User manual / 2105552 Rev. AC

Remote Modular Controller (RMC)
RMC-100

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

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General information

Read these instructions carefully prior to installation and commissioning. For clarity, these instructions do not contain details about every type of installation and, therefore, do not take into account every assembly, operating, or maintenance scenario. For further information, or for specific questions which are not addressed in this user manual, please contact ABB at the number listed at the back of this manual. The content of these instructions is neither part of nor provided for changing a previous or existing agreement, promise, or legal relationship. All obligations on ABB result from the respective sales contract, which also contains the full and valid warranty clauses. These are neither limited nor extended by the contents of these instructions.

Observe all warning signs on the packaging and on the device.

Safety warning and note conventions

DANGER – Serious damage to health / risk to life. This symbol, in conjunction with the signal word "DANGER", indicates an imminent danger. 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 what the result would be if not followed.

DANGER – Serious damage to health / risk to life. This symbol, in conjunction with the signal word "DANGER", indicates an imminent 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 what the result would be if not followed.

WARNING – Bodily injury. This symbol, in conjunction with the signal word "WARNING", indicates a potentially dangerous situation. Failure to observe this safety information may result in severe injury. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.

CAUTION – Minor injuries. This symbol, in conjunction with the signal word "CAUTION", indicates a potentially dangerous situation. Failure to observe this safety information may result in minor or moderate injury.

NOTICE – Property damage. This symbol indicates a potentially damaging situation. Failure to observe this safety 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. The signal words "IMPORTANT NOTE" do not indicate a dangerous or harmful situation.

Although "WARNING" hazards are related to personal injury and "NOTICE" hazards are associated with equipment or property damage, it must be understood that under certain operating conditions, operating damaged equipment can result in degraded system or process performance leading to serious or life-threatening injuries. Therefore, compliance with all "WARNING" or "NOTICE" hazards is required at all times.

The assembly, installation, commissioning, and maintenance of this equipment must be conducted only by authorized personnel, and in accordance with relevant national and local electrical codes. Ensure compliance with the regulations applicable in the country of use.

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

The following regulations must also be considered:

– The applicable standards and safety regulations concerning the construction and operation of electrical installations. For example, comply with the regulation on technical working materials (safety guidelines for tools).

– Follow the regulations and recommendations relating to explosion protection if installing equipment with explosion protection.

Compliance

EU Directive 2012/19/EU - Waste Electrical and Electronic Equipment (WEEE)

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.

Cyber security

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

Although ABB provides functionality testing on the products and updates that 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 system functionality in the customer's environment is as expected.

Additional information

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

Remote Modular Controller Startup Guide	2105551
Remote Modular Controller Data Sheet	2101126
TFIO Module User Manual	2101226

1 System description

The Remote Modular Controller (RMC-100) is the first phase of a new product line of the next generation platform of controllers. The RMC design meets a wide range of applications including measurement, automation, monitoring, alarming, asset data management, control, and data logging applications.

1.1 Features overview

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

The RMC supports I/O and communication expansion capability to expand over time.

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

1.1.1 General specifications

Table 1 provides the general specifications for the RMC.

Table 1: General specifications

Specification item	Description	
Operating voltage range	12 – 24 Vdc (+/- 20% variation, acceptable input range 9 – 30 Vdc)	
Nominal power	1.5 watts	
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 70° C (-40° F to 158° F) Storage temperature of -40° C to 85° C (-40° F to 185° F) or greater	
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, 1 kV to AC, 0.5 kV to DC & Signals EN 61000-4-5, Surge, 2 kV CM, 1 kV DC & Signals EN 61000-4-6, Conducted, 0.15-80 MHZ, 3 Vrms EN 61000-4-8, Magnetic Fields, 3 A/m 50/60 Hz	
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" UL No 508: “Industrial Control Equipment” 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”	

Specification item	Description
	ANSI/UL 60079-15: “Explosive atmospheres – Part 15: Equipment protection by type of protection 'n' ”
	UL No 50E: “Enclosures for Electrical Equipment, Environmental 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)”

1.2 Physical Description

DIN rail mountable housing provides a cover for the RMC components. The RMC meets Class 1, Division 2 certification requirements. Installation of the RMC can be in an enclosure or on an interior wall. Either one must meet the environmental ratings for the environment of the location. The top cover of the RMC provides access to the ports, security switch, battery back-up switch, reset button, LCD assembly, and four directional buttons.

Figure 1 identifies and Table 2 describes the housing components.

WARNING – Property damage. Do not connect a 12 volt SLA battery to the RMC if the external charging voltage or the external power supply is greater than 15.5 Vdc.

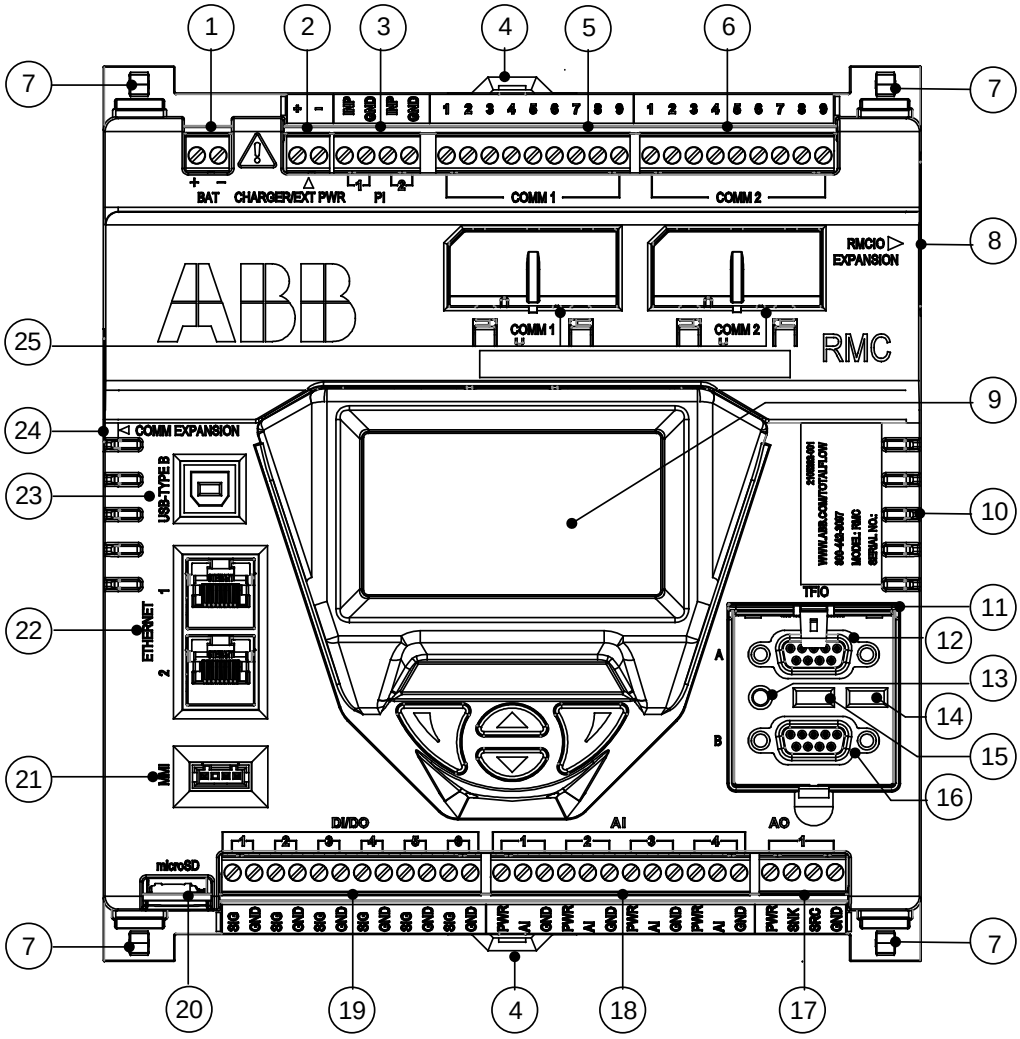


Figure 1: Housing Cover

Table 2: Housing identification

ID	Description	ID	Description
1	Battery connection (BAT)	13	Reset
2	Charger input when battery-powered, or external power when not battery-powered (CHARGER/EXT PWR)	14	Security switch
3	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 (AO)
6	COMM 2 connector	18	Analog input (AI)
7	Clip which holds the top to the housing base	19	Digital input/output (DI/DO)
8	RMC I/O Expansion connector (future use)	20	microSD 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

Four release clips (on each corner of the underside of the top housing) snap into the slots on the base of the housing to secure the top housing.

