) shows the connections for a MOXA® model Nport IA5440AI. This scenario shows a single ABB multivariable transmitter (XMV) connected to the MOXA® module. Other scenarios might include multiple XMVs on the same module port.



IMPORTANT NOTE: The procedures in this chapter show configuration for XMV connections. The RMC and the MOXA® module support other ABB and third-party external devices with standard RS-232 or RS-485 interfaces. For additional configuration options, see PCCU online help or contact technical support.

Figure 10-1: Ethernet-to-Serial MOXA® Module Connection MOXA



10.1 Configuration overview

The example described in this section includes a MOXA module and an ABB XMV as the measurement transmitter with which the RMC communicates. This scenario assumes:

- RMC COMM 1 and COMM 2 are unavailable or additional serial capacity is necessary.
- The RMC is connected to a network. There is also an available connection for the MOXA module on the same network.
- Valid IP addresses are available for both the RMC and the MOXA module.



IMPORTANT NOTE: Both the RMC and the MOXA module must have valid IP addresses to communicate. Devices such as the XMV transmit measurement data in real-time, so the TCP/IP connection between the RMC and the Ethernet-to-serial device must be reliable (the IP configuration must remain intact all the time). To prevent loss of IP configuration, configure both devices with static IP addresses.

Static IP address configuration does not depend on network connectivity as dynamic addressing does. Use of DHCP for device IP addressing in this scenario could cause measurement data loss during a network outage or disconnection. Network connectivity should never affect local communication with measurement or control peripherals.

Table 10-1: Configuration for connection to Ethernet-to-serial devices

Configuration item	RMC	Ethernet-to-Serial device
Ethernet interfaces	Verify that the Ethernet interface is enabled (In PCCU Entry mode, on the navigation tree, select Communications then the Networking tab): Ensure the State of the interface is set to Enable .	Consult MOXA documentation for details to enable the Ethernet interface on the module.
Network (IP) Parameters	Do not enable DHCP. Change default IP parameters for valid IP parameters and restart the interface. In PCCU Entry mode, on the navigation tree select Communications then the Networking tab. Enter valid IP parameters (obtained from the network administrator). They must be on the same subnet as the Ethernet-to-serial device.	Consult MOXA documentation for details to configure static addressing (ensure DHCP is disabled) and manually configure valid IP parameters (obtained from the network administrator). Must be on the same subnet as the RMC.
Serial interfaces	In PCCU Entry mode, on the navigation tree select Communications , then on the Communication Setup tab, add the communication application appropriate for the serial device type and configure desired serial parameters. Serial port parameters must match those on the MOXA module and serial devices. See section 10.3 Configure the RMC Ethernet interface to support MOXA® .	Consult MOXA documentation for serial port configuration. Make sure to match serial interface parameters to the attached serial device.



IMPORTANT NOTE: For other third-party devices, consult vendor documentation for steps to enable the Ethernet interface, and configure network (IP) and serial port parameters. Details of configuration depend on the implementation of vendors, but standard Ethernet and serial interfaces should be interoperable.

10.2 Configure the MOXA® module

This procedure describes how to configure the MOXA® module to operate with the RMC. This includes manually setting up the module’s IP network parameters (static addressing), the serial port configuration, and the mode of operation.



IMPORTANT NOTE: Some steps in this procedure use the MOXA® NPort web console. Screens or options might change based on the user interface and the firmware version in the module. Refer to MOXA® documentation for additional configuration options.

To configure the MOXA® module:

- Verify that the host system or laptop you use to configure the module has a web browser or the MOXA® module user interface shipped with the module (N port device manager).
- Verify that the RMC Ethernet or network adapter is enabled and configured with a valid IP address.
- Obtain RMC-compatible IP parameters for the MOXA® module:
 - A valid IP address, subnet mask, and gateway for public addressing.
 - A valid IP address and subnet mask compatible with the RMC factory defaults for private addressing.

To configure the MOXA® module network settings using the web interface:



IMPORTANT NOTE: Complete all configuration before restarting the module. Once configuration changes take effect after a restart, the connection from your laptop to the module will be lost. To reconnect with the module again, configure laptop with a compatible IP address.

1. Verify that the module is powered on.
2. Configure the laptop with a private IP address that is compatible with the default address on the MOXA® module. The default private IP address of the module is 192.168.127.254.



IMPORTANT NOTE: Choose an IP address from the Internet Assigned Numbers Authority (IANA) reserved address block: 192.168.0.0 to 192.168.255.255. The assigned subnet mask for this block is 255.255.0.0.

3. Use an Ethernet cable to connect the laptop Ethernet port to the module's Ethernet port 1.
4. Launch the web browser on the laptop and direct the browser to the module's default IP address (192.168.127.254). The main configuration page displays.
5. Configure the network parameters:
 - a. Click **Network Settings** on the navigation tree.
 - b. Type the valid IP parameters (IP address, Netmask, Gateway).
 - For private IP addressing: Type an IP address and subnet mask that is compatible with the RMC default IP parameters. You can use private addressing if the RMC is not connected to a network.



IMPORTANT NOTE: Select an IP address from the Internet Assigned Numbers Authority (IANA) reserved APIPA address block: 169.254.0.0 - 169.254.255.255. The assigned subnet mask for this block is 255.255.0.0.

- For public IP addressing: Type a valid address from the network administrator. Use public addressing when the RMC connects to a network and has an IP address to connect to that network.
6. Verify that the IP Configuration is set to **Static**.



IMPORTANT NOTE: Do not configure the MOXA® module for DHCP. Use a static IP address to ensure RMC-MOXA® connections are never disrupted by loss of IP configuration.

7. Take note of the IP address. The IP address is a required parameter when configuring the RMC for communication with the module.
8. Click **Submit**.
9. Configure each serial port:
 - a. Click **Serial Settings** on the navigation tree.
 - b. Select the port.
 - c. Select the appropriate configuration for each of the settings. Verify that they match those of the device attached to the port.
10. Click **Submit**.

11. Configure operating settings for each port:
 - a. Click **Operating Settings** on the navigation tree.
 - b. Select the port.
 - c. Click the Operation Mode drop-down list and select the TCP server.
 - d. Click the Max connection drop-down list and select the number of devices that connect to the port. Take note of the number. It is required for the RMC configuration.



IMPORTANT NOTE: Each MOXA® serial port supports connection with single or multiple devices (up to eight) depending on the serial interface type. A four-port MOXA® supports up to 32 devices, but the total number an RMC supports might be less. This number depends on the complexity of the RMC's configuration and the number and type of the enabled applications. Decide what the optimal number is for your specific situation.

Ensure that RMC CPU utilization remains optimal when planning multiple-device connections to avoid performance degradation.

