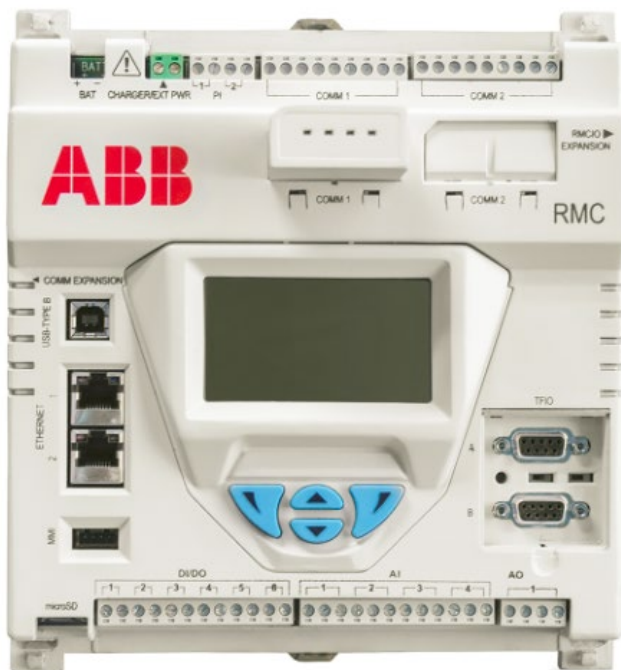


ABB MEASUREMENT & ANALYTICS | 2105551MNAD

Remote Modular Controller (RMC-100) Startup Guide



A scalable controller supporting control and measurement applications from simple to large oil and gas production and transmission sites

Measurement made easy

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Additional information

Carefully read the contents of this startup guide prior to beginning installation. For any questions that are not answered in this guide, or in the documentation listed below, call the ABB main office number on the last page.

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

[RMC-100 product page](#)



Table 0-1: Related documentation

Documents	Document number
RMC-100 data sheet	2101126
RMC-100 quick start guide	2107023
RMC-100 safety and compliance	2107022
RMC-100 user manual	2105552
TFIO module user manual	2101226
XIO user manual	2106424
Network communication guide	2107013
IO Interface application guide	2107011
Digital Oilfield user manual	2106300
How to guide – Configure MQTT	2106521
RMC-100 AI to ABB 2600 T pressure transmitter	2105593
RMC-100 COMM (RS-485) to ABB XMV (267/269CS/266J) W/RTD	2105579
RMC-100 to ABB FCB Coriolis meter	2105592

Compliance

Cyber security

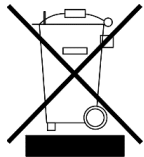
This product is designed to be connected, and communicate information and data, via a network interface. All ABB Totalflow products should be connected to a secure network. It is the customer's sole responsibility to provide, and continuously ensure, a secure connection between the product(s) and the 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 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.



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

Waste electrical and electronic equipment (WEEE) shall be treated separately using 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 product and do not explain all assembly, operating, or maintenance scenarios. Ask the manufacturer for further information.

The content of these instructions is neither part of nor provided for changing a previous or existing agreement, promise, or legal relationship. All obligations of ABB result from the respective sales contract, which also contains the full and solely valid warranty clauses. These are neither limited nor extended by the content of these instructions.

Observe warning signs on packaging and on the device.

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 EN 60 900, 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

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

Safety symbol conventions

The following conventions appear throughout this document:

DANGER and WARNING hazards relate to personal injury and NOTICE hazards are associated with equipment or property damage. However, under certain operating conditions, operating damaged equipment can result in a degraded system or process performance leading to serious or life-threatening injuries. Therefore, compliance with all DANGER, WARNING and NOTICE hazards is required at all times.



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



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



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



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

Potential safety hazards

The Remote Modular Controller operates on 9 to 30 Vdc. There are no hazardous voltages present in the controller. There are no chemical or burn hazards. 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.



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. 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. 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.



WARNING – Bodily injury. The RMC-100 startup guide does not address any requirements for the installation of product(s) in hazardous (classified) locations. Refer to the installation instructions and local and national electrical codes for installation requirements in hazardous (classified) locations.



WARNING – Bodily injury. Field wiring cables and wires can be energized from optional power sources other than the RMC. Disconnecting energized cabling or wiring would cause a spark that would ignite a hazardous atmosphere if present.



NOTICE – Equipment damage. Potential electrostatic charging hazard: clean only with damp cloth.

1 Introduction

The startup guide is designed for typical installations only. Installations must be performed by personnel knowledgeable of the Remote Modular Controller 100, local and national codes, communication wiring, and electrical wiring. Many sites have unique system installation requirements. In these cases, it is important to reference site-specific documentation.

In this startup guide, the Remote Modular Controller 100 will be referred to as the RMC or the controller, unless otherwise indicated.

1.1 Assumptions

- The software PCCU32 version 7.68 or newer is installed and operational on the PC used to communicate with the RMC equipment for configurations. PCCU32 version 7.68 fully supports the 2-port switch mode for Ethernet and connections with the XIO.
- Installation and maintenance will only be conducted by personnel authorized to work on electrical installations.
- Installation and maintenance will be conducted in accordance with relevant national and local codes.

2 Site planning and requirements

Installing the RMC 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 listed in this section to select compliant equipment. Failure to comply with these specifications may create unsafe conditions, resulting in bodily injury and equipment damage.

2.1 Enclosure requirements

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

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

2.2 Battery and charger requirements

When powering the controller with a battery (battery mode), comply with the following specifications:

- Battery specifications:
 - Nominal 12 Vdc Sealed Lead Acid
 - RMC rating for ambient temperature with battery is $T_a = -40\text{ °C to }+60\text{ °C}$ ($-40\text{ °F to }140\text{ °F}$)
- Battery charger specifications:
 - Solar panel must be nominal 12 Vdc, 20W or less, or
 - Power source: 14.5 Vdc to 15.5 Vdc, 1.65 A

2.3 External power supply requirements

When powering the controller with external power (EXT PWR mode), comply with the following specifications:

- Power supply must provide power not exceeding the voltage range allowed by the RMC. EXT PWR mode operation is +9 Vdc to 30 Vdc, 5A maximum.
- RMC rating for ambient temperature without battery is $T_a = -40\text{ °C to }+70\text{ °C}$ ($-40\text{ °F to }158\text{ °F}$).



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

2.4 Location specifications and design

Decide on the location to install the controller. The RMC mounts on a DIN rail. Mount the DIN rail in an enclosure or on an interior wall that meets the environmental ratings for the location (see details in section [2.1, Enclosure requirements](#)).

The RMC mounting surface must have sufficient strength to support the hanging weight of the controller (maximum of 1.816 pounds) and associated equipment to meet the requirements of IEC715. The installation location should allow access to the RMC, power sources, cables, and connections.

If a solar panel is used, decide where and how to install the solar panel outdoors. For optimum charging, avoid placing the solar panel where it will be in shadows any part of the day.

2.5 Wiring requirements

All wiring connections and screw terminals for power, input ports, output ports, and communications support 12 AWG to 22 AWG. Wire gauge selection should be based on the voltage and current requirements of the circuitry as well as the expected length of the wires. The gauge differs for each application.

Follow local electrical codes when selecting the appropriate wire gauge and type based on the load current, voltage, signal type, wire length, and indoor or outdoor application.



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

3 Unpack and inspect



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:

1. Inspect the shipping carton for damage.
2. Carefully remove items from the carton.
3. Keep all shipping materials to return any parts.
4. Compare the packing list with the materials received. Check for missing or incorrect parts.
5. Inspect the items for damage:
 - RMC exterior
 - LCD display
 - Optional equipment if purchased
6. If there are any missing, incorrect, or damaged parts or noticeable defects, call the ABB main office number listed on the last page of this guide.

4 Basic hardware installation

This is an overview of basic hardware installation. For different installations, refer to the RMC user manual or call the ABB main office number listed on the last page of this guide.



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



DANGER – Serious damage to health / risk to life. Allowing the RMC components to make contact with a non-insulated tool or without a proper grounding device 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.

4.1 Ground the controller

The RMC must be grounded by mounting on a grounded DIN rail.



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 12 AWG or 4 mm².

To ground the DIN rail:

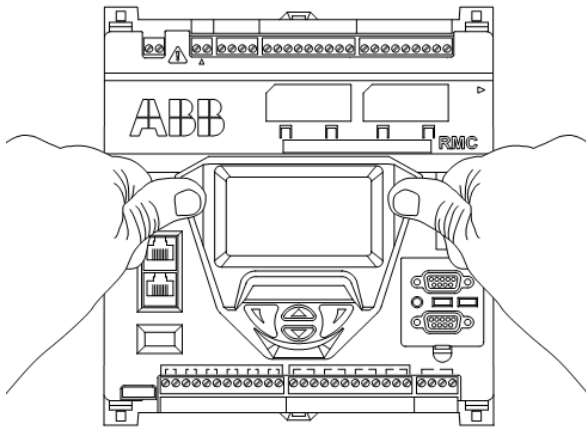
1. Screw the DIN rail onto the mounting surface.
2. Attach a grounding wire to the DIN rail.
3. Attach the other end of the grounding wire to an electrical ground.

4.2 Mount the RMC

To mount the controller on the DIN rail:

1. Position the RMC on the DIN rail.
2. Push the RMC onto the DIN rail until it snaps into place ([Figure 4-1](#)).

Figure 4-1: Mounting the RMC



IMPORTANT NOTE: To remove the controller, use a slotted screwdriver inserted in the access slot of the DIN rail release clip to loosen the clip. For more information, refer to the Maintenance and Service section in the RMC User Manual.

4.3 Wire COMM ports

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

[Table 4-1](#) provides the specifications for the serial communication ports.

Table 4-1: Serial communication specifications

Type	Maximum Length	Termination
RS-232	50 feet (15 meters)	Terminal connector (9 POS), screw termination and pluggable COMM module Active when communication module is inserted
RS-485 or RS-422	4000 feet (1220 meters)	

[Table 4-2](#) identifies RS-232, RS-422, and RS-485 communication pinouts for COMM 1 and COMM 2.

Table 4-2: COMM 1 and COMM 2 serial communication 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)

PIN	RS-232	RS-422	RS-485
4	Operate (OPER)	Operate (OPER)	Operate (OPER)
5	Remote request to send (RRTS)	Remote request to send (RRTS)	Remote request to send (RRTS)
6	Request to send (RTS)	Transmit bus+ (TBUS+)	Transmit/Receive (BUS+)
7	Transmit data (TX)	Transmit bus- (TBUS-)	Transmit/Receive (BUS-)
8	Receive data (RX)	Receive bus+ (RBUS+)	Not Used
9	Clear to send (CTS)	Receive bus- (RBUS-)	Not Used

Refer to the RMC user drawings for COMM wiring details for specific external devices. See the [Additional information](#) section.