The RMC has grounding clips attached to the bottom of the electronic board. The grounding clips fit through the grounding slot to contact the DIN rail when mounted. Be sure to ground the DIN rail.

Figure 2 identifies and Table 3 describes the housing base components.

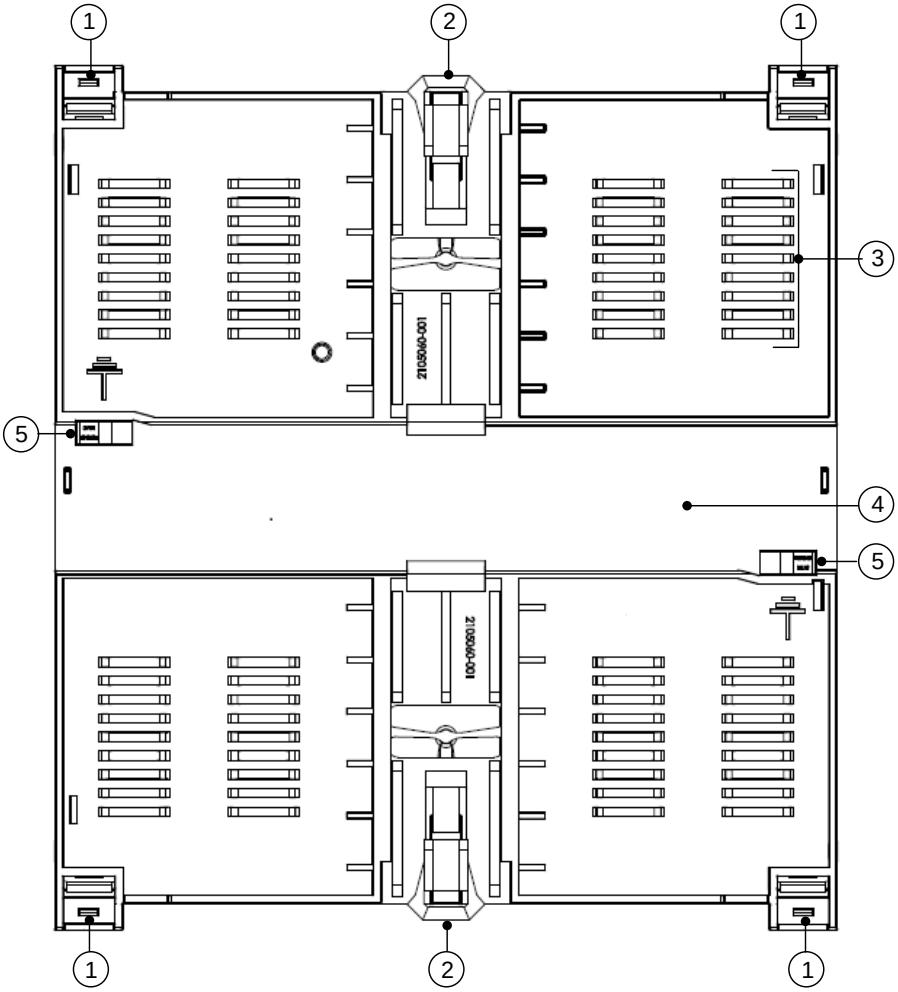


Figure 2: Housing base

Table 3: Housing base

Part ID	Description	Part ID	Description
1	Housing slot	4	Horizontal DIN rail slot
2	Spring release clip	5	Grounding slot
3	Vents		

1.2.1 LCD display

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

The LCD size measures approximately 1 5/8 x 2 7/8 inches, with 128 x 64 pixels used for display status and configuration data. Table 4 provides the LCD display characteristics and Figure 3 shows the display.

Table 4: LCD display characteristics

Characteristic	Display
Number of lines on the display	8 lines
Maximum number of characters per line	21
Character font size	8 x 6 pixels
Number of items displayed at one time	2 items (each items 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

As the data scrolls up the screen, each display item has two lines with the name of the item on the first line. The measurement value and unit displays 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.

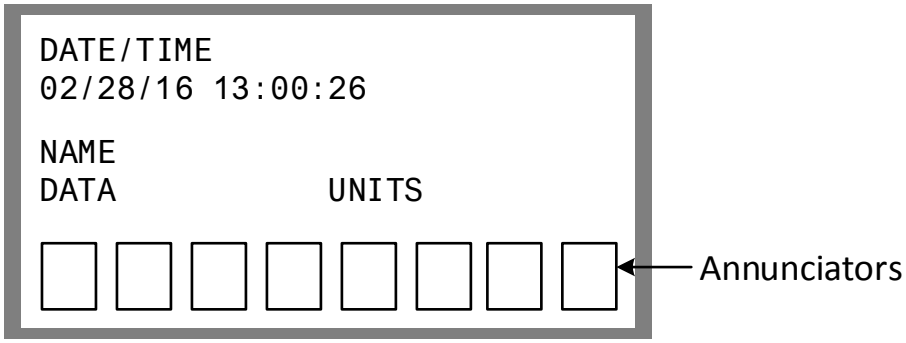


Figure 3: LCD Display

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

1.3 Electronic board

A plastic case houses the RMC electronic board. The electronic board components are processor, memory, communication ports, power ports, and input and outputs.

All RMC input and output connections have snap-in connector terminals. Table 5 provides the electronic board specifications.

Table 5: Board specifications

Component	Description
LCD interface	Parallel 128 x 64 graphic LCD with backlight
Directional button interface	Dedicated 4 button interface: up, down, left, and right
Core processor	Cortex A8 processer
Memory	256 Mbyte mDDR Application data and configuration files permanently stored in EMMC Flash. Factory supplied registry (MAC address, etc.) is stored in 256 byte E^2PROM
Operating speed	300 MHZ, or 720 MHZ option at purchase time
Communication ports	2 software configurable RS232/RS485/RS422 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 XSeries^{G4} MMI port
Digital input/output	6 open/drain outputs; each pin is 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 kHz)
I/O scan rate	Configurable up to 4 times per second
I/O expansion interfaces	2 independent TFIO module buses 1 RMCIO Expansion interface (Available for future use) 1 Type-A USB COM expansion (Available for future use)
Power	12 Vdc SLA battery input 9 – 30 Vdc external power source (no battery)
Charger	Nominal 12 V solar charger controller; solar panel maximum 30 watts (60 ˚C) Maximum 30 Ah SLA battery when using integrated charger controller
Security switch	On/Off supported in combination with two configurable security code levels
Time-based stability	± 7.5 ppm (parts per million)

1.3.1 Processor and memory

The RMC processor is available in two speeds: 300 MHZ or 720 MHZ. Table 6 indicates the memory components of the electronic board.

Table 6: Memory components

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

1.3.2 Communication ports

Communication ports provide communication between the RMC and host systems or external devices. Factory pre-configured ports support typical communication scenarios. Several communication protocols are available and supported by the ports.

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, etc.)

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 capability to support future external communication modules. Figure 4 identifies and Table 7 describes the ports and communication expansion interface.

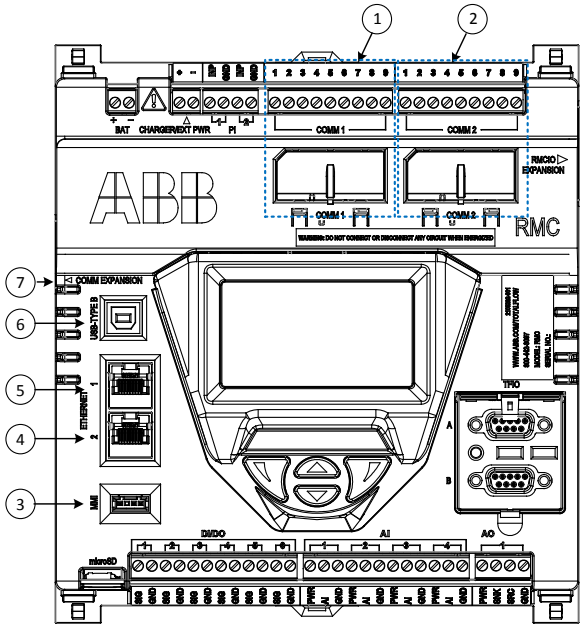


Figure 4: Communication ports

Table 7: Communication data speed and use

ID No.	Port name	Data transfer rate (port speed)	Use
1 and 2	COMM 1 and COMM 2	2,400 to 115,200 bps	Remote or local serial communication configurable for either RS232, RS422 or RS485
3	MMI	Baud Rate: 2,400 to 115,200 bps (manually configurable from the user interface)	Local serial communication (RS232)
4 and 5	ETHERNET 1 and ETHERNET 2	100 Mbps or 10 Mbps full duplex (supports auto-negotiation, uses standard or straight-through Ethernet cable)	Local communications (high-speed TCP/IP-based local operator interface) Remote communication using TCP/IP connections over a network (management port) Daisy chain other Totalflow equipment (for example, additional RMCs, flow computers or transmitters, etc.) Connect Ethernet-to-serial devices
6	USB	Supports USB 2.0 full speed mode and high-speed mode	Local communication (high-speed serial local operator interface)
7	COMM EXPANSION	(future use)	

1.3.2.1 Serial communication ports

The COMM 1 and COMM 2 slots contain a 40-pin connector to support hot swappable serial communication modules (Figure 5). These modules are software configurable for serial (RS-232, RS-485, or RS-422) communication. Use the same type of module for any of the communication types.