- e. Take note of the Local TCP port number. Unique TCP port numbers are assigned by default to each serial port. This port number is a required parameter when you configure the RMC for communication with the port.
12. Click **Submit**.
13. Click **Save/Restart** for all configurations to take effect.
14. Disconnect the laptop from the module.
15. Use an Ethernet cable to connect the module's Ethernet port 1 to the RMC's Ethernet port 2.
16. Reconfigure the laptop with the appropriate network parameters and connect the laptop to the network.
17. Verify that the module is connected and responding. Ping the module's new IP address over the network and verify that there is a response.

10.3 Configure the RMC Ethernet interface to support MOXA®

The following procedure describes the configuration of the RMC to operate with the MOXA® module. This configuration adds a communication application to handle communication with the external device attached to one of the serial ports on the MOXA® module. The RMC should have a communication application for each MOXA® serial port in use. Add and configure four communication applications for a four-port module.

Choose the application, associated parameters, and protocol based on the type of external device that connects to the serial ports. Multiple devices that connect to a single MOXA® serial port must all be of the same type.

There are special purpose communication applications for specific types of ABB equipment. An example is the XMV Interface, the application that communicates with XMVs (ABB multivariable transmitters). If you connect other type of ABB devices, you can use available special purpose applications. A generic communication application is available for third-party devices or ABB devices without specific applications. Select **Generic Com App**. Contact technical support for configuration options.

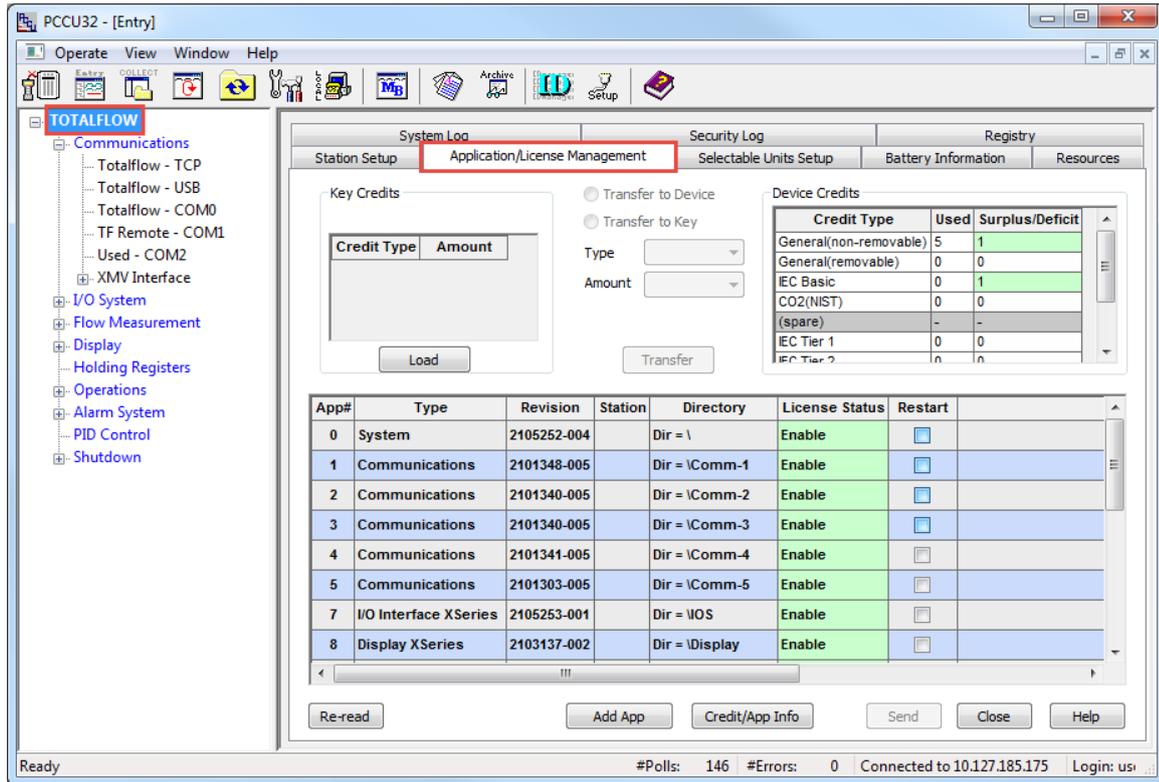


IMPORTANT NOTE: Do not configure the RMC for DHCP when connecting a MOXA® module. Use a static IP address to ensure RMC-MOXA® connections are never disrupted by loss of IP configuration.

To configure the RMC for communication with XMVs through the MOXA® module:

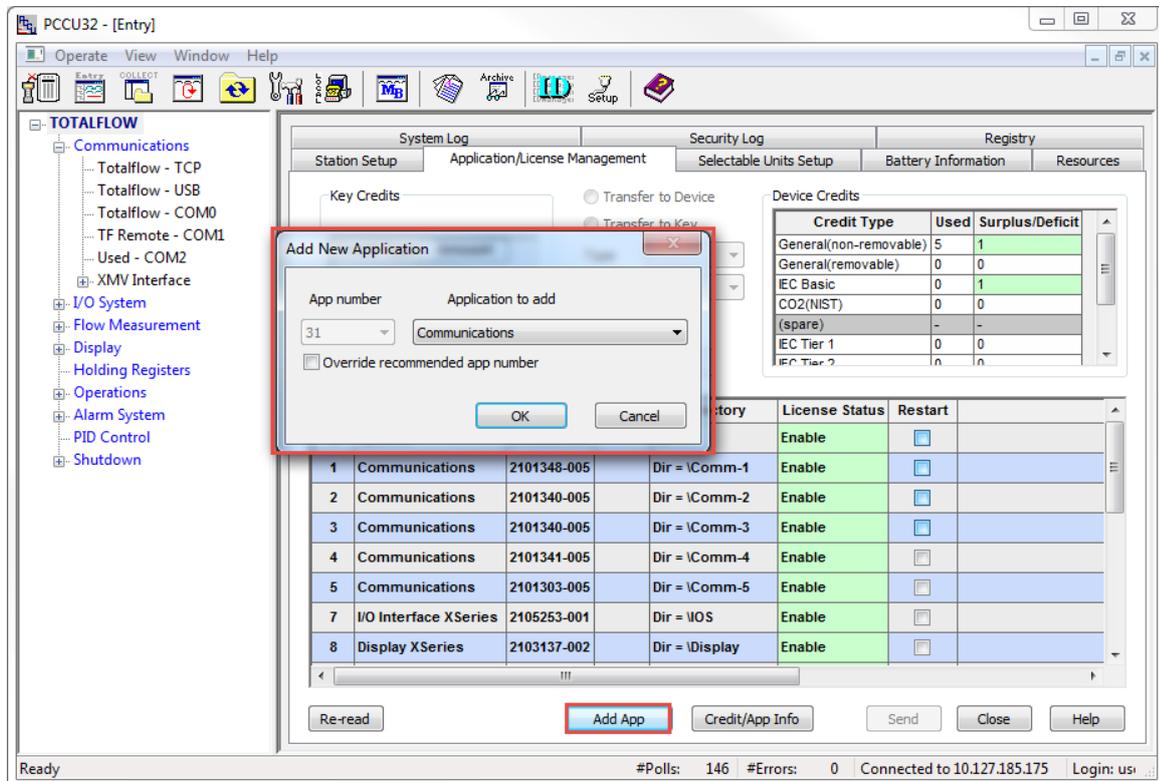
1. Connect the PC or laptop with PCCU32 to the controller.
2. Launch PCCU32 and click the **Entry** icon on the toolbar.
3. Click the Station ID (top item) on the navigation tree, then click **Application/License Management**. The Application/License Management tab displays ([Figure 10-2: Application/License Management tab](#)).