To wire the serial communication port:



NOTICE – Equipment damage. An external device can be powered from pin 1 (VOUT) or pin 3 (Sw VOUT) on both COMM1 and COMM2. The output voltage at these pins is dependent upon the external power supply connected to the CHARGER/EXT PWR port.

Before connecting to these pins, ensure that the device is compatible with the input voltage at the CHARGER/EXT PWR port. Connecting an incompatible device may result in damage to the device.

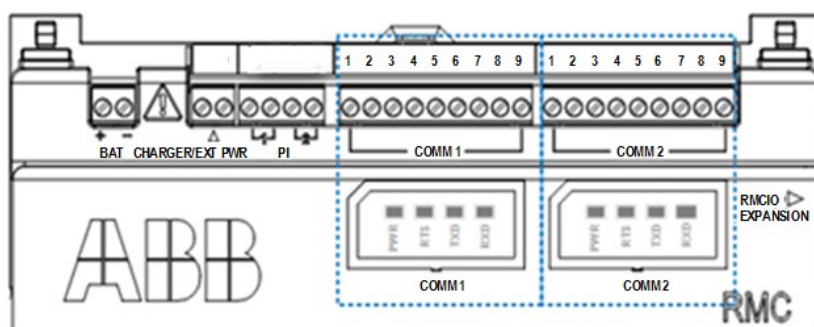
1. Use a slotted screwdriver to pry the terminal connector off the electronic board.
2. Trim the wire covering back ¼ inch on each wire.
3. Loosen the terminal connector screws for the correct pin according to [Table 4-2](#).
4. Insert the wires in the required pins. If powering the device from the COMM port:
 - a. Use pin 1 (VOUT) and pin 2 (GND) to provide constant voltage.
 - b. 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 as this may 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 4-2](#)). The communication module pushes the port cover downward when inserted.

Figure 4-2: COMM terminals and modules



4.4 Wire I/O ports

Wire the RMC I/O ports to monitor, control and power external devices. Wiring for power is required if there is no external supply powering the device. Refer to the RMC user drawings for I/O wiring details for specific external devices. See the [Additional information](#) section.

To wire the I/O port:



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

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

1. Use a slotted screwdriver to pry the terminal connector off the electronic board.
2. Trim the wire covering back ¼ inch on each wire.
3. Loosen the terminal connector screws for the correct pin according to the I/O tables. See sections [4.4.1](#), [4.4.2](#), [4.4.3](#) and [4.4.4](#) in this guide.
4. Insert the wires in the required pins. If powering the device from the AI or the AO:
 - a. Use pin 1 (PWR) and pin 3 (GND) for devices attached to the AI.
 - b. Use pin 1 (PWR) and pin 4 (GND) for devices attached to the AO.
5. Tighten the terminal connector screws.



NOTICE – Equipment damage. Do not overtighten the terminal connector screws as this may damage the wire.

6. Insert the terminal connector back on the I/O port if it was removed.

4.4.1 Analog input pinouts

[Table 4-3](#) and [Figure 4-3](#) identify the AI pinouts.

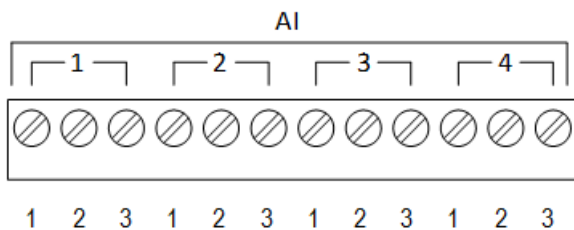


NOTICE – Equipment damage. Before connecting to pin 1 (PWR), ensure that the external device is compatible with the input voltage at the CHARGER/EXT PWR port. Connecting an incompatible device may result in damage to the device.

Table 4-3: Analog input pinouts

Input	Pin	Description	Input	Pin	Description
1	1	PWR - Power	3	1	PWR - Power
	2	AI - Input signal		2	AI - Input signal
	3	GND - Input ground		3	GND - Input ground
2	1	PWR - Power	4	1	PWR - Power
	2	AI - Input signal		2	AI - Input signal
	3	GND - Input ground		3	GND - Input ground

Figure 4-3: Analog input pinouts



4.4.2 Analog output pinouts

[Table 4-4](#) and [Figure 4-4](#) identify the AO pinouts.

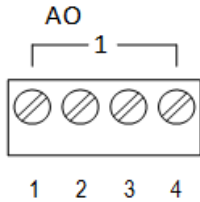


NOTICE – Equipment damage. Before connecting to pin 1 (PWR), make sure that the external device is compatible with the input voltage at the CHARGER/EXT PWR port. Connecting an incompatible device may result in damage to the device.

Table 4-4: 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 4-4: Analog output pinouts



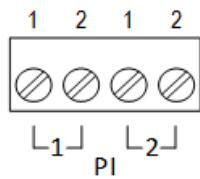
4.4.3 Pulse input pinouts

Table 4-5 and Figure 4-5 identify the PI pinouts.

Table 4-5: Pulse input pinouts

Input	PIN	Description
1	1	INP - Pulse input 1
	2	GND - Ground
2	1	INP - Pulse input 2
	2	GND - Ground

Figure 4-5: Pulse input pinouts



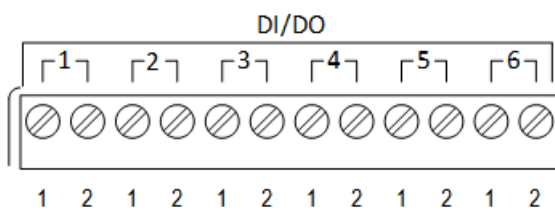
4.4.4 Digital input and output pinouts

Table 4-6 and Figure 4-6 identify the DI/DO pinouts.

Table 4-6: Digital I/O pinouts

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

Figure 4-6: Digital I/O pinouts



4.5 Connect TFIO modules

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



NOTICE – Equipment damage. When the TFIO interface is disabled, the module(s) remain powered. Remove the power from the RMC before connecting or disconnecting additional TFIO module(s) or the TFIO cable. Failure to power down the RMC may result in damage to the module(s).

[Table 4-7](#) identifies the different module types available. The RMC does not support the TFIO CIM module part number 2100421 supported by other Totalflow equipment. For serial port capacity expansion options, see section [7.3 Expand serial communications](#).



IMPORTANT NOTE: [Table 4-7](#) includes module and embedded software base part numbers only. The same part number is used for each module type. An additional revision-level number identifies the module generation. For example, for the Valve Control Combo I/O module, a module with part number 2100412-001 identifies a legacy (green) module, while part number 2140412-010 identifies a newer module.

Table 4-7: TFIO modules

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



NOTICE – Equipment damage. Power compatibility for TFIO modules depends on module generation:

- Older green modules must only use 12 Vdc.
- M2 modules and newer gray modules can use 12 or 24 Vdc.
- A combination of green modules and M2 modules or gray modules must only use 12 Vdc.

To connect the TFIO module(s):

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: A maximum of 22 modules is supported by each port. 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 according to [Table 4-8](#).
10. Insert the wires in the required TFIO pins.
11. Tighten the terminal connector screws.



NOTICE – Equipment damage. Do not overtighten the terminal connector screws as this may damage the wire.

Figure 4-7 shows the side view of a TFIO module and its pinouts.

Figure 4-7: TFIO module

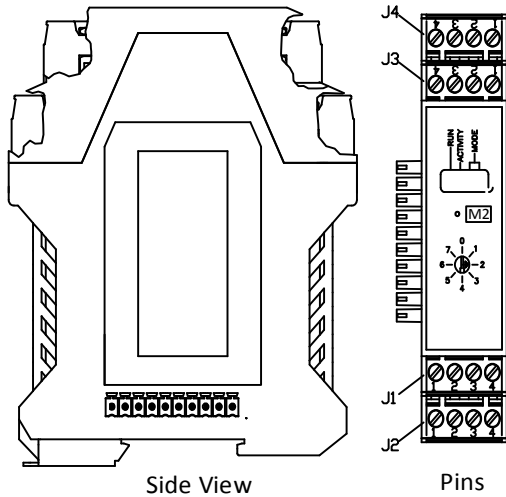


Table 4-8 through Table 4-13 identify the wiring pins for the TFIO modules used with the RMC. The wiring pins are the same for legacy TFIO modules.



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

J2-1, J4-1 and J4-3 (Table 4-8) and J1-1, J2-1, J3-1, J4-1 (Table 4-9)

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

Table 4-8: TFIO valve control interface module

	J1	J2	J3	J4
1	POINT 1 SIG	AO Vdc source	POINT 3 SIG	POINT 5 SIG
2	POINT 1 GND	AO Isink	POINT 3 GND	POINT 6 SIG
3	POINT 2 SIG	AO Isource	POINT 4 SIG	POINT 7 SIG
4	POINT 2 GND	AO Vdc common	POINT 4 GND	POINT 8 SIG

Table 4-9: TFIO analog output (4-20 mA) module

	J1	J2	J3	J4
1	AO1 Vdc source	AO2 Vdc source	AO3 Vdc source	AO4 Vdc source
2	AO1 Isink	AO2 Isink	AO3 Isink	AO4 Isink
3	AO1 Isource	AO2 Isource	AO3 Isource	AO4 Isource
4	AO1 Vdc common	AO2 Vdc common	AO3 Vdc common	AO4 Vdc common

Table 4-10: TFIO analog input module

	J1	J2	J3	J4
1	AI1 (+)	AI3 (+)	AI5 (+)	AI7 (+)
2	AI1 (GND)	AI3 (GND)	AI5 (GND)	AI7 (GND)
3	AI2 (+)	AI4 (+)	AI6 (+)	AI8 (+)
4	AI2 (GND)	AI4 (GND)	AI6 (GND)	AI8 (GND)

Table 4-11: TFIO combo digital module and extended

	J1	J2	J3	J4
1	POINT 1 SIG	POINT 3 SIG	POINT 5 SIG	POINT 7 SIG
2	POINT 1 GND	POINT 3 GND	POINT 5 GND	POINT 7 GND
3	POINT 2 SIG	POINT 4 SIG	POINT 6 SIG	POINT 8 SIG
4	POINT 2 GND	POINT 4 GND	POINT 6 GND	POINT 8 GND

Table 4-12: TFIO thermocouple module

	J1	J2	J3	J4
1	Shield	Shield	Shield	Shield
2	TC1 (J-Wht/K-Yel)	TC2 (J-Wht/K-Yel)	TC3 (J-Wht/K-Yel)	TC4 (J-Wht/K-Yel)
3	TC1 Red (-)	TC2 Red (-)	TC3 Red (-)	TC4 Red (-)
4	Shield	Shield	Shield	Shield

Table 4-13: TFIO RTD module

	J1	J2	J3	J4
1	OUT	OUT	OUT	OUT
2	(+)	(+)	(+)	(+)
3	(-)	(-)	(-)	(-)
4	IN	IN	IN	IN

See section [8.6](#) to configure the TFIO interfaces.