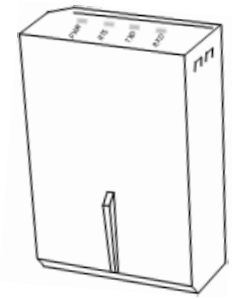


Figure 5: Hot swappable communication module

To activate the port, insert the communication module into the slot and configure the interface type required by the external device. Use the COMM terminal connectors for the physical wiring of the external device.

Maximum serial communication speed is dependent on the interface type configured and the distance between the RMC and the connected external device. Supported port speed ranges from 2,400 bps to 115,200 bps.

1.3.2.2 USB port

The USB Type B port provides high-speed serial communications between the RMC and equipment, host systems or computers with USB interfaces. When accessing the RMC using the USB port, use the PCCU32 version 7.55 or newer for configuration or upgrades.

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

1.3.2.3 Ethernet ports

The RMC has a three port 10/100 Base T Ethernet switch which provides 2 external ports and one internal (CPU-connected) port to support Layer 2 and Layer 3 communication between the RMC and external devices. Table 8 indicates the uses of the Ethernet ports.

Table 8: Ethernet ports

Port name	Data transfer rate (port speed)	Use
ETHERNET 1 OR ETHERNET 2	100 Mbps or 10 Mbps full duplex (supports auto- negotiation, uses standard or straight-through Ethernet cable)	External ports available for connections for: Local communications (high-speed TCP/IP-based local operator interface) Remote communication using TCP/IP connections over a network (management port) Daisy chain other Totaflow equipment (for example, additional RMCs, flow computers, transmitters, etc.) Connect Ethernet-to-serial devices
Not visible (Internal only)		Internal port. Not available for operator use. Handles all traffic to/ from the RMC's CPU.

Use either Ethernet port 1 or 2 for local operator access. The RMC's default private IP (169.254.0.11) may be used to support direct connection with a laptop configured for automatic private IP addressing.

IMPORTANT NOTE: Connect the Ethernet port to Ethernet-to-serial devices to expand the serial communication capacity of the RMC. For more information about using an Ethernet port for serial expansion see Appendix E.

The ports do not consume power until the system detects that the port is enabled and connected to a live jack.

1.3.2.4 MMI port

The MMI port provides a circular military-type EIA/TIA – 232 (RS-232) serial interface for direct serial communication between the RMC and a laptop. The port is configured, by default, to support local operator access using PCCU32 version 7.55 or newer. Supported port speed ranges from 2,400 bps to 115,200 bps.

IMPORTANT NOTE: Newer personal computers or laptops do not have legacy RS-232 interfaces. Use the USB port instead.

1.3.3 Inputs/Outputs

Inputs provide the ability to read and monitor signals transmitted from external devices. Outputs provide the ability to 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 Inputs (AI)

– 1 Analog Output (AO)

– 2 Pulse Inputs (PI)

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

Figure 6 identifies and Table 9 describes the inputs and outputs.

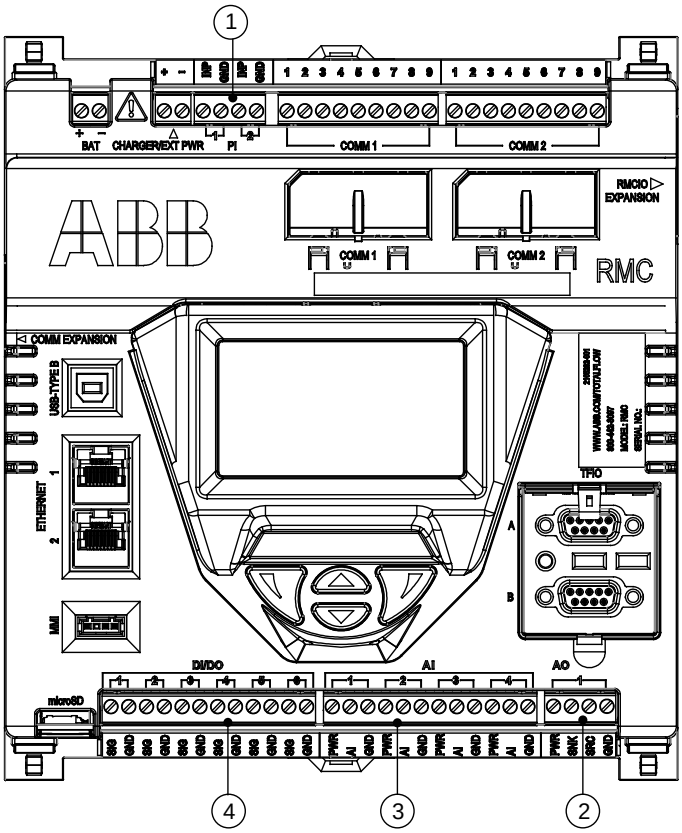


Figure 6: Inputs and outputs

Table 9: Inputs and outputs

ID No.	Port name	Terminal type
1	PI	Terminal connector (4 POS), screw termination. Wire gauge 12 awg to 22 awg.
2	AO	Terminal connector (4 POS), screw termination. Wire gauge 12 awg to 22 awg.
3	AI	Terminal connector (12 POS), screw termination. Wire gauge 12 awg to 22 awg.
4	DI/DO	Terminal connector (12 POS), screw termination. Wire gauge 12 awg to 22 awg.

1.3.3.1 Analog input

The RMC provides four analog inputs. Each port consists of a power source input pin, input signal pin, and input ground pin. See section 2.4.8.1, *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 10 provides the analog input specifications.

Table 10: 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 mAdc max
AI resolution	Analog to digital converter (ADC) resolution for the input	24 bit
AI Input Protection Vtvs	Each AI input has TVS protection, typical Vthreshold level to begin conducting.	32 Vdc typical

1.3.3.2 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 GND pin. The AO can provide 4-20 mA output through the sink and source pins. Calibrate the AO from the user interface. See section 2.4.8.2, *Analog output pinouts*.

Table 11 provides the analog output specifications.

Table 11: Analog output specifications

Electrical specification (each point)	Description	
AO input voltage	Value	0 – 30 Vdc
AO output current	current that the sinking and sourcing pins can drive	0 – 24 mA direct current
AO sink to source resistance	resistance in loop on the RMC	154 Ω
AO voltage sourcing Vaosrc	voltage provided at Pin 1	Vinput to RMC – 0.6 V typical
AO current sourcing Iaosrc	current range provided at Pin 1	0-24 mAdc
AO output resolution	DAC 16 bit resolution output	16 bit resolution DAC output
AO output protection Vtvs	Each AO has onboard TVS protection, typical Vthreshold level to begin conducting.	32 Vdc typical

1.3.3.3 Pulse input

The RMC provides two pulse inputs (PI). Each PI can accept a variety of input types: 0-5 Vdc TTL input, Open-Collector (OC), 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.

Table 12 provides the pulse input specifications.

Table 12: 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 uF
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, 5V TTL type inputs	

Table 13 identifies the pulse input pinouts.

Table 13: Pulse input pinout

ID pinout	Description
1	PI input
2	PI ground

1.3.3.4 Digital input and output

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

The digital input mode is capable of handling up to 30 Vdc and the configurable built-in pull-up resistor is for reading signals from devices with dry contact and open collector/drain output types.