Figure 10-2: Application/License Management tab



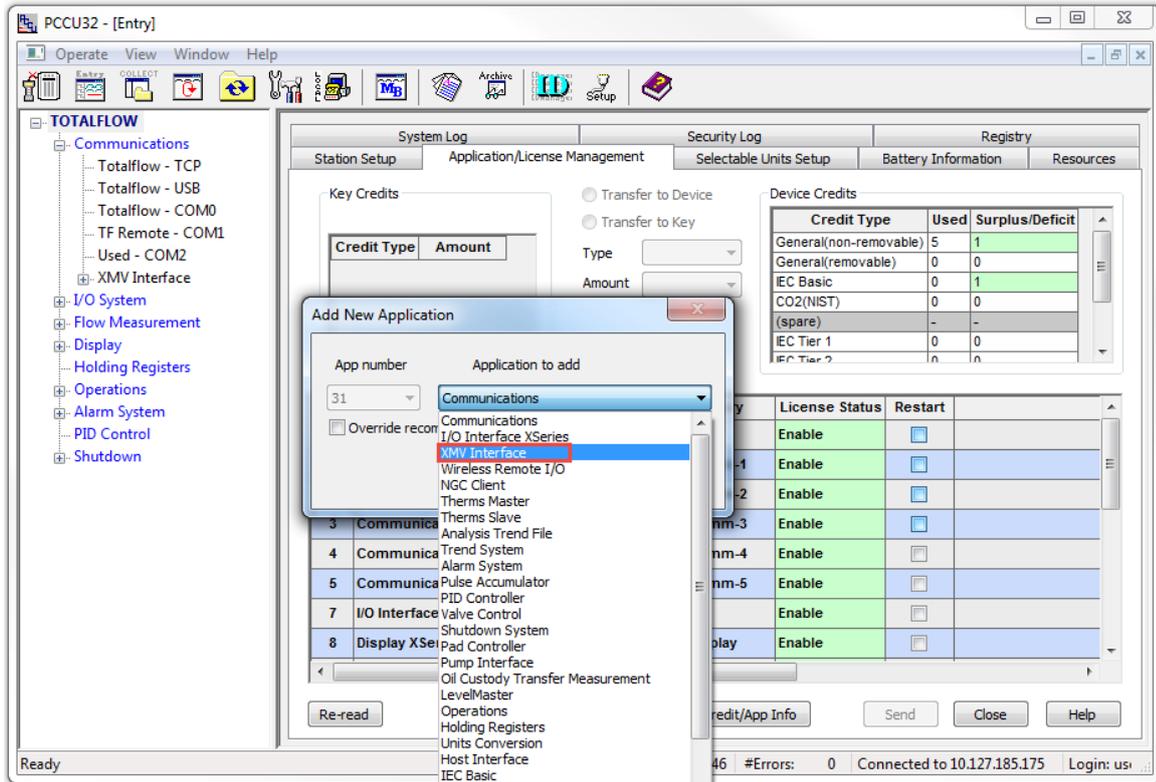
4. Click **Add App**. The Add New Application dialog displays (Figure 10-3).

Figure 10-3: Add New Application



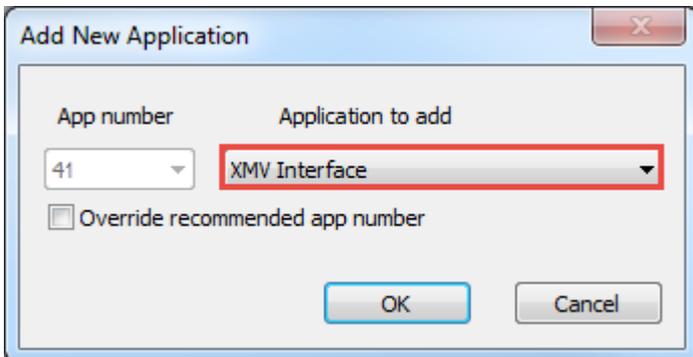
5. Select **XMV Interface** from the Application to Add drop-down list (Figure 10-4).

Figure 10-4: Select application to add



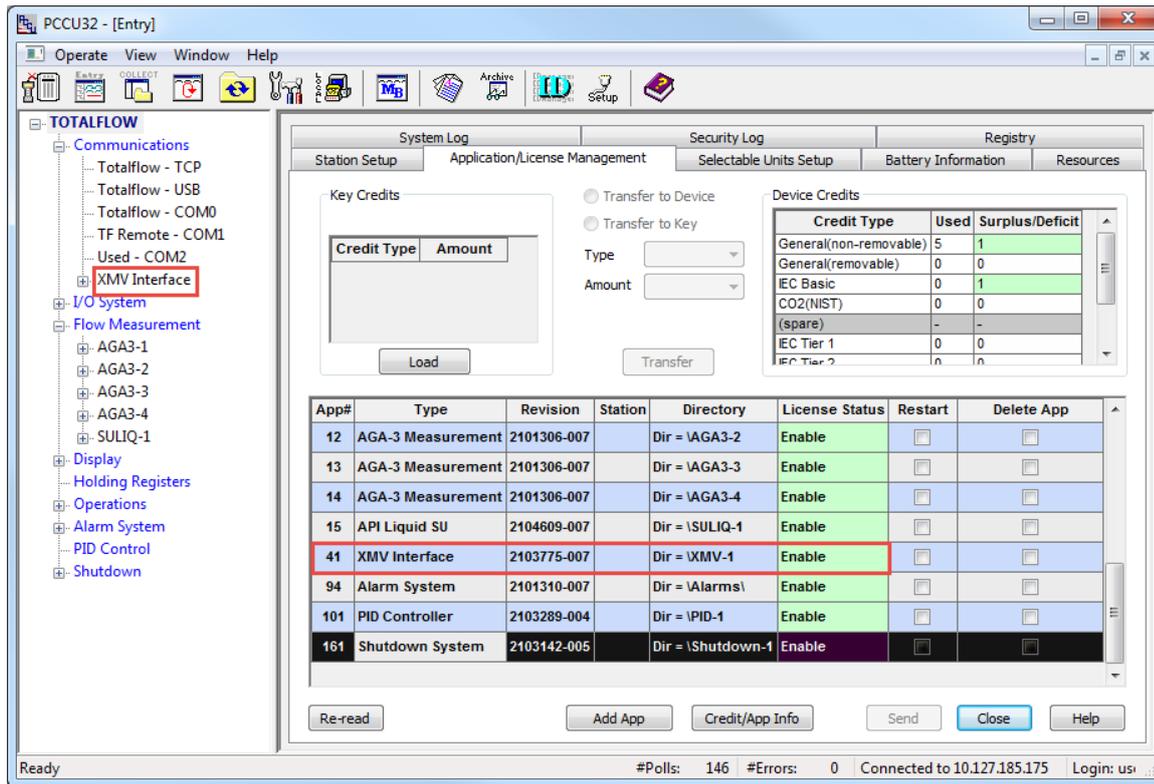
The XMV Interface application displays with the default app number ([Figure 10-5](#)).