5 Power the RMC

This section describes two modes for powering the controller:

- Battery mode: Power is supplied by a 12 volt battery with a charger (see section [5.2](#).)
- External power mode: Power is supplied by an external power source (see section [5.3](#).)

Review section [5.1](#), follow the instructions for the appropriate power mode, then continue to section [5.4](#) [Lithium battery](#).



NOTICE – Equipment damage. Power compatibility for TFIO modules depends on module generation:

- Older green modules must only use 12 Vdc.
- M2 modules and newer gray modules can use 12 or 24 Vdc.
- A combination of green modules and M2 modules or gray modules must only use 12 Vdc.

5.1 Power on sequence

The RMC power on sequence is initiated as soon as power is connected. The following information may be displayed on the LCD 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 [5.1.1](#).)
- APP 2105457-XXX: indicates the flash version



IMPORTANT NOTE: The scrolling duration of the displayed items may vary. When the DATE/TIME displays, the power on sequence is completed.

5.1.1 Super capacitor

The RMC design includes a super capacitor (Super CAP) that serves as a short-term power reservoir. The first time that the unit is powered up, or if the RMC is left powered off for several hours or longer, the boot time is approximately 2 minutes to allow for charging of the super capacitor. Once the capacitor is fully charged, the boot time is considerably less.



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

5.2 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 solar panel system as the charger. These instructions should be adapted for alternate installations.



IMPORTANT NOTE: Make sure the battery and charger meet the specifications requirements given in section [2.2](#).

5.2.1 Connect the battery (dc power)

The hardware required for a battery installation is a 12 volt sealed lead acid (SLA) battery and the battery cable. 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 where it will be used.



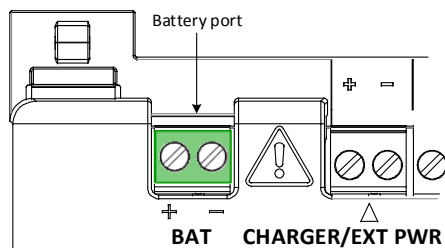
WARNING – Bodily injury and property damage. Do not allow the battery terminals or cable ends, if attached, to come in contact with any metal surface. When the positive and negative battery terminals contact a conductive material, this creates a short circuit and could result in sparks, property damage,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

2. Connect the battery to the terminals ([Figure 5-1](#)). The power terminal block is green. Observe the polarity (+ and -).



WARNING – Bodily injury and property damage. All wiring of peripheral or external devices to the controller should be completed prior to applying power (connecting the battery). Connect the battery before connecting the charger cable.

Figure 5-1: Battery port



3. Confirm that the battery is supplying power to the RMC by observing the power on sequence information scrolling on the LCD (see details in section [5.1](#)). When the DATE/TIME display, the sequence is complete.
4. If the power on sequence fails to initiate or complete, press the reset button shown in [Figure 5-4](#).

5.2.2 Connect the charger

The RMC may use a solar panel (20 Watt or less) with Nominal 12 Vdc output voltage. The solar panel may be mounted on a 2 inch pipe or the top or side of a meter house. Call the ABB main office number

listed on the last page of this guide for questions about mounting the solar panel on the top or side of a meter house.



NOTICE – Equipment damage. Alternate installations could use a power source instead of a solar panel charger. When using a power source, the output must be 14.5 Vdc to 15.5 Vdc maximum as described in section [2.2](#).

Failure to use chargers that meet the required voltage specifications may cause equipment damage.

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

For optimum charging, avoid placing the solar panel where it will be in shadows for any part of the day.

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

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

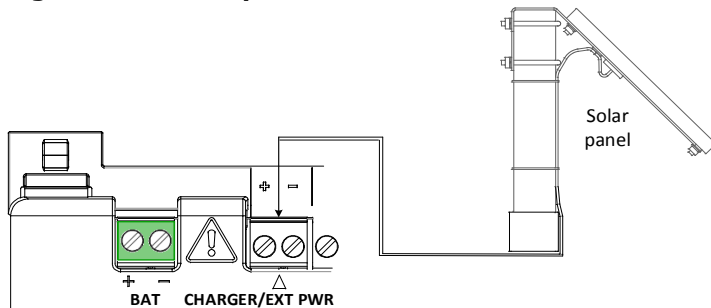


NOTICE – Equipment damage. Never connect the solar panel or alternate charger cable to the RMC before the battery is connected to the BAT port ([Figure 5-1](#)).

To connect the solar panel charger (adapt instructions if connecting to a power source as a charger):

1. Verify that the solar panel is operating properly before installation:
 - a. Check the solar panel using a digital voltmeter to verify polarity and output voltage. Voltage varies depending on the amount of sun, angle to sun, etc.
 - b. If the measured output voltage is within the manufacturer's specification as defined by the specification sheet supplied with the panel, continue with the installation.
 - c. If the measured voltage is out of specification, call the ABB main office number listed on the last page of this guide for a replacement panel.
2. Connect the solar panel cable to the CHARGER/EXT PWR terminals as shown in [Figure 5-2](#). Observe the polarity (+ and -).

Figure 5-2: Solar panel connection



3. 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.

Continue to section [5.4 Lithium battery](#).

5.3 Power with external power

The controller can be powered from an external power supply (9 to 30 Vdc).



IMPORTANT NOTE: Make sure that the external power supply meets the specifications given in section [2.3](#).

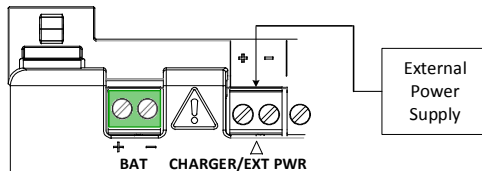


NOTICE – Equipment damage. A battery cannot be used when the controller is in the EXT PWR mode.

To wire an external power supply to the controller:

1. Follow the manufacturer’s instructions supplied with the external power supply to install and connect it to a power source.
2. Connect the external power supply cable to the CHARGER/EXT PWR terminals as shown in [Figure 5-3](#). Observe the polarity (+ and -).

Figure 5-3: External power supply connection



3. Apply power to the external power supply.
4. Confirm that the RMC is receiving power by observing the power on sequence information scrolling on the LCD (see details in section [5.1](#)). When the DATE/TIME display, the sequence is complete.
5. If the power on sequence fails to initiate or complete, press the reset button shown in [Figure 5-4](#).

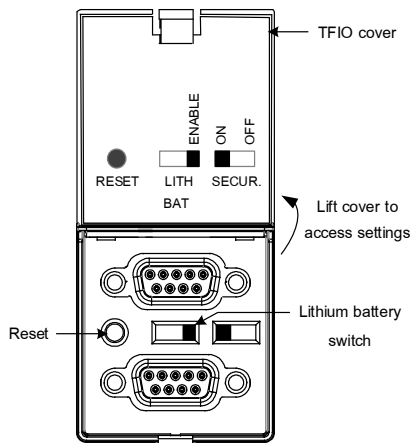
5.4 Lithium battery

The lithium battery serves to retain operation of the real time clock with the lithium battery backup switch. The switch is located between the TFIO ports and is accessed by 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 ensure the lithium battery is enabled, insert a small screwdriver in the slot and move the switch to the ENABLE position as shown in [Figure 5-4](#).

Figure 5-4: Lithium battery switch



6 Establish local communication

Establish initial communication with the RMC-100 with a direct connection to the USB or Ethernet ports.

6.1 Local connection on USB

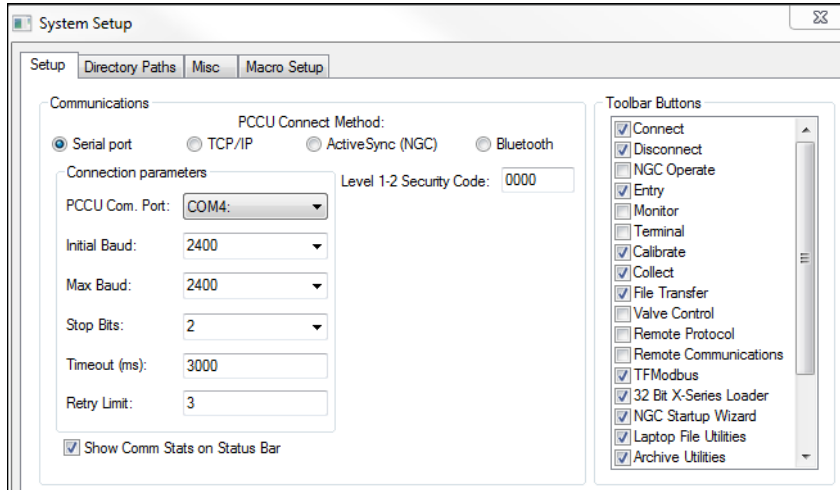
Local communication between a host system (laptop or PC) and the RMC can be established by a direct USB connection.

The following instructions are for a USB port connection. The required USB cable has a USB 2.0 Type B plug to a USB 2.0 Type A plug.

To set up local communication using the USB port:

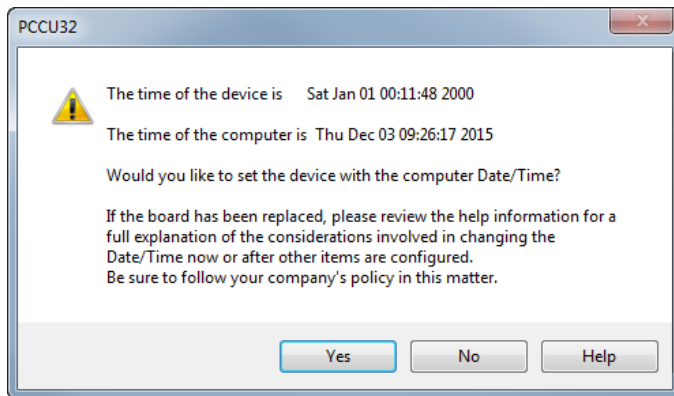
1. Power on the RMC and laptop.
2. Connect the USB cable. An annunciator in the RMC LCD displays a lower case “u” for local USB connection.
3. On the laptop start PCCU.
4. On the PCCU32 tool bar, click **Setup**. The System Setup window displays ([Figure 6-1](#)).