The digital output mode provides a MOSFET open drain (OD) type output capable of sinking up to 2 Adc current

Table 14 provides the digital input and output specifications. See section 2.4.8.4, *Digital input and output pinouts.*

Table 14: 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 10K pull-up enabled	3.4 Vdc +/- 0.3 Vdc
DI Iminsink	Minimum external sinking current required to detect CLOSED input with DI 10K 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 10k pull-up enabled	450 uA typical
DI/DO shielding	Shielded signal pairs shielded to prevent spurious signals	
DI/DO Vtvs	Each DI/DO point has onboard TVS protection, typical Vthreshold 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

1.3.4 Expansion interfaces

The RMC provides expansion interfaces to add modular I/O. Two TFIO interfaces support TFIO modules. The RMCIO interface is for future use.

1.3.4.1 TFIO

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. Totalflow has implemented an I/O protocol to exchange information between the modules and the RMC. The buses operate in a master/slave mode, with the main board acting as master.

The TFIO modules are DIN rail mountable and employ contact technology for field wiring. The modules interconnect to 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 M2 for use with 24 Vdc.

All modules have four LED lights, a manual reset button, and a selectable address from zero through seven (Figure 7). On the faceplate of each module is:

– Type of module (name and color coded)

– LED light panel

– Reset button

– Module address selector

For additional information, refer to the TFIO Module User's Manual (part number, 2101226-001).

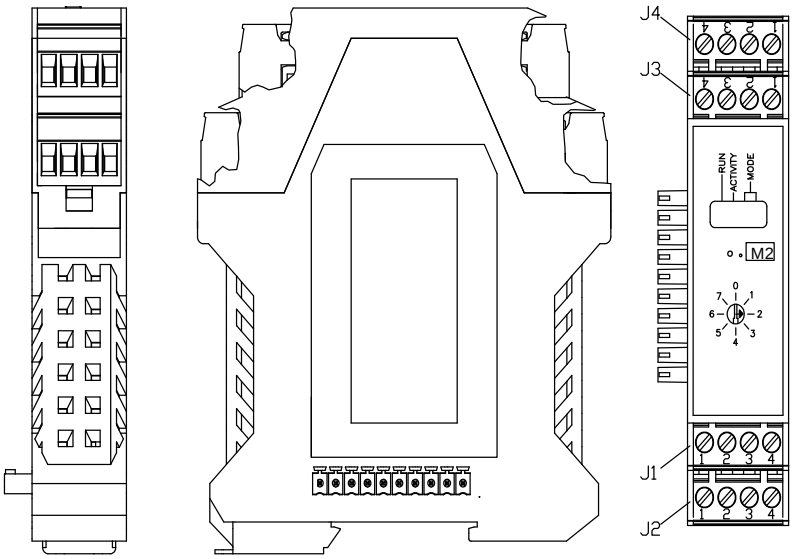


Figure 7: TFIO module

1.3.4.2 RMCIO

Available for future use.

1.3.4.3 USB expansion interface

Available for future use.

1.3.5 Power ports

WARNING – Property damage. Never connect a 12 volt SLA battery to the RMC when the external charging voltage is 24 volts.

The battery will not charge when the charger power is less than 13 Vdc.

If using the legacy TFIO modules, the maximum input voltage should be 12 Vdc.

IMPORTANT NOTE: Externally fuse the power input per design loading. The wire gauge should be appropriate (minimum 16 gauge recommended).

Table 15 provides the power sources for each power port.

Table 15: Power ports and sources

Power port	Source	Description
CHARGER/EXT PWR (external power)	14.5-15.5 Vdc charger	The charger provides power to operate the RMC and recharges the battery when the battery power is low. Use an ABB Totalflow approved charging source or equivalent.
	12 Vdc solar panel	During daylight hours, the solar panel provides the power to the RMC and recharges the battery when the battery power is low. During the night hours, the battery provides the power for the RMC to operate.
	10-30 Vdc external power supply	The external power unit provides the power for the RMC to operate. When using external power, a 12-volt SLA battery is not connected to the RMC.
BAT (battery)	12 V sealed lead acid (SLA) type battery.	The input voltage is 12 Vdc when using a battery with an external charger system, either a solar panel or a charger. The battery provides the power for the RMC to operate during the night. Connect only an SLA battery to the BAT port.

1.3.5.1 Battery port

WARNING – Property damage. Do not connect a 12 volt SLA battery to the RMC if the external charging voltage or the external power supply greater than 15.5 Vdc.

Use the BAT port to connect a 12 Vdc SLA battery (Figure 8).

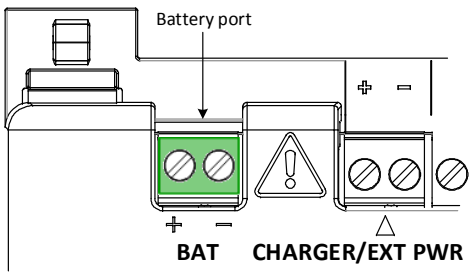


Figure 8: Battery port

Table 16 provides the battery port (BAT) specifications.

Table 16: 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

1.3.5.2 Charger port

Connect a charger when a 12-volt battery powers the RMC. The battery does not charge when the charger voltage is less than 13 Vdc.

When a charger is connected, the charger controller charges SLA type batteries. The charge controller is designed to optimally control the charge and hold cycle for SLA type batteries. The charge controller prevents overcharging and complete draining of a battery. It supports the three charge states: high current bulk charge, controlled over-charge, and a float charge.

1.3.5.3 External power port

Connect the external power supply to the CHARGER/EXT PWR port.

Table 17 provides the external power specifications.

Table 17: Charger and external power 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 with RMC 720 MHZ clock rate 2 amps 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

1.3.6 Security switch

The RMC has a security switch located between the A and B TFIO connections (Figure 9). Lift the cover over the TFIO A and TFIO B to view the switch settings. With security enabled and a local connection is made to the RMC through PCCU32 version 7.55 or newer, the security code must be entered. With security disabled, the operator may configure the RMC without security access.

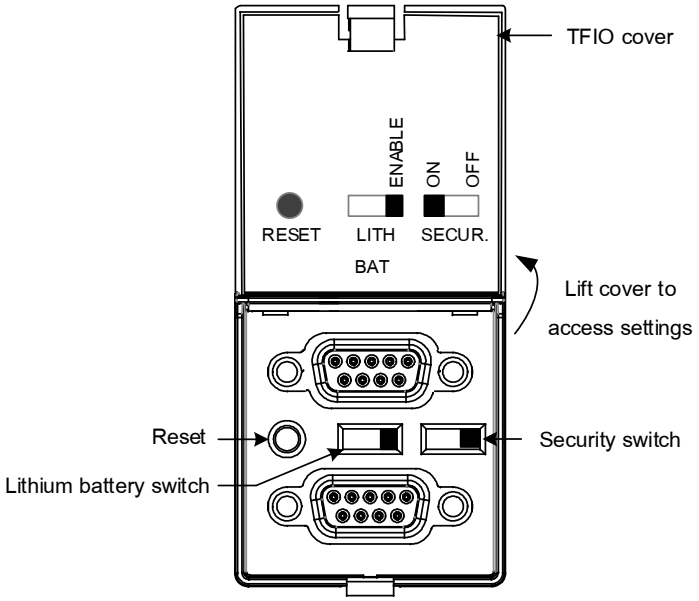


Figure 9: Security switch

Move the switch to the ON position to activate security. If the security switch is in the ON position, PCCU32 version 7.55 or newer is required to have the proper level of access (security codes). If the security switch is in the OFF position, PCCU32 has full access to the RMC. The security switch only controls security through the local PCCU32 connection. The default position of the security switch is OFF. Security must be off to configure security in PCCU and set the security codes for read only or read/write access.

1.3.7 Reset button

Reset is the function that restarts the RMC. Pressing the reset button is the same as a warm start. The reset button is located between the TFIO ports.

1.3.8 Lithium battery switch

The lithium battery serves to retain operation of the real time clock. The lithium battery backup switch is located between the TFIO ports. If the switch is enabled, the lithium battery backs up the real time clock. If power is lost or disconnected, the real time clock continues to operate until the depletion or removal of the lithium battery. If the switch is disabled, the lithium battery does not back up the real time clock.