Figure 10-5: Add the XMV Interface application



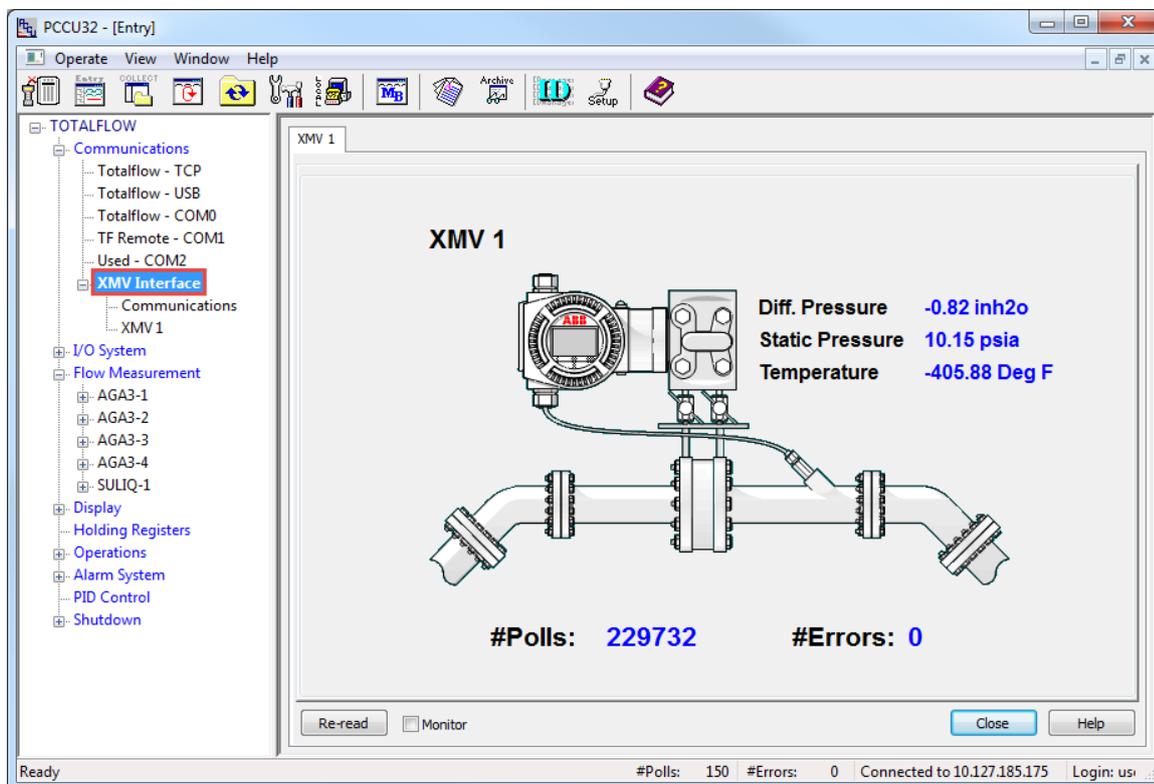
6. Click **OK**.
7. Click **Send**. The XMV Interface displays in the application table and the navigation tree ([Figure 10-6](#)).

Figure 10-6: XMV Interface on the navigation tree and application table



8. Click **XMV Interface** on the navigation tree to expand it (Figure 10-7).

Figure 10-7: XMV status screen



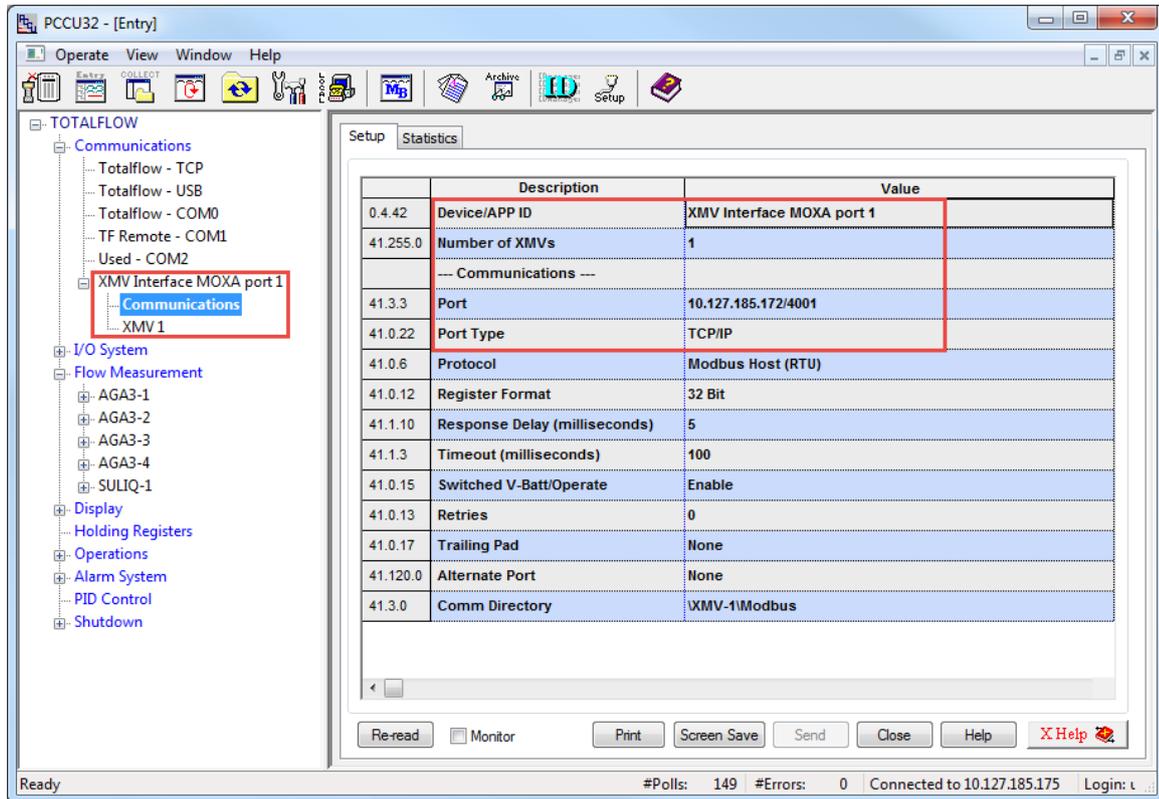
9. Click **Communications**. The Setup tab displays (Figure 10-8).