Figure 6-1: System setup



5. Under Communications, in the Setup tab, select the **Serial port** radio button.
6. Select the PCCU Com. Port from the drop-down list (the computer USB port that the cable is connected to).
7. Click **Close**.
8. On the PCCU32 tool bar, click **Entry** to connect to the device. When the connection is successful, the PCCU32 Entry screen displays.
9. If the RMC calendar clock is different from the laptop’s date and time, a message box displays to synchronize the date and time ([Figure 6-2](#)).

Figure 6-2: Synchronize date and time

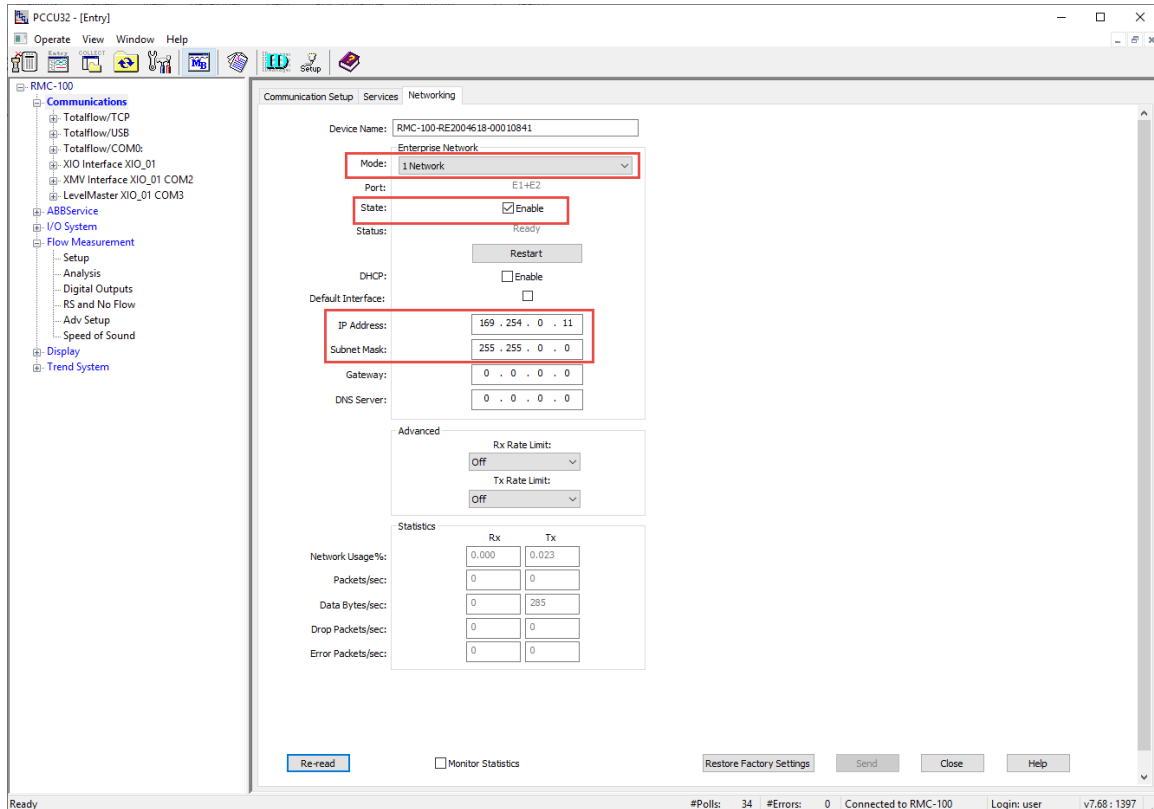


10. Click **Yes**. The RMC calendar clock is synchronized with the laptop date and time.

6.2 Local connection on Ethernet

[Figure 6-3](#) shows the default Ethernet configuration of the RMC. The RMC is configured as a 2-port Ethernet switch from the factory. 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. Both ports are enabled by default.

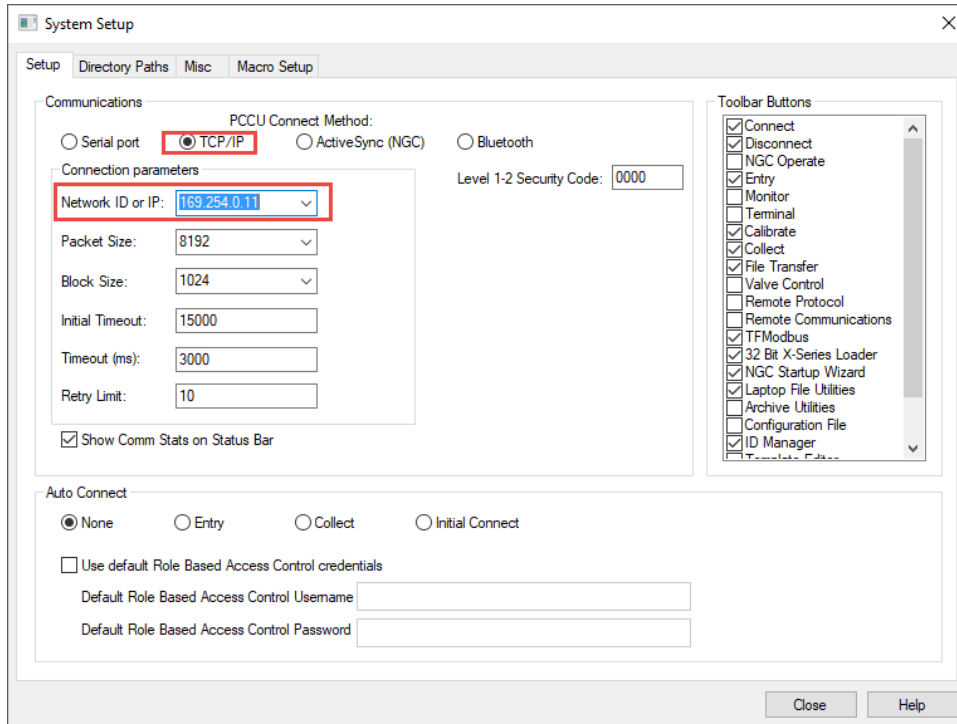
Figure 6-3: Factory default Ethernet configuration



To establish local connection:

1. Connect the laptop to either Ethernet port.
2. Start PCCU32.
3. Click the Setup icon on the PCCU32 toolbar menu. The System Setup window displays.
4. Under Communications, select **TCP/IP**.
5. Under Connection Parameters, type the IP address: **169.254.0.11**.

Figure 6-4: Connection setup when using Ethernet for local communication



6. Click **Close** to exit connection setup and return to the main PCCU screen.
7. Click **Entry** on the top PCCU tool bar to establish connection.

6.3 Configure the station

To configure the station:

1. At the PCCU32 Entry screen, click the station ID name in the top node of the navigation tree. The Station Setup tab displays.
2. Set up the basic settings identified in [Table 6-1](#).

Table 6-1: Required Station setup

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

3. Verify the Lithium Battery Status is OK in a green bar ([Figure 6-5](#)). If the status is "Low Voltage" or "Not Connected", the field background color is red. Refer to Troubleshooting in the RMC-100 user manual to determine and resolve the problem before continuing with startup instructions.

Figure 6-5: Station Setup screen

Station Setup		
Applications App Licensing Selectable Units Setup Battery Information Resources System Log Security Log Registry		
	Description	Value
0.0.4	Station ID	USCALCTEST
0.0.5	Location	Measurement and Control
0.9.0	Date/Time	12/02/2015 16:53:25
0.9.0	Set Device with PCCU Date/Time	No
	--- Security ---	
0.0.6	Security Code Level 1	
0.0.7	Security Code Level 2	
0.7.3	Security Switch Status	Off
	--- Sleep Mode ---	
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
	--- Lithium Battery Status ---	
0.7.10	Lithium Battery Status	OK
	--- Backup ---	
0.21.0	Update Cold Start Configuration	No Operation

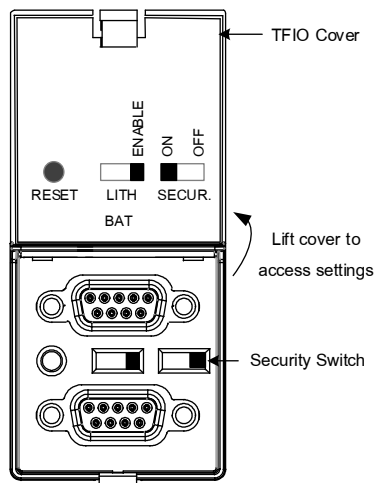
4. Change any other settings in the Station Setup tab as needed. Leave PCCU open on the Station Setup tab. For more information, refer to the RMC user manual.

6.4 Configure security

Configuring the security is optional. To configure the security settings:

1. Ensure that the security switch is set to off. The switch is located between the TFIO A and TFIO B connectors on the RMC ([Figure 6-6](#)).

Figure 6-6: Security switch



2. Return to the PCCU32 **Station Setup** tab.
3. Verify the Security Switch Status field shows **off** ([Figure 6-5](#)). The security codes cannot be configured if the status is on.
4. Type a four-digit security code for Security Code Level 1 (read only access).
5. Type a four-digit security code for Security Code Level 2 (read and write access).



IMPORTANT NOTE: Take note of the security codes typed. Once saved, they are not visible on the Station Setup tab.

6. Click **Send**.
7. Set the RMC security switch to **ON**.

- Click **Re-read** and check that the security switch status is on to begin enforcement of the security codes.



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

- Call the ABB main office number listed on the last page of this guide if you need further assistance with security.

6.5 Change the LCD display

The factory configuration has a default date and time display. To change the display to preferred settings:

- On the Station Setup tab, scroll down to the LCD Display Date/Time Format section ([Figure 6-7](#)).

Figure 6-7: LCD display date and time format

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

- Select the preferred Date/Time Format (mmddy or yymmdd).
- Select the preferred Date Separator (slash, dash, or period).
- Select the preferred Time Separator (colon or period).
- Click **Send** to save the station settings.