1.4 Embedded software description

The major components of the embedded software:

- Seamless support of all Totalflow applications.
- Executes XSeries^{G4} suite of applications with backward compatible protocol transactions for:
  - All supported measurement applications
  - Trending subsystem
  - Alarm Logs
  - Register based transactions (the array:reg portion of the address remains same as XSeries^{G4} devices)
  - Importing the XRC^{G4} configuration files to RMC (may require I/O system configuration)
- Battery condition metering
- Improved real-time performance metrics

1.4.1 Applications

The following applications are available to add to the RMC (Table 18). The applications are identified for use in the United States (US) or internationally (SU).

Table 18: Applications available with RMC

Application	US	SU
AGA-3 Measurement	X	
AGA-7 Measurement	X	
Alarm System	X	X
Analysis Trend File	X	X
API Liquid SU	X	X
Communications	X	X
Coriolis Interface	X	X
Coriolis SU	X	X
Display X Series	X	X
ENRON Interface	X	X
Facility Management App	X	X
Gas Lift	X	X
Gas Orifice SU		X
Gas Turbine SU		X
Holding Registers	X	X
Host Interface	X	X
I/O Interface X-Series	X	X
IP Multiplexer	X	X

Application	US	SU
Level Master	X	X
NGC Client	X	X
NIST14 Gas SU	X	X
NIST14 Liquid SU	X	X
Nozzle SU	X	X
Oil Transfer Measurement	X	X
Operations	X	X
Pad Controller	X	X
PID Controller	X	X
Plunger Control	X	
Plunger SU		X
Pulse Accumulator	X	X
Pump Interface	X	X
Shutdown System	X	X
System	X	X
TFWeb Server	X	X
Therms Master	X	X
Therms Slave	X	X
Trend System	X	X
Units Conversion	X	X
Valve Control	X	X
V-Cone Measurement	X	
V-Cone SU		X
Wedge Gas SU	X	X
Wireless Remote I/O	X	X
XMV Interface	X	X

1.4.2 Application licensing (credit key)

Add or remove applications from the licensed applications list as needed. Four (4) general credits are included in the RMC without the purchase of additional licenses. Purchase additional license credits for additional applications as needed. These credits run the various applications available.

The credits are maintained on the credit key. The credit key is a secure USB flash drive (thumb drive). The only program that can write to or read the USB flash drive is PCCU32 version 7.55 or newer.

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

See section 6.18, *Maintaining the credit key* for information to add or transfer credits.

1.4.3 Operating system

The RMC uses a thread priority preemptive real-time operating system. This software architecture takes advantage of this by prioritizing real-time functionality (measurement and control applications) before executing non-real-time functional (post measurement data processing and file system access).

1.4.3.1 File system

The file system is composed of a RAM file system and an eMMC 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 for 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, PCCU loader, or reset button).

A large capacitor provides power for 2.5 seconds to the system in the event of a power loss. This allows the software to safely shutdown the eMMC file system. The system data not backed up by the one-minute periodic update will be lost.

1.4.3.2 Configuration files

The configuration files are stored in the following locations:

– Factory configuration the ABB default factory configuration or a customer specific configuration programmed into the factory folder during final assembly.

– Startup (cold) configuration is used for cold restart of the device or when a configuration package is sent to the device by the PCCU loader.

– Running (warm) configuration is normally used by the device during normal operation. In addition to the configuration data, it contains the data collection files (accumulated measurement tube data and trend data for the applications).

1.4.3.3 Data collection files

The data collection files are stored only with the running configuration data, which is the tfData directory.

1.4.3.4 Log files

The event/change, alarm, and system logs are stored with the running configuration data (tfData).

1.4.4 Device loader

Totalflow distributes the required device software through software packages. The loader sends or saves the packages with the required package format (.pkg file extension). The components of the software package are the boot, OS, application, and configuration files. These components are available for selection in the device loader screens. The boot component does not always display.

The device loader updates software in the RMC. The three major functions of the loader are:

– Send: transmits software from a PC or laptop system to a Totalflow device. The send function is used to replace the current software on the Totalflow device in the following cases:
  – Update any or all of the software package components in the device with components of newer or earlier versions
  – Reload any or all of the software package components in the device components of the same versions as the versions currently on the device.
  – Restore any or all of the software package components with backed up versions of the components.

– Save: a copy of any or all components of the device software is transmitted to a PC (or laptop) for backup

– Restart: restarts the device with the running (warm), startup (cold), or factory configurations

IMPORTANT NOTE: The software update packages can only be sent to the device when the security switch is off. If the security switch is on, sending software to the device or restarting the device is not allowed. The loader may be used to view and save device software.

1.4.5 SSH/SFTP

The Secure Shell (SSH) and Secure File Transfer Protocol (SFTP) are implemented on the RMC to allow secure login access and file transfer capability. SSH provides an encrypted communication channel. Private keys are required to establish communication.

The SSH/SFTP communication is client-server based. The SSH/SFTP server is implemented in the RMC. The SSH/SFTP client is implemented in third-party software installed in the computer used to communicate with the RMC.

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

The SFTP access for the customer is read-only. SSH access is not available to the customer. Customers may copy files from the RMC, but not write or send files to the RMC. The following folders are available to copy or download as required.

– Crash dumps
– Flash – Main Totalflow application (App), factory startup (cold) configuration, and startup (cold) configuration.
– Logs – System and device loader log files
– tfData – Running (warm) configuration files

1.5 I/O calibration

Calibration allows the RMC and other ABB Totalflow devices to be calibrated and checked to retain accuracy and have optimal operation. The types of calibration depend on the devices connected and applications assigned to the RMC. An authorized field technician performs the calibration after installation and startup.

1.6 Environmental enclosures

Table 19 provides the enclosure sizes available to install the RMC in outdoor environments.

Table 19: Enclosures available

Part number	Size
2424	24 x 24 x 12 inches
3630	36 x 30 x 12 inches
4836	48 x 36 x 12 inches

1.7 PCCU user interface

The user interface and related processes are supported by:

– PCCU32 version 7.55 or newer for first time installation, connection to the RMC, and the initial configuration
– PCCU32 has online help files

PCCU32 software running in a Windows® environment offers the most capabilities for configuring the RMC and adding new applications. The Windows environment features easy-to-follow menus and help files.

IMPORTANT NOTE: Connect to the RMC with PCCU32 version 7.55 or newer.

2 Installation

This chapter provides the information for RMC installation and setup. For safe and trouble-free installation, follow all instructions and advisories.

IMPORTANT NOTE: Read the installation chapter before beginning the installation and review the wiring diagrams delivered with the RMC.

2.1 Site planning and preparation

Decide on the location to install the RMC. 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 environment of the location.

IMPORTANT NOTE Do not mount the RMC outdoors without environmental protection.

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

If a solar panel is to provide power, 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.

2.2 Wiring specifications

All wiring connections and the screw terminals for power, input/output, and communications support 12 awg to 22 awg. The wire gauge selection is according to the voltage and current requirements of the circuitry. 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, and indoor or outdoor environment.

DANGER – Damage to health / risk to life / property damage. Do not connect or disconnect wires, terminal connectors, or cable connectors to the RMC, communication, or I/O while power is connected to the RMC and external power sources.

Remove all power sources including the USB cable and external power to the I/Os.

When the RMC and its options are installed in an area that may contain explosive gas mixtures, arcs and sparks could ignite the gas mixture causing an explosion.

2.3 Unpack and inspect

The RMC and parts ship in a specially designed shipping carton with a startup guide 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:

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, damaged parts or noticeable defects, call the ABB main office number listed on the last page of this manual.

2.4 Basic hardware installation

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

DANGER – Damage to health / risk to life / property damage. 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. When connecting or disconnecting wires, use properly insulated tools and wear a grounding strap to eliminate static electricity.

2.4.1 Grounding the RMC assembly

Ground the RMC by mounting it on a grounded DIN rail. 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.

2.4.2 Mounting the RMC

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.

IMPORTANT NOTE. To remove the RMC, use a slotted screwdriver inserted into the access slot of the DIN rail release clip to loosen the clip. See section 6.12, *Removing the RMC from the DIN rail.*

2.4.3 Wiring COMM ports

Wire the RMC according to the type of serial communication used. Table 20 provides the specifications for the serial communication ports.

Table 20: Serial communications specifications

Cable	Maximum length	Required cabling and termination
RS-232	50 feet (15 meters)	Terminal connector (9 POS), screw termination and hot swappable COMM module Active when communication module is inserted
RS-485 or RS-422	4000 feet (1220 meters)	

Table 21 identifies the RS-232, RS-422, and RS-485 communication pinouts for COMM 1 and COMM 2.