10. Configure the following:

- a. Type the XMV interface instance name into Device/APP ID. Use a name that identifies the port, such as "XMV Interface MOXA port 1"

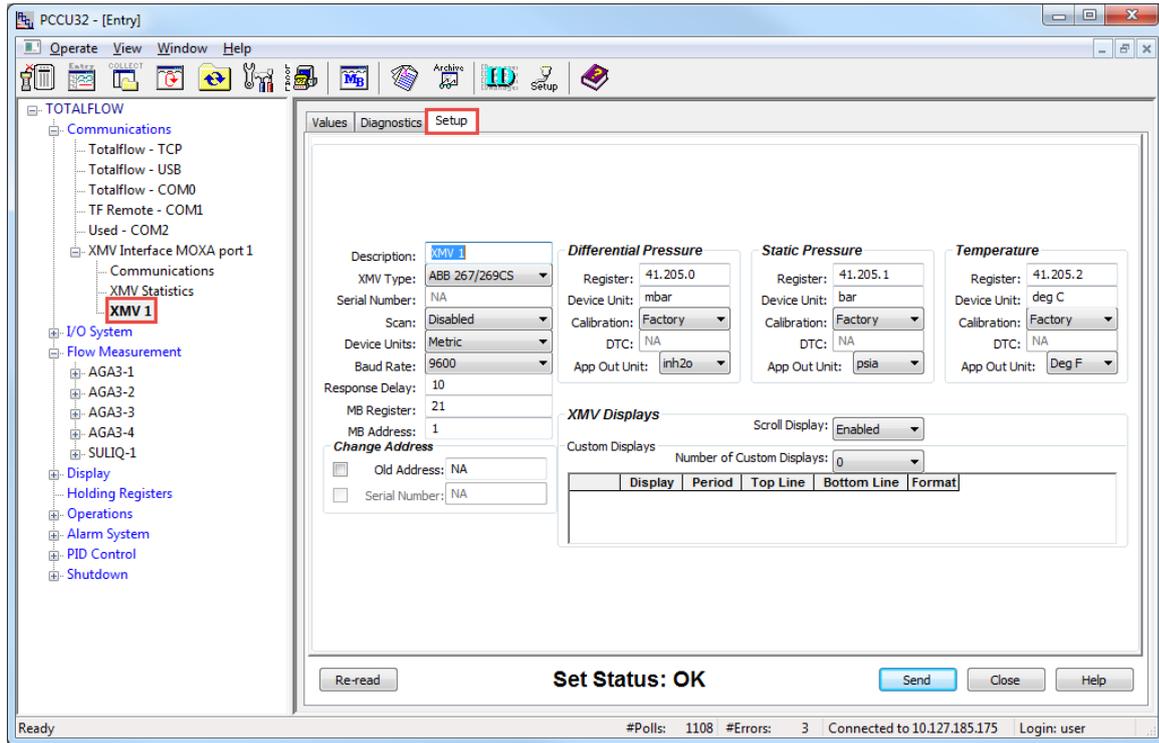
- b. Type the number of XMVs attached to the serial port. This number must match the one configured in the MOXA module Max Connection field in the Operation Modes configuration menu.
 - c. Type the MOXA's IP address and the serial port's Local TCP port into Port. Use the following format: IP address/Local TCP port. For example, "10.127.185.172/4001".
 - d. Select **TCP/IP** from the Port Type drop down list.
11. Click **Send**. The navigation tree displays the new name for the XMV interface and the number of supported XMVs. In this example, only one XMV displays for a single device connection (XMV 1).

Figure 10-8: XMV Interface Communication Setup



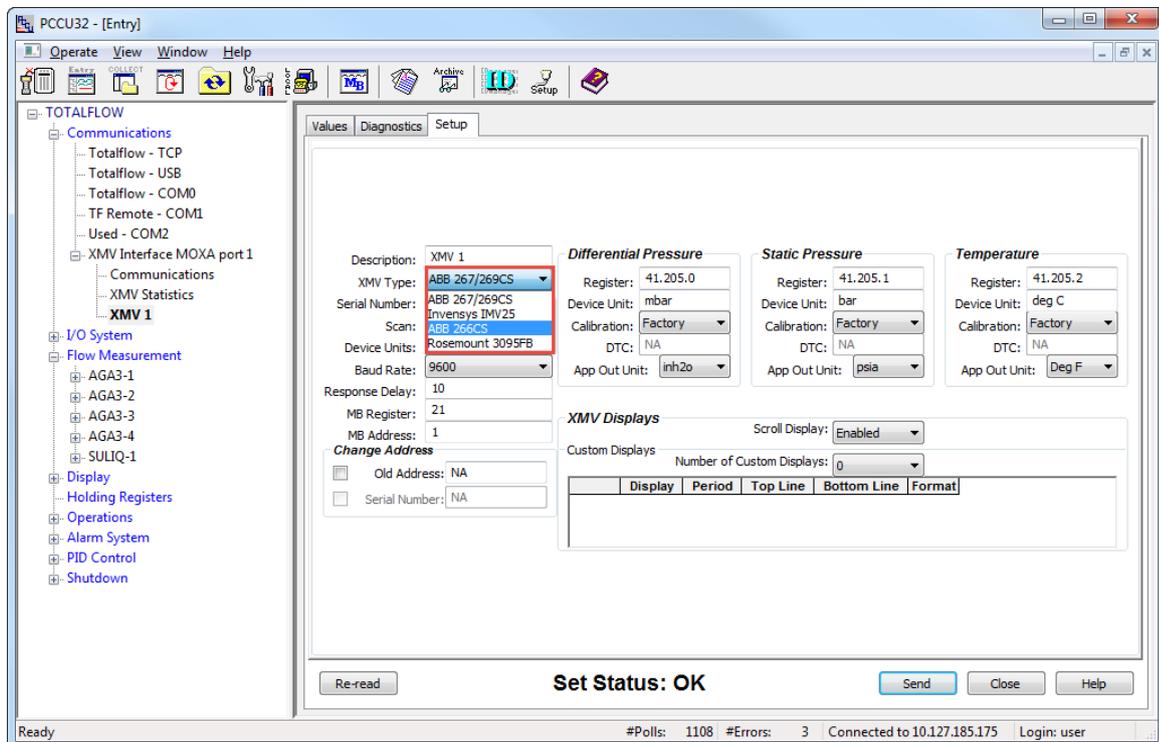
12. Configure the XMV:
 - a. Select the XMV instance on the navigation tree, then click **Setup** (Figure 10-9).