7 Configure communications

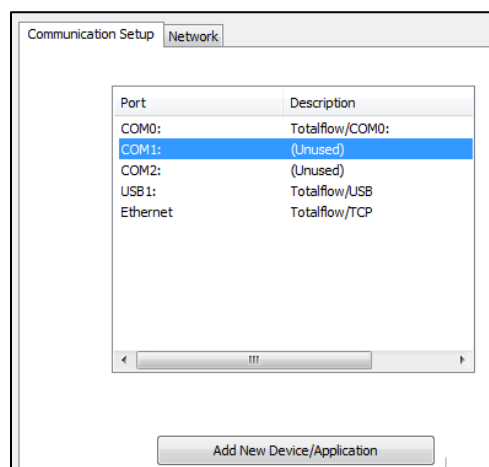
7.1 Configure the COMM ports

This configuration is for COMM1 and COMM 2 communication ports when connecting one or more serial devices. These ports are software-configurable to support RS-232, RS-422, and RS-485.

To configure the ports:

- Ensure the power LED on the COMM module is on (green).
- In PCCU, click **Communications** on the navigation tree. The Communications Setup tab displays ([Figure 7-1](#)).

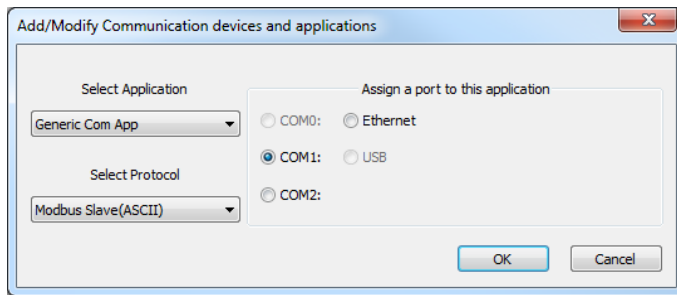
Figure 7-1: COMM port configuration



- Verify that the port is unused.
- Select the appropriate port (COM1 or COM2).

5. Click **Add New Device/Application**. The Add/Modify Communication device and applications box displays ([Figure 7-2](#)).

Figure 7-2: Add communication



6. Select the appropriate application from the Select Application drop-down list.



IMPORTANT NOTE: Some of the applications in the list are designed for specific ABB 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 user-defined Port Description. Ensure the port description uniquely identifies the port.
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**.

If the protocol selected in the Add/Modify Communication device and application box is MODBUS®, select the appropriate register format.

11. If configuring the interface as RS-485 or RS-422, select the Bus termination check box only if the RMC is the last device on the RS-422 or RS-485 communication bus.
12. Change the default values for time outs and delays as needed. Consult the external device's specifications to determine appropriate settings.
13. Click **Send changes to device**. Verify that the new port name displays under Communications on the navigation tree.

The LED lights on the top of the communication module show that data is being sent (TXD) and received (RXD) when the external device begins communicating with the RMC. When the RMC is powered on, the PWR LED light should be on.

[Figure 7-3](#) provides a communication configuration example to connect an ABB Totalflow product, such as a multivariable transmitter or XMV. The XMV Interface is chosen to support this type of connection.

Figure 7-3: Serial port configuration to connect XMVs

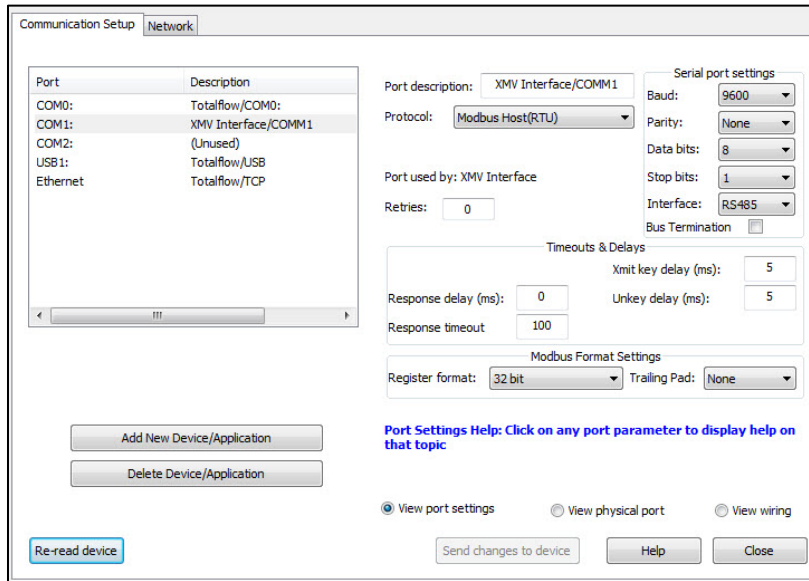
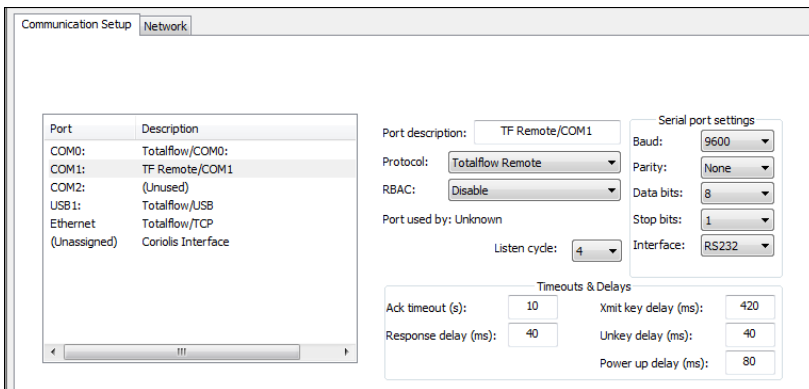


Figure 7-4 provides a communication configuration example to connect equipment for remote communication such as a radio. The Generic Com App is chosen to support this type of connection.

Figure 7-4: Serial port configuration for remote communication



7.2 Configure Ethernet (network) communication

To configure the RMC for network communication, determine the required network topology first. 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.

- 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.
- 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.

The Ethernet interface supports static (manual) or dynamic (DHCP) IP addressing. Static addressing is recommended. Follow the procedure that applies to the required topology and Ethernet mode.



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



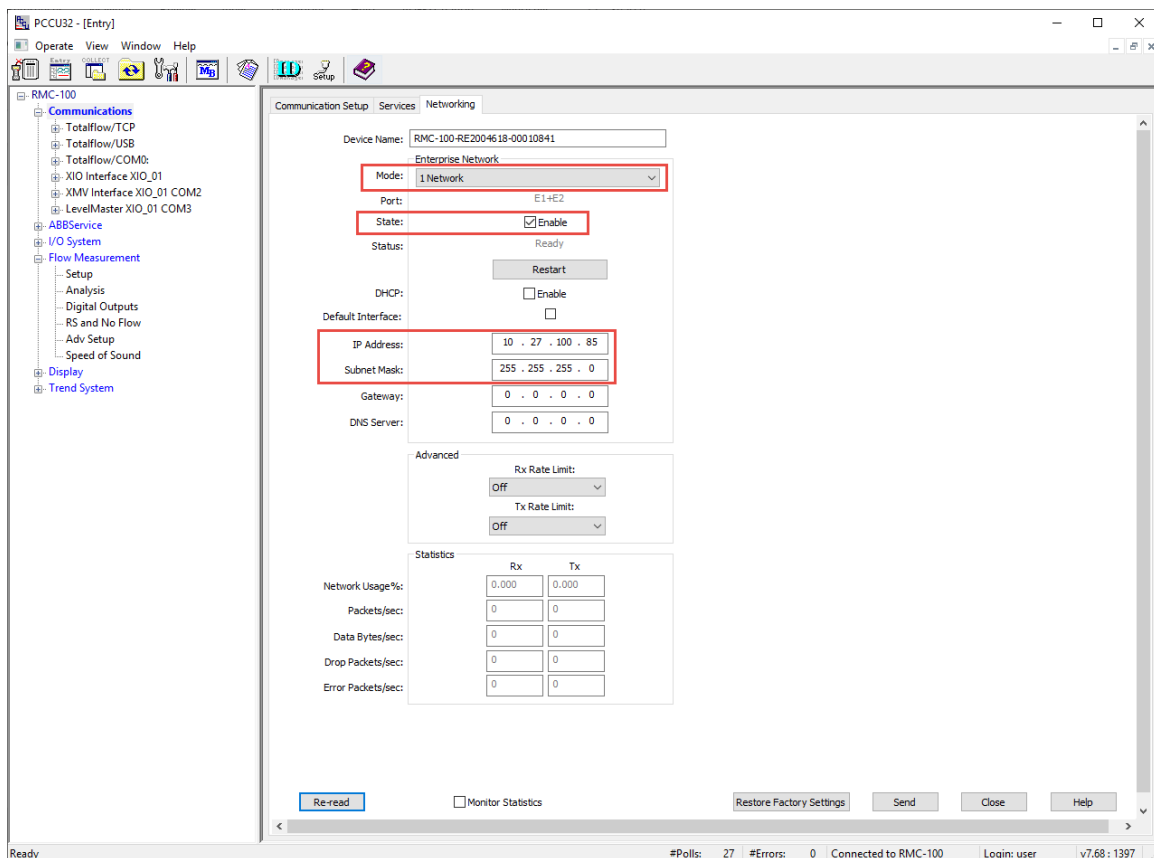
IMPORTANT NOTE: If you are connected to one of the Ethernet ports to configure the RMC-100, changing the Ethernet configuration and restarting the interface will cause you to lose connection. Make sure to configure your laptop with an IP address compatible with the new IP address assigned to the RMC.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

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

To configure the network parameters:

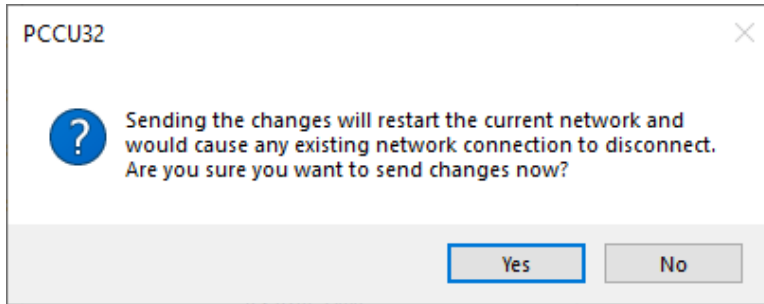
1. Connect the Ethernet cable from the RMC to the network communication equipment (hub, switch, router, etc.).
2. Verify the Ethernet port LED is green (the network Ethernet link is on).
3. Start PCCU on the laptop.
4. Configure the network parameters:
 - a. Select **Communications** on the PCCU navigation tree. The Communications Setup tab displays.
 - b. Select the **Networking tab** (Figure 7-5).
 - 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, type each of the parameters: IP Address, Default Gateway, and Subnet Mask.