Table 21: COMM 1 and COMM 2 serial communication port pinouts

PIN	RS-232	RS-422	RS-485
1	Voltage out (VOUT)	Voltage out (V OUT)	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 (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	Request to send (RX)	Receive bus + (RBUS+)	*Not Used*
9	Clear to send (CTS)	Receive bus – (RBUS-)	*Not Used*

IMPORTANT NOTE: Use a slotted screwdriver to pry the terminal connector off the electronic board.

To wire the serial communication port:

1. Trim the wire covering back one-quarter inch (.635 cm) on each wire.
2. Loosen the terminal connector screws for the correct pin based on Table 21, *COMM 1 and COMM 2 serial communication port pinouts*.
3. Insert the wires in the required pins.
4. Tighten the terminal connector screws.

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

5. Insert the terminal connector back onto the COMM port if it was removed.
6. Insert the communication module in the appropriate slot (Figure 10). The communication module pushes the port cover downward when inserted.

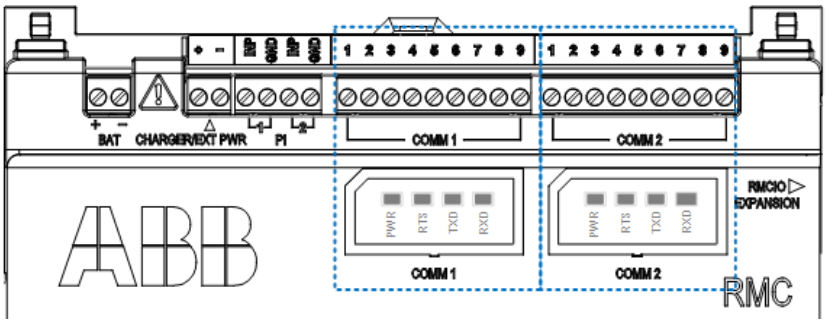


Figure 10: COMM terminals and modules

See section 3.4.1, *Configuring the COMM ports.*

2.4.4 Wiring COMM ports to power external device

The VOUT is a constant voltage. SW VOUT is switched voltage. VOUT and Sw VOUT are equal to the input voltage from the power source. For example:

– Battery or charger/external power input is 12 volts – the VOUT or Sw VOUT is 12 volts.

– External power input is 24 volts – the VOUT or Sw VOUT is 24 volts.

Any device connected to a serial communication port should be compatible with VOUT or Sw VOUT.

When wiring the COMM ports to power an external device:

– Use pins 1 and 2 for constant voltage to power device from VOUT.

– Use pins 2 and 3 for switched voltage to power device from Sw OUT.

2.4.5 Wiring multiple external devices

Ports configured as RS-485 or RS-422 ports support serial communication with single (point-to-point) or multiple devices (multi-drop topologies). For example, Figure 11 shows the connection between the RMC port (configured for RS-485) and daisy chained multivariable transmitters. The example shows the multivariable powered from the RMC.

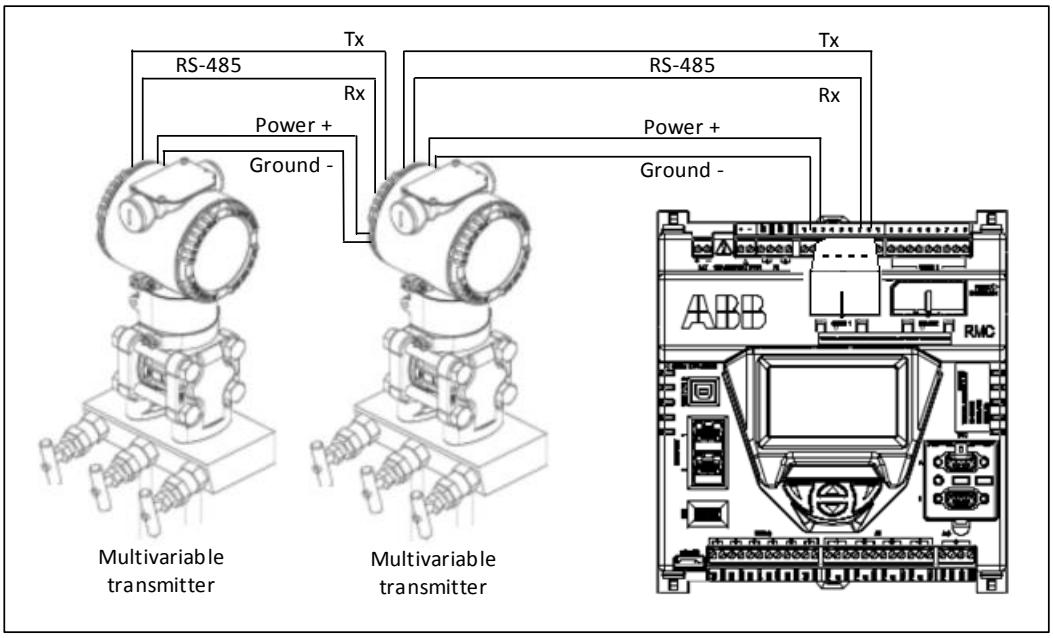


Figure 11: COMM 1 for RS-485 communications with multiple devices

2.4.6 Wiring remote communications (radio)

Ports configured as RS-232 ports support point-to-point serial communication with single serial device. For example, Figure 12 shows the connection between radio equipment and the RMC port.

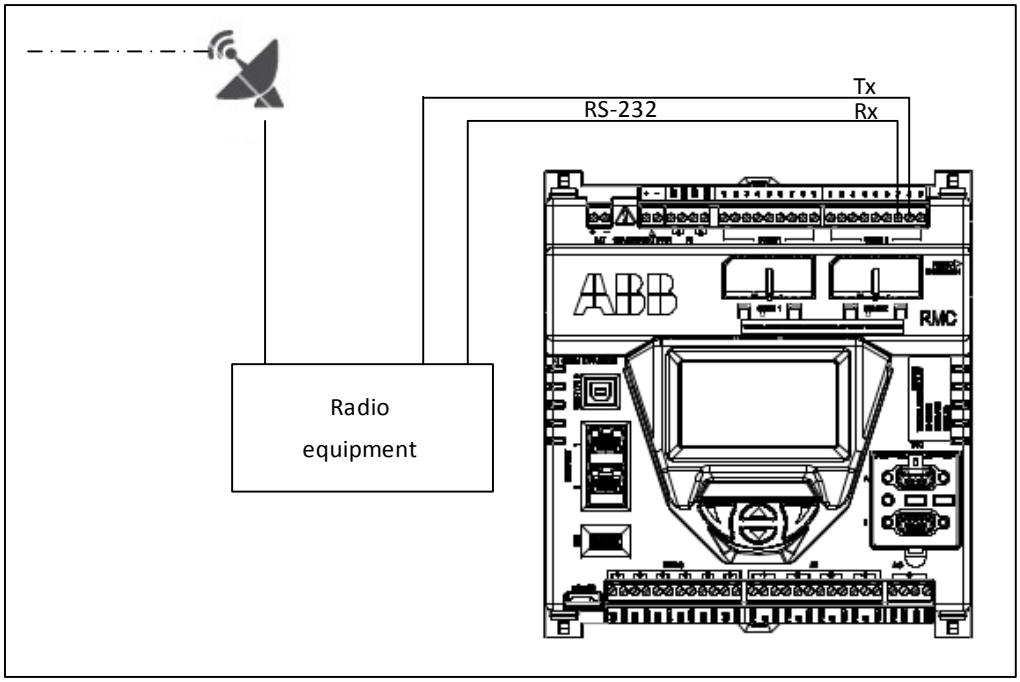


Figure 12: Serial communication (radio)

2.4.7 Connecting additional devices

Multiple external devices such as an XFC, XRC, analyzer, or an additional RMC may be connected to the RMC Ethernet port.

IMPORTANT NOTE: Each device connected to an Ethernet port requires a valid IP address for TCP/IP communications. If the devices do not have a valid IP address, communication over the network will not be possible.

Figure 13 illustrates how an Ethernet port 2 supports daisy chaining multiple RMCs.