Figure 10-9: XMV instance Setup



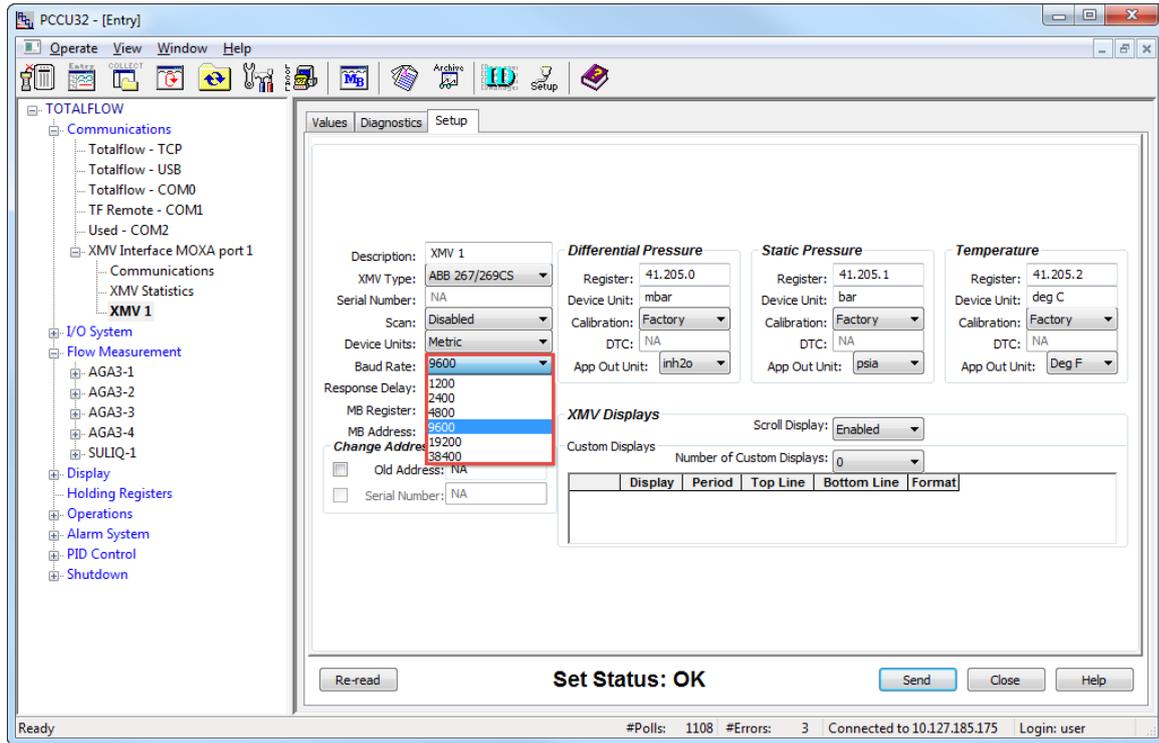
- b. Type a description or name into Description. Or accept the default name.
- c. Select the XMV model from the XMV Type drop-down list (Figure 10-10).

Figure 10-10: Select the XMV type



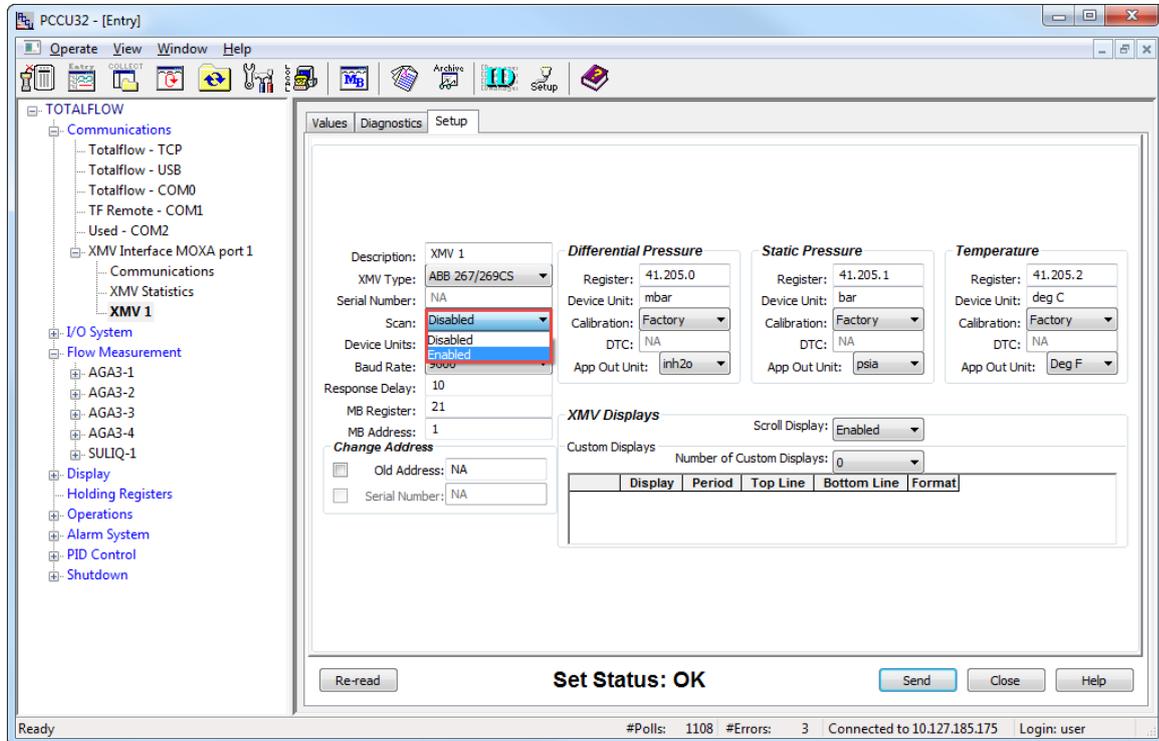
- d. Select **9600** from the Baud rate drop-down list (Figure 10-11)