Figure 7-5: Network communication for 1 Network mode



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

Figure 7-6: Warning before Ethernet interface restart



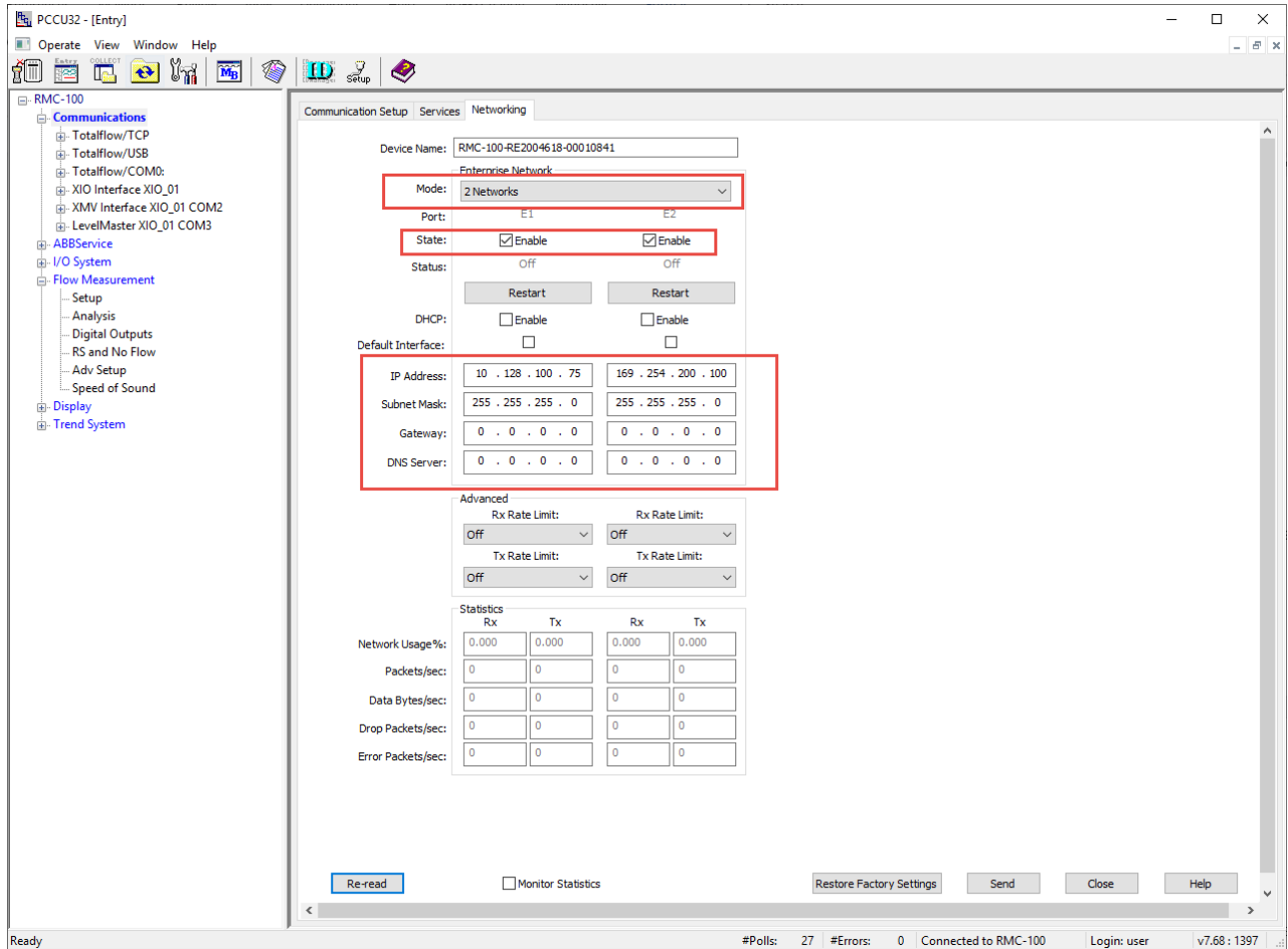
7. Click **Yes**.
8. Click **OK**.
9. Verify that the configuration is correct. If DHCP is enabled, ensure the RMC has obtained its required IP parameters (the IP parameter fields must be automatically populated after the restart).
10. Ping the device from the WAN or field network. The RMC should reply 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.

7.2.2 Configure the RMC for 2 Network mode

To configure network parameters:

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 7-5](#)).
 - 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 7-7: Network communication for 2 Network mode



7.3 Expand serial communications

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 [7.2 Configure Ethernet \(network\) communication](#).

7.3.1 Expand with ABB’s XIO

The RMC supports serial port expansion through ABB’s Extendible IO devices (XIOs). The RMC can obtain measurement data from peripherals such as measurement transmitters connected to XIO COM ports. 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 two options to implement RMC-remote device communication are:

- Use the RMC’s XIO Interface application for RMC-XIO communication.
- Use the XIO’s Ethernet-to-Serial Passthrough application for RMC-XIO communication.

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. See [Additional information](#) for a link to the document.



IMPORTANT NOTE: The two configuration options for connection with the XIO (XIO Interface and Ethernet-to-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.

7.3.2 Expand with third-party serial-to-Ethernet module

The RMC also supports serial port expansion through third party Serial-to-Ethernet modules. The RMC can obtain measurement data from peripheral devices such as measurement transmitters connected to

the third-party devices performing Ethernet-to-Serial passthrough. The configuration instructions for the third-party device are provided from their manufacturer. For additional details, refer to the RMC-100 user manual. See [Additional information](#) for a link to the document.



IMPORTANT NOTE: Using a third-party serial-to-serial Ethernet device does not provide any integrated monitoring or troubleshooting capabilities as is provided when using the XIOs. The configuration of the device requires the vendor’s user interface which is separate from ABB’s PCCU.

8 Configure input and output

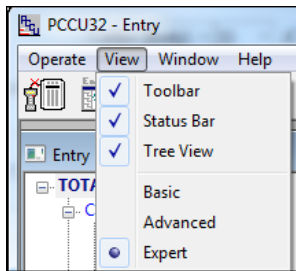
Complete the I/O configurations in PCCU32 Expert view mode and select the I/O System option in the navigation tree.

8.1 Change view option

The default view is the advanced option. This needs to be changed to expert view to configure the I/O ports. To change the view option:

1. On the top PCCU32 menu bar, select **View**.
2. Select the **Expert** option ([Figure 8-1](#)).
3. Click **Yes** at the warning and wait for the PCCU32 entry mode screen to refresh.

Figure 8-1: Expert view selection



8.2 Analog input configuration

The analog input configuration sets the AI to support the specific type, measurement and operating range of the external device. To reflect the external device's AI value range in non-default engineering units, the AI must be calibrated. For AI calibration, refer to the RMC-100 user manual. Analog inputs can be configured for voltage or current input signals. Choose the signal type that matches that of the external device.

To configure the analog input signal mode:

1. Select **I/O System** on the navigation tree. The Analog Inputs tab displays ([Figure 8-2](#)).

Figure 8-2: Analog input configuration

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

2. Select the Signal field for the required AI.
3. Select 0-30 Volt or 4-20 mA in the drop-down list.
4. Click **Send**.

8.3 Analog output configuration

The analog output configuration defines the AO value in percentage of the full scale or in engineering units. The engineering units depend on the type of external device connected to the AO and its operating or measurement range.

When defining non-default engineering units for the first time, it is recommended that the AO is calibrated first. Engineering units can be defined after calibration is completed. Engineering units defined on the calibration screen are automatically reflected in the Analog Output tab ([Figure 8-3](#)) screen. For AO calibration, refer to the RMC-100 user manual.

To change settings for the analog output after first-time calibration:

1. Select **I/O System** on the navigation tree.
2. Select the **Analog Output** tab ([Figure 8-3](#)).

Figure 8-3: 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	

3. Enter the AO percentage or the engineering units number.
4. Click **Send**.
5. Click **Re-read**.

8.4 Digital input/digital output configuration

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

In input mode, the input thresholds are configurable for an input voltage range of 0 to 30 Vdc. This mode supports signals from external devices with:

- Active voltage outputs types (non-dry contact): Digital Input (Voltage)
- Dry contact and open collector/drain output types: Digital Input (Dry-contact)

In output mode, the DO provides a MOSFET Open Drain (OD) type output capable of sinking up to 2 amps (direct current).

To configure each digital input or output:

1. Select **I/O System** on the navigation tree.
2. Select the **Digital I/Os** tab ([Figure 8-4](#)).

Figure 8-4: 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 (Voltage) is the default.
4. Configure each Digital I/O port as appropriate:
 - a. For digital input mode, select the low and high threshold voltage.
 - b. For digital output mode, select the current value and the initial value.
5. Click **Send**.

8.5 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 0 to 100 Hz.

To configure the pulse input:

1. Select **I/O System** on the navigation tree.
2. Select the **Pulse Inputs** tab ([Figure 8-5](#)).

Figure 8-5: 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. Go to the Debounce area of the screen.
4. Select **On** if debounce is required. Set this for each PI port if debounce is needed.
5. Click **Send**.

8.6 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.

9 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 interface on the RMC.

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



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

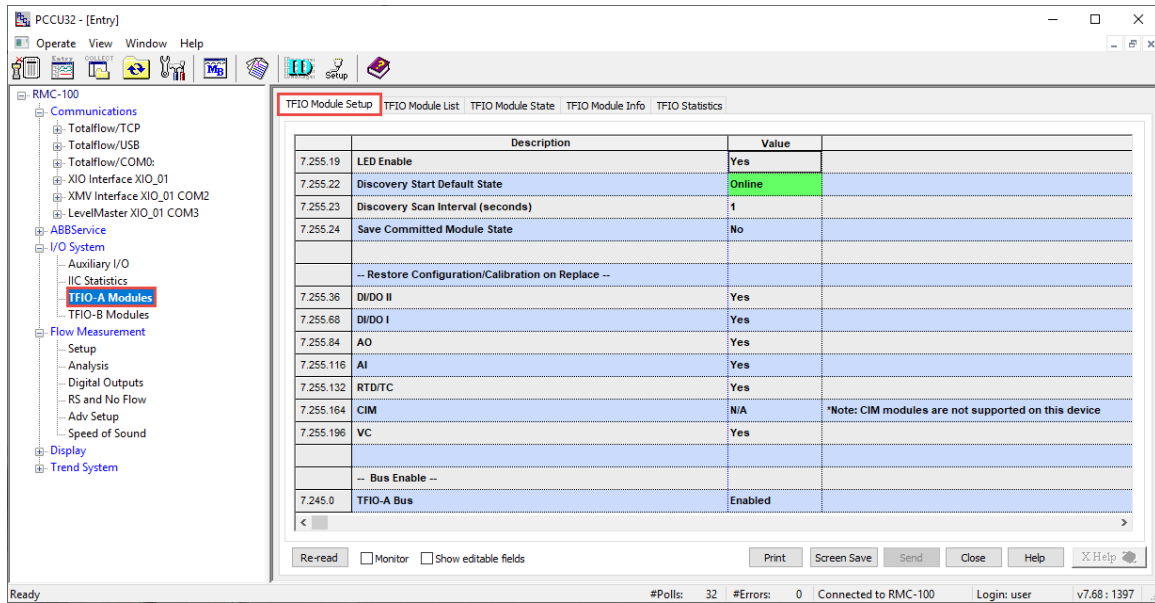


IMPORTANT NOTE: PCCU32 version 7.68 and later support TFIO module hot swap and additional configuration and troubleshooting options not available on earlier versions of PCCU.