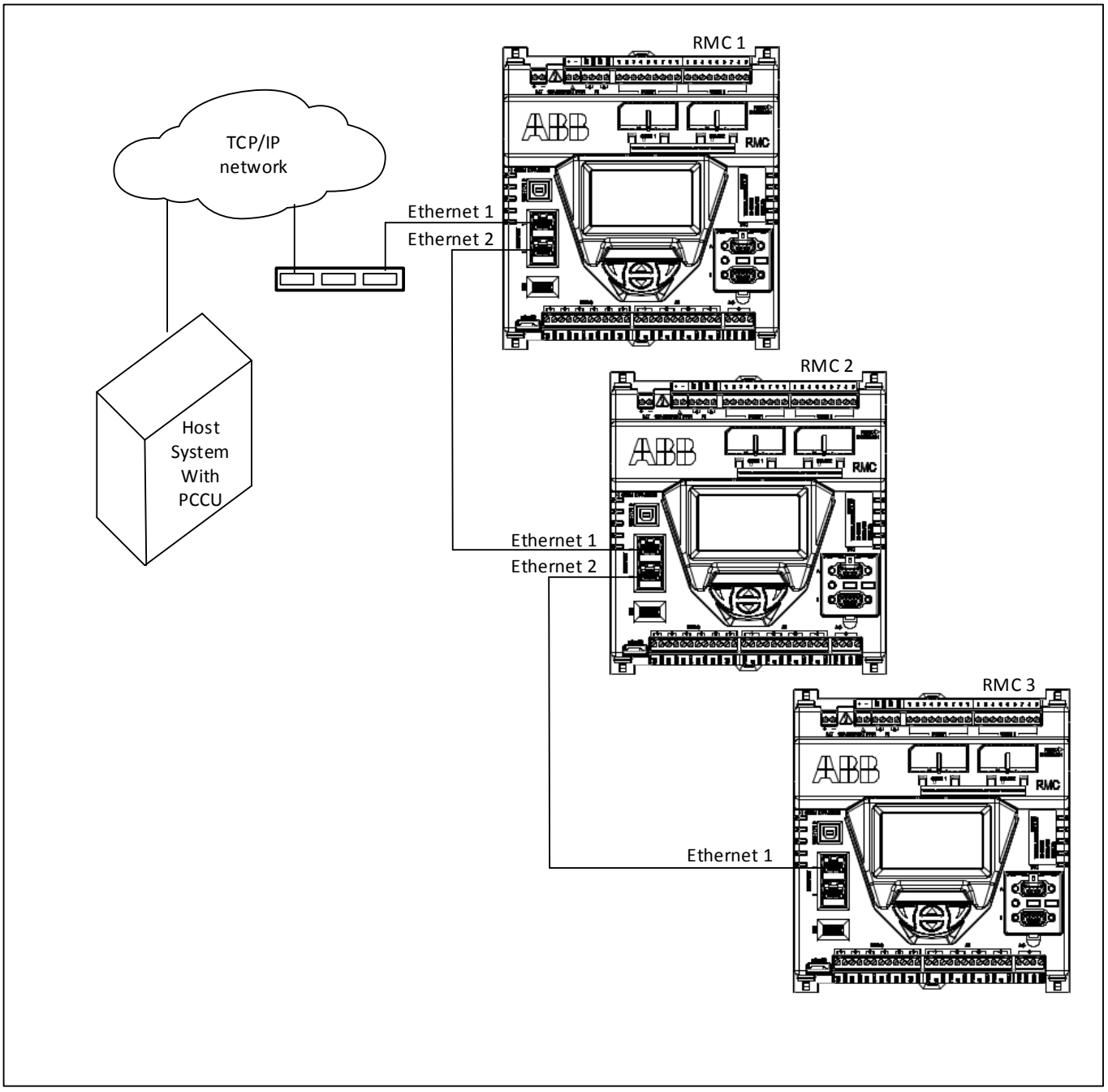


Figure 13: Daisy chaining RMCs

Figure 14 illustrates how an Ethernet port supports connecting other Totalflow equipment.

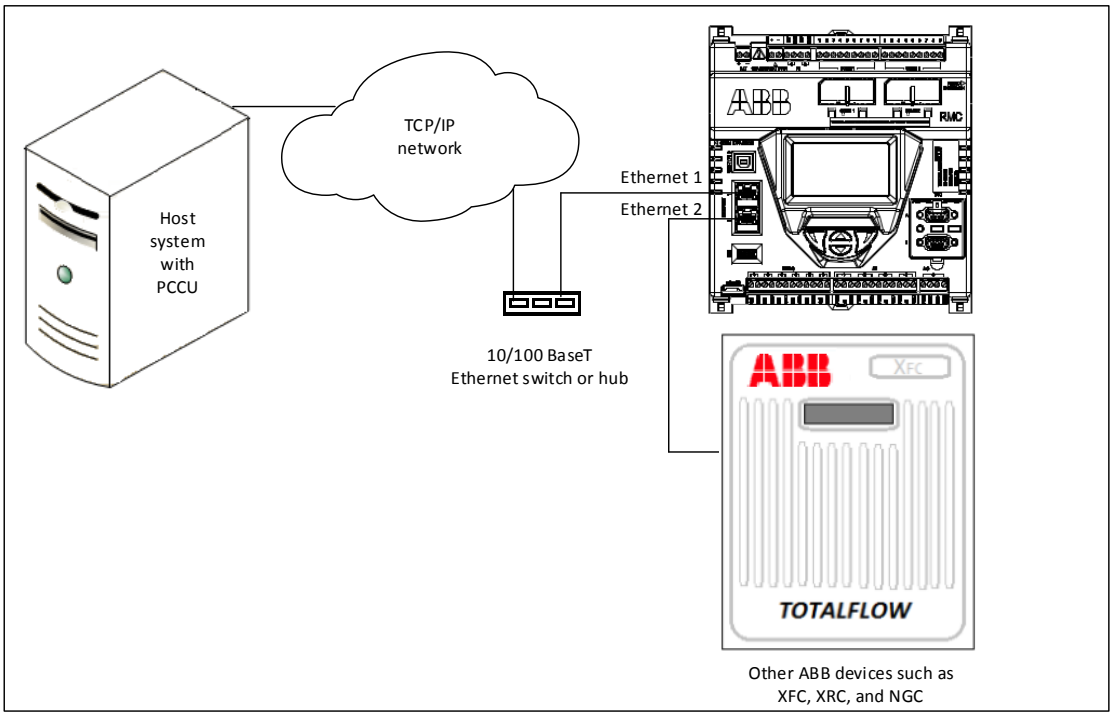


Figure 14: Connecting RMC to other Totalflow devices

Never connect Ethernet 1 and Ethernet 2 to the same Ethernet switch (Figure 15). Connecting both ports to the same switch will disable both ports.

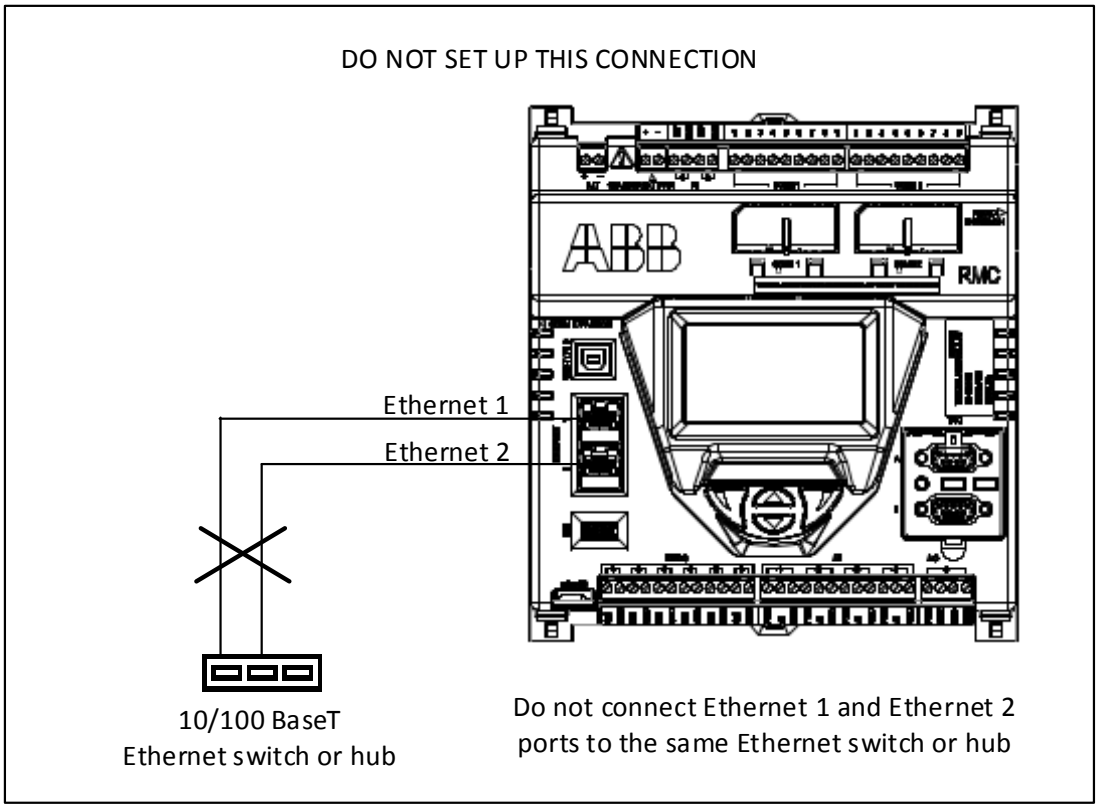


Figure 15: Wrong Ethernet connection

2.4.8 Wiring input and output

The RMC may require other basic setup and wiring depending upon the use of other devices.