Figure 10-11: Select baud rate



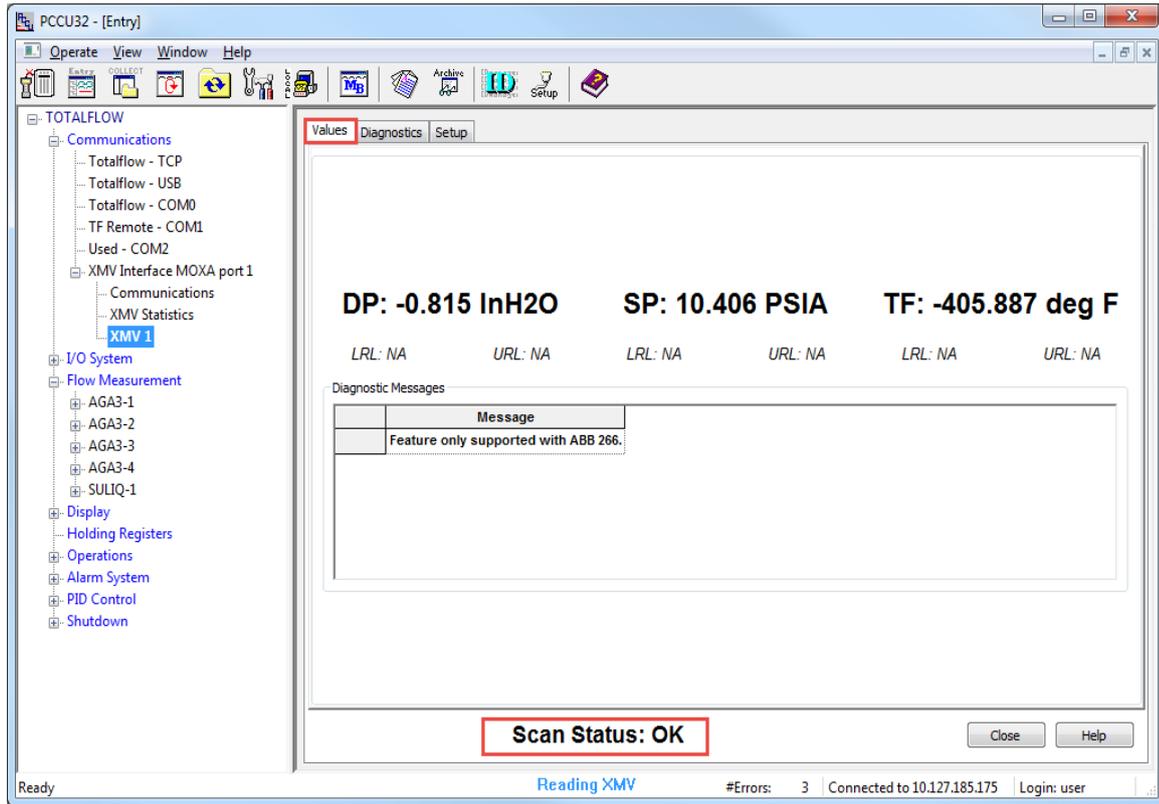
- e. Type the response time (0, 10, etc.) in seconds into the Response delay field.
 - f. Type the Modbus address into the MB Address field. Assign each XMV a unique address.
13. Click **Send**.
 14. Select **Enabled** from the Scan drop-down list ([Figure 10-12](#)).

Figure 10-12: Select Scan mode



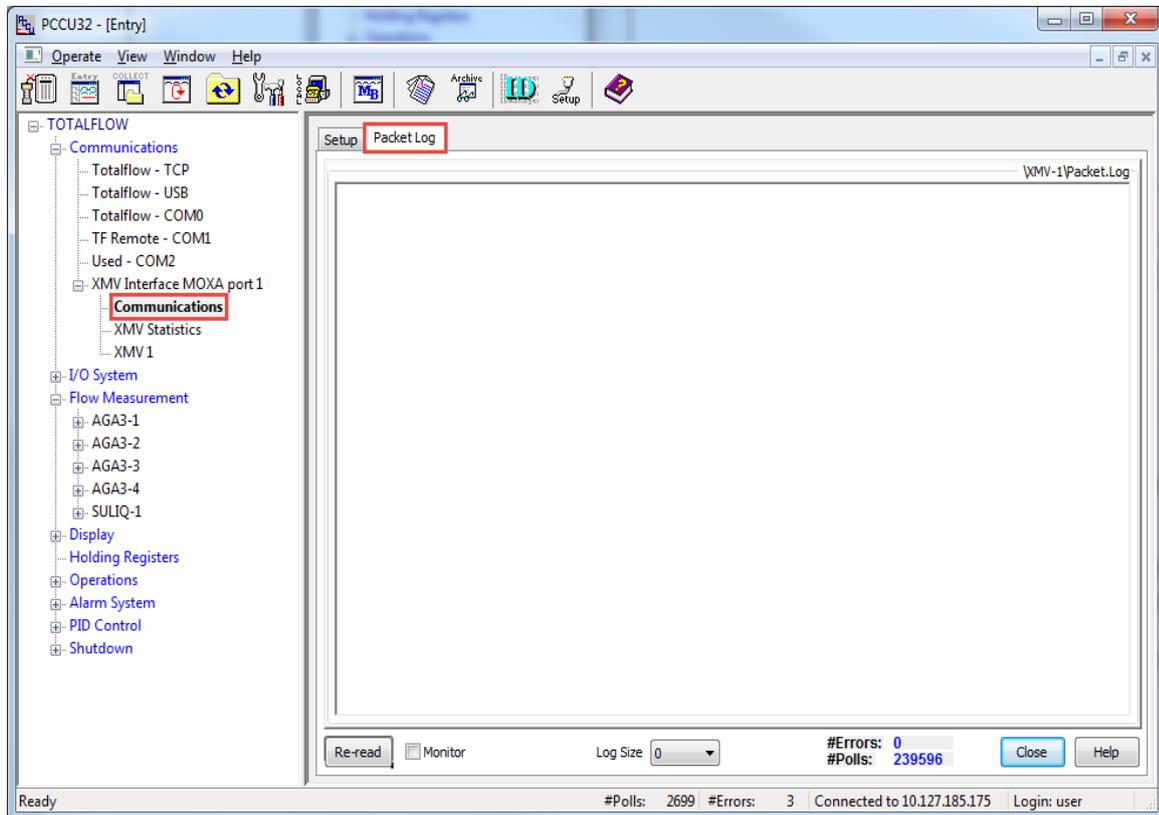
15. Click **Send**.