To verify or enable communication with TFIO modules:

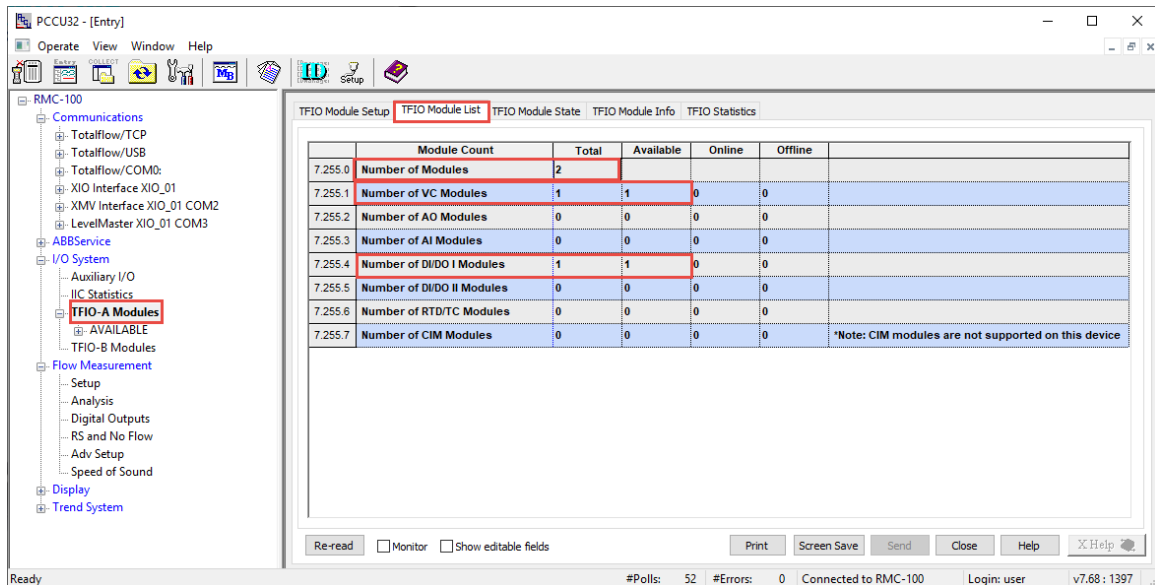
1. If modules were installed in TFIO-A, select **TFIO-A Modules** on the navigation tree. The TFIO Module Setup displays (Figure 9-1).

Figure 9-1: TFIO-A Modules Setup



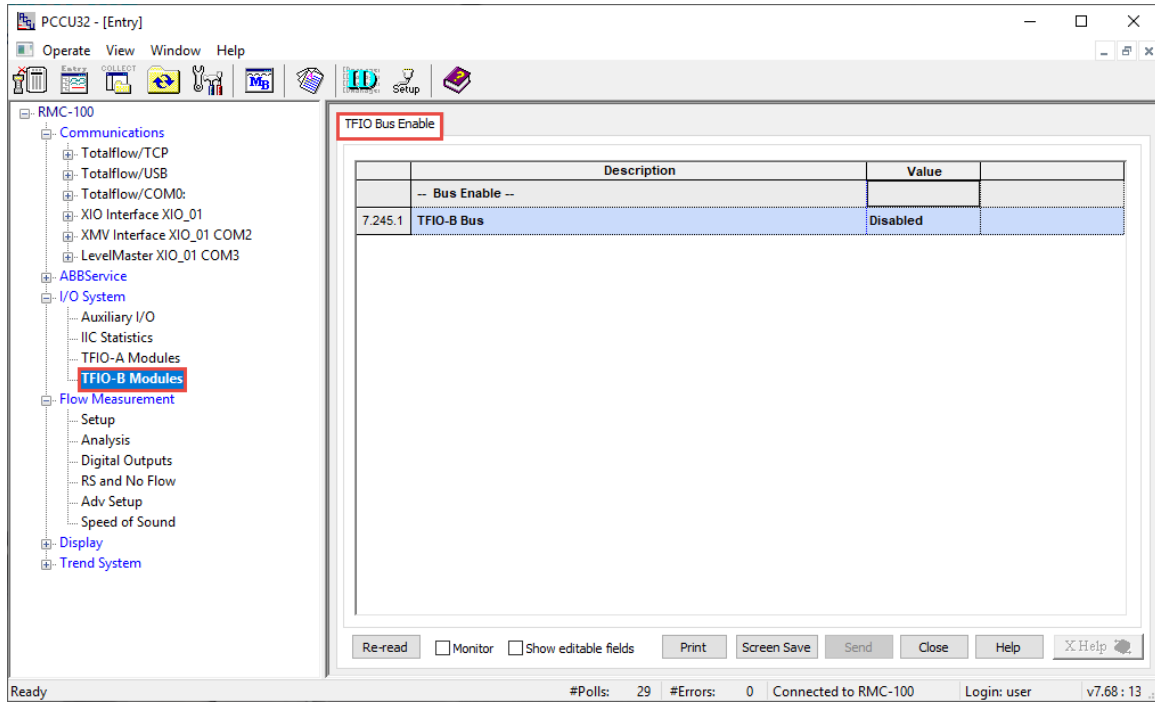
2. Click the **TFIO Module List** tab (Figure 9-2):
 - a. Verify all TFIO modules are connected and their type listed.

Figure 9-2: TFIO-A Module List



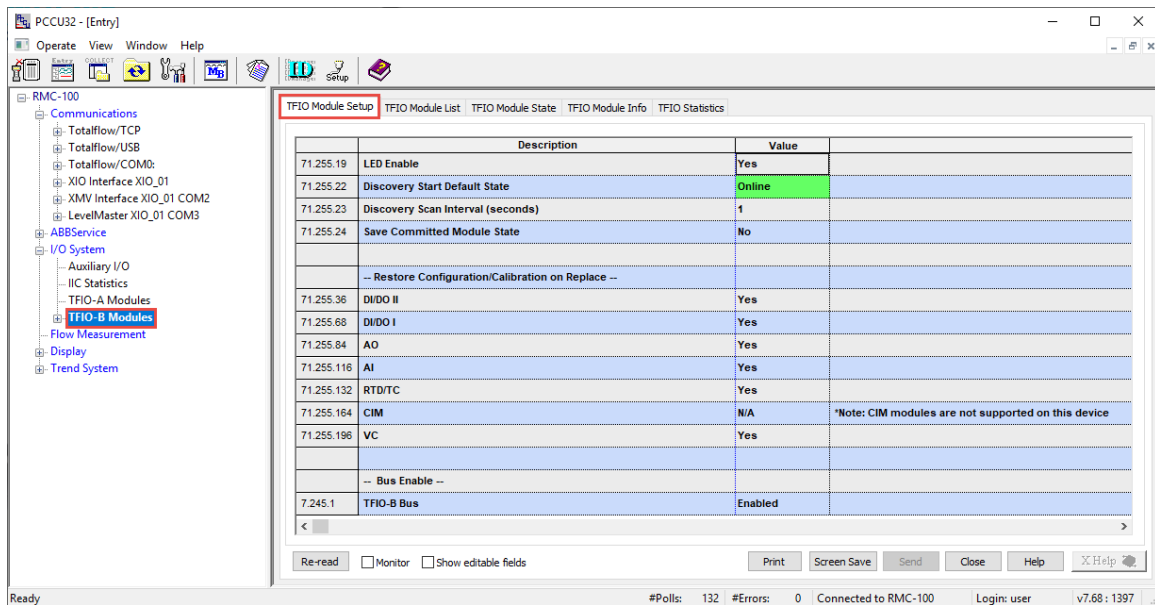
3. If modules were installed in TFIO-B, select **TFIO-B Modules** on the navigation tree. The **TFIO Bus Enable** tab displays (Figure 9-3).

Figure 9-3: TFIO-B Bus Enable tab (bus disabled by default)



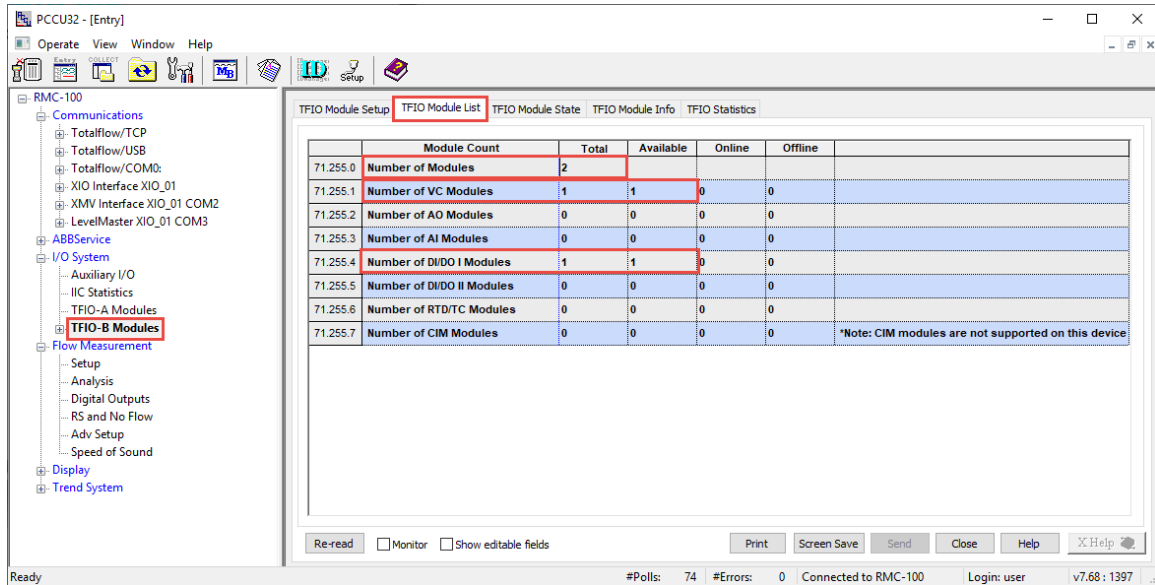
- a. Select the TFIO-B Bus field to change to **Enabled**.
- b. Click **Send**. The TFIO Bus Enabled screen clears and the navigation tree refreshes.
- c. Select **TFIO-B Modules** from the navigation tree. The **TFIO Module Setup** tab displays (Figure 9-4).