WARNING – For any device powered from any AI or the AO, ensure compatibility of the AI or AO output power to prevent damage to the device. The output power from the AI or AO is the same as the input power from the battery or external power supply to the RMC.

IMPORTANT NOTE: Use a slotted screwdriver to pry the terminal connector off the electronic board.

To wire the I/O:

1. Trim the wire covering back one-quarter of an inch (.635 cm) on each wire.
2. Loosen the terminal connector screws for the correct pin according to the following I/O tables.
3. Insert the wires in the required pins.
4. Tighten the terminal connector screws.

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

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

2.4.8.1 Analog input pinouts

Table 22 and Figure 16 identify the AI pinouts.

Table 22: Analog input pinouts

Input	Pin	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

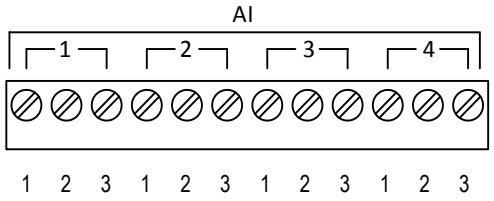


Figure 16: Analog input pinouts

2.4.8.2 Analog output pinouts

Table 23 and Figure 17 identify the AO pinouts.

Table 23: 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

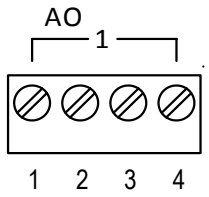


Figure 17: Analog output pinouts

2.4.8.3 Pulse input pinouts

Table 24 and Figure 18 identify the PI pinouts.

Table 24: Pulse input pinouts

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

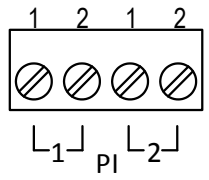


Figure 18: Pulse input pinouts

2.4.8.4 Digital input and output pinouts

Table 25 and Figure 19 identify the DI/DO pinouts.

Table 25: Digital I/O pinouts

PI	PIN description	AO	PIN description
1	SIG-Signal D I/O 1	4	SIG-Signal D I/O 4
	GND–ground		GND–ground
2	SIG-Signal D I/O 2	5	SIG-Signal D I/O 5
	GND–ground		GND–ground
3	SIG-Signal D I/O 3	6	SIG-Signal D I/O 6
	GND–ground		GND–ground

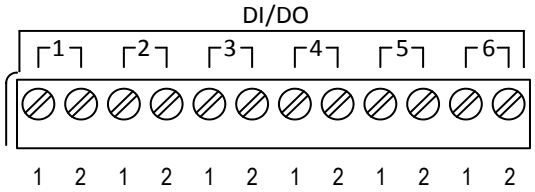


Figure 19: Digital I/O pinouts

2.4.9 Wiring AI and AO to power external device

The AI/AO output voltage (PWR) is equal to the input voltage from the power source. For example:

– Battery or charger/external power input is 12 volts –the PWR is 12 volts.

– External power input is 24 volts – the PWR is 24 volts.

Any device connected to any AI or AO should be compatible with the PWR.

IMPORTANT NOTE: Refer to the RMC wiring diagrams in the ABB Library for details on how to wire an external device.

2.5 Connect expansion interfaces

2.5.1 Connecting TFIO modules

The RMC has two TFIO ports. Each 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*.

Table 26 identifies the different module types available for use with RMC that support 9 volt and 30 volt operation. The RMC does not support the TFIO CIM module, part number 2100421.

Table 26: 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

CAUTION – Property damage. If using legacy TFIO modules (not labeled as M2), the maximum voltage to operate is 12 Vdc. Applying more than 12 Vdc will damage the legacy TFIO modules. Only the TFIO M2 modules support voltages higher than 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 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 3.6, *Configure TFIO interfaces*.

Figure 20 shows the pinouts of a TFIO module. For additional information, refer to the TFIO Module User's Manual.

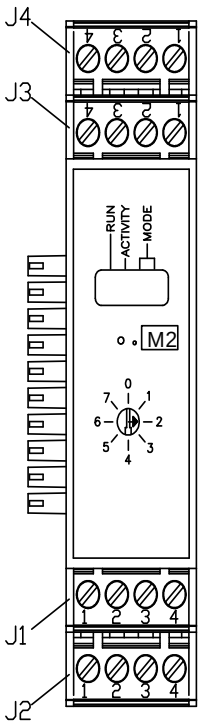


Figure 20: TFIO module pins

2.5.2 Connecting third party serial modules

Third party serial-to-Ethernet modules add serial communication ports for external devices such as XMVs and transmitters. The manufacturer provides the installation instructions. For information about MOXA®, see Appendix B.

2.6 Powering the RMC

The RMC has several power source options. This manual provides instructions for two power source options:

– 12 volt battery with a solar panel charger (section 2.6.1)

– External power (section 2.6.2)

Follow the instructions for the appropriate power source option; then continue to section 2.7, *Lithium battery*.

2.6.1 Connecting the battery with solar panel charger

A 12 volt sealed lead acid (SLA) battery provides the RMC with direct current operating power. The solar panel charging system uses sunlight to recharge the battery. The following subsections provide instructions for the installation of a typical system. These instructions should be adapted for alternate installations.

2.6.1.1 Connecting the battery (dc power)

The hardware required for a battery installation is:

– One 12 volt SLA battery

– One battery cable

Before installation, inspect the power 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 to contact 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.

7. Connect the battery to the terminals (Figure 21). The power terminal block is green. Observe the polarity (+ and -).

WARNING – Bodily injury and property damage. Complete all wiring of peripheral or external devices to the RMC prior to applying power (connecting the battery).

Connect the battery before connecting the solar panel cable.

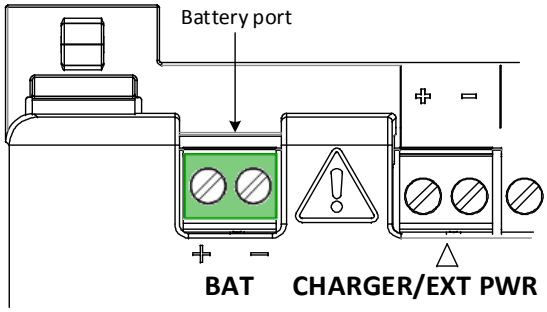


Figure 21: Battery port

8. Confirm that the battery is supplying power to the RMC by observing that the LCD display is scrolling.

IMPORTANT NOTE: The scrolling sequence on the LCD display reads:

ABB TOTALFLOW RMC-100
BOOT 2105412-XXX
OS 2105411-XXX
Super CAP Charged
APP 2105457-XXX

The scrolling duration may vary for each item. When the DATE/TIME displays, the power-up sequence is completed.

If the display is not scrolling as listed above, perform a warm boot or press the reset switch. See section 6.7.2, *Warm restart*.

IMPORTANT NOTE: The super cap is a capacitor that serves as a short-term power reservoir. In the event of a loss of power or reset, the super cap 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.

The first time that the unit is powered up or if RMC is left powered off for several hours or longer, the boot time is approximately 2 minutes to charge the super cap. Once the super cap.is fully charged, the boot time is considerably less.

2.6.1.2 Connecting the solar panel

The RMC may be used with a 10, 20, or 30 watt solar panel with a 16.5 to 17.5 volts output. The solar panel may be mounted on a 2 inch (5.08 cm) pipe or on the top or side of a building.

IMPORTANT NOTES. Call the ABB main office number listed on the last page of the manual for questions about mounting the solar panel on the top or side of a building.

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.

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

CAUTION – Minor injuries. Ensure that the battery is connected to the RMC before connecting