Figure 10-13: Verify the XMV Scan Status



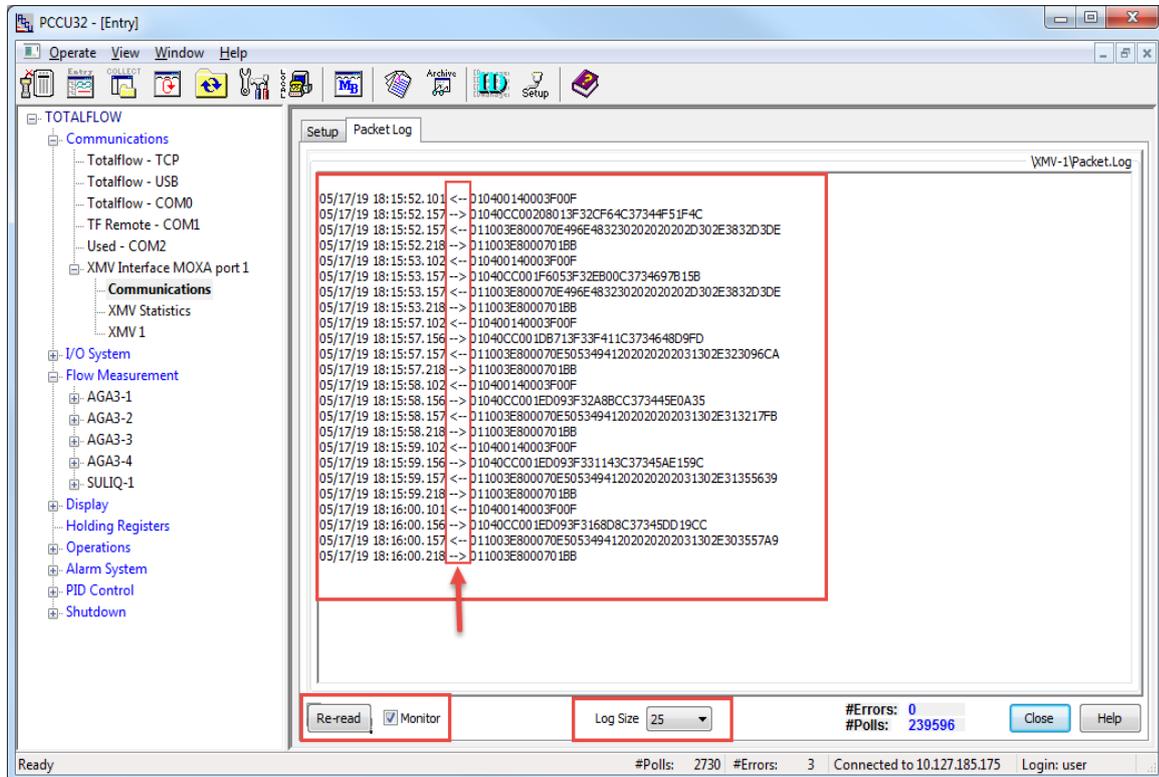
16. Verify that Scan status is OK.
17. Click **XMV interface** > **Communications** on the navigation tree (Figure 10-14).
18. Click **Packet Log**.

Figure 10-14: XMV Interface Communications Packet Log screen



19. Display the packet logs (Figure 10-15):
 - a. Click the **Monitor** checkbox.
 - b. Select a value from the Log Size drop-down list.
 - c. Verify that communication traffic flows between the RMC and XMV. Arrows on the log point in two directions to indicate requests and responses between the RMC and the XMV.

Figure 10-15: XMV Interface Communications Packet Logs



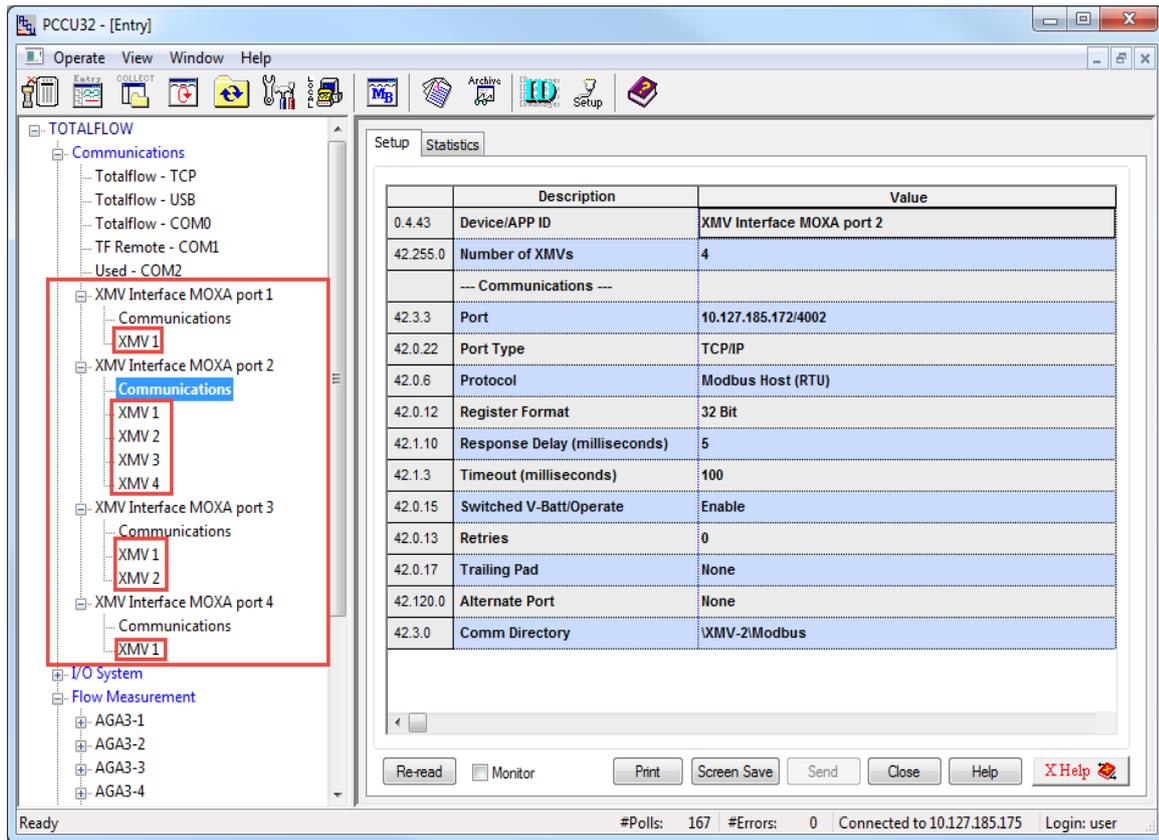
IMPORTANT NOTE: A packet log that displays requests from the RMC but not from the XMV, could indicate a baud rate mismatch, or an unpowered or damaged XMV.

When multiple XMVs connect to the RMC and the packet log displays correct communication exchange for some XMVs but not for others, verify connection with the non-responsive XMVs. If the configuration is correct, the XMVs might be unpowered or damaged.



IMPORTANT NOTE: If all serial ports in the MOXA® module are in use, four communication applications should be added and configured. Use one application for each port. For example, Figure 10-16 shows an RMC with four XMV Interface applications configured for each of the serial ports on a four-port MOXA® module. In this example, ports 1 and 4 connect to a single XMV. Ports 2 and 3 connect to multiple XMVs.

Figure 10-16: XMV Interface applications for each MOXA port



11 Product warranty

Before installation, store the equipment in a clean, dry environment, per the Company's published specification. Make periodic checks on the equipment's condition. In the event of a failure under warranty, provide the following documentation to support your claim:

- A list providing evidence of process operation and alarm logs at the time of failure
- Copies of all storage, installation, operating and maintenance records relating to the alleged faulty RMC



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