Figure 9-4: TFIO-B Module Setup



- d. Click the **TFIO Module List** tab.
- e. Verify all TFIO modules are connected and their type listed (Figure 9-5).

Figure 9-5: TFIO-B Module List



- f. 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.

10 Enable 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.

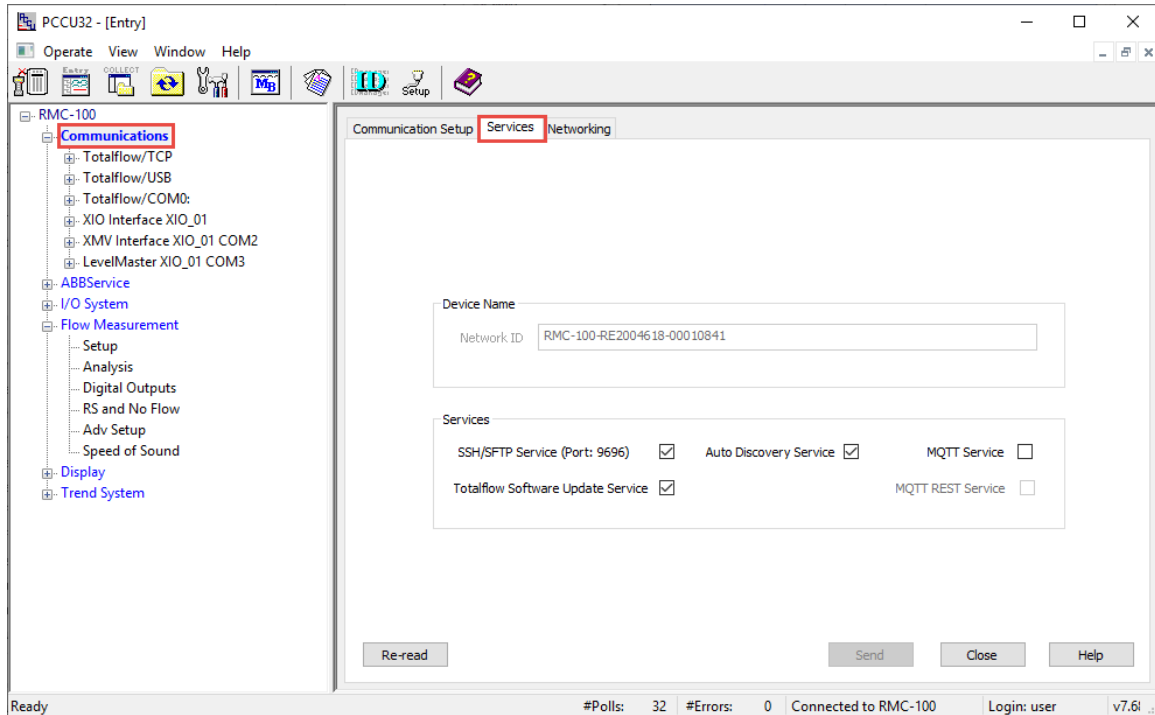


NOTICE – Cybersecurity risk: The RMC-100 is not an internet-facing device. Do not connect directly to the Internet. An MQTT gateway is required between the Digital Oilfield and the RMC. If the customer’s corporate network firewall is compromised, the RMC-100 would be at risk without the MQTT gateway.

Enable MQTT and REST (MQTT configuration interface):

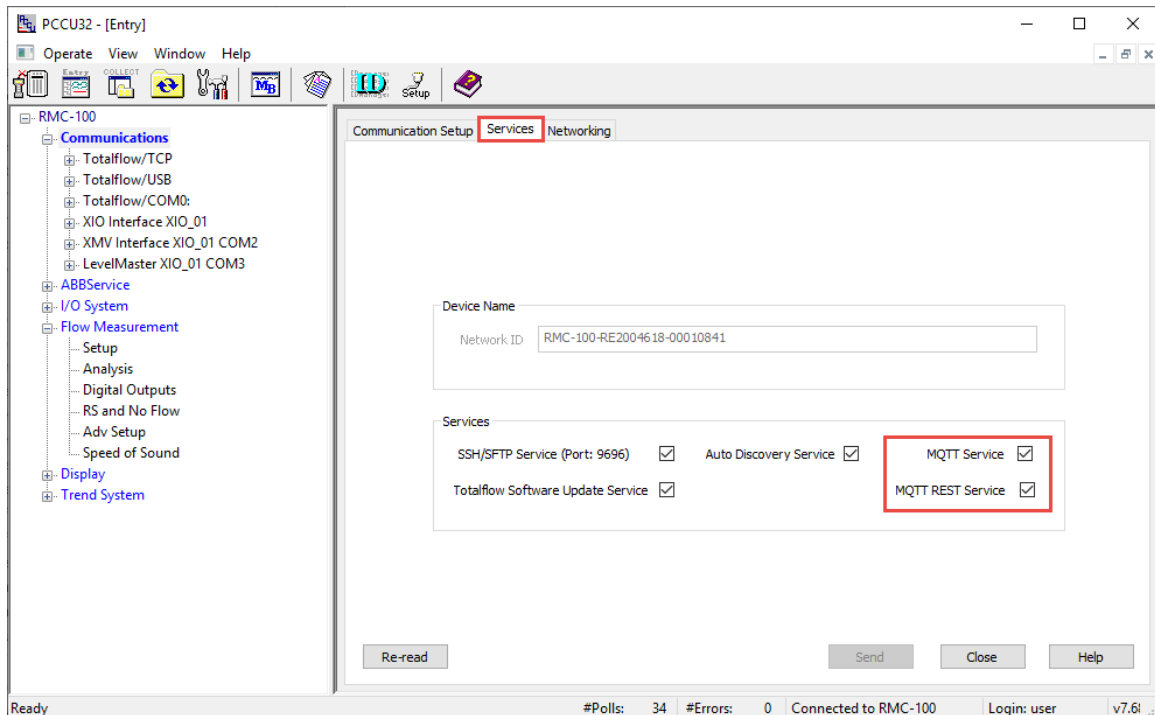
1. On the PCCU Entry mode navigation tree, select **Communications>Services** (Figure 10-1).

Figure 10-1: RMC-100 Services



2. Select the **MQTT Service** checkbox (Figure 10-2). 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 10-2: 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.

11 Troubleshooting

11.1 Visual alarm and status codes

After powering on, observe the LCD display. System alarms may display and indicate a condition to be resolved (Figure 11-1).

Figure 11-1: LCD display

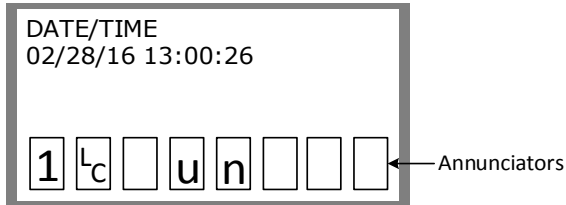


Table 11-1 provides a description of the alarms and status codes. The alarms provide a brief summary of the action to resolve the condition.

Table 11-1: Alarms and status codes

Indicator	Description and action
System	
(Blank LCD)	No annunciators or nothing on the display. No power to the controller. Action: Check the cable connections and check the voltage. Make a local connection with RMC and PCCU.
LL	Low Lithium Battery Alarm. When LL (low lithium) displays, the lithium battery voltage is below 2.5 Vdc. If lithium battery voltage is above 2.5 Vdc, LL appears shaded. A new lithium battery measures approximately 3.6 Vdc. Action: Replace the lithium battery.
LC	Low Charger. Displayed if the battery charging voltage is (+) 0.4 Vdc or is less than or equal to battery voltage. If (+) 0.4 Vdc battery charging voltage is greater than battery voltage, LC is shaded. Action: Check the cable connections and check the power source.
Display application	
1	A number represents the Display Group number currently displayed.
↑	The displayed item's value is above the Data High Limit value specified on the Display Item Setup screen.
↓	The displayed item's value is below the Data Low Limit value specified on the Display Item Setup screen.
Communication protocols	
→	Transmitting data: sending a response
←	Receiving data: processing a response
!	Nak: Negative acknowledgement with packet list
+	Acknowledgement: positive acknowledge of receipt of request
⏸	Waiting for Acknowledgement; waiting for response after transmission
?	Exception alarm processing
⏸	ID Recognized: The ID has been recognized but is waiting for "Sync"
⏸	Listen Cycle: flashes if this remote port is active and running Totalflow Remote Protocol. Flashes in sync with listening cycle that occurs at 1, 2 or 4 second intervals.
R	LevelMaster Protocol: LevelMaster protocol is selected for the port assigned to this annunciator
L	Displayed when connected to MMI port
U	Displayed when connected to USB port
¥	Packet Protocol: the Totalflow Packet Protocol selected on this port
MODBUS®	
M	MODBUS® ASCII protocol is selected for the port assigned to this annunciator
Valve control	
V	Displayed when the Valve Control option is on an Expanded I/O board (plug-in RTU). Other Valve Control symbols do not apply

Indicator	Description and action
+	Positive Acknowledge of receipt of request
=	Displayed when the valve control option is installed. Process value (PV) is within the user-set dead band.
┌	Valve is in full open position.
└	Valve is in full closed position.
↑	Valve is opening. (Open signal is being sent to the valve actuator.)
↓	Valve is closing. (Close signal is being sent to the valve actuator.)
□	Valve RMC override conditions met (DP/SP override set point or Low Battery)
LL	Local Lock-out is initiated.
Measurement application	
H	Hold: displayed when HOLD flag is active. HOLD displays when PCCU21 is being calibrated.
Z	Zero Flow Condition: visible only when Flow Rate is displayed.
A	Alarm Condition: need to view alarm. Compare application limits to current values to determine where the alarm condition is present
AD	A to D Failure: displayed 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: visible only when DP variable is displayed
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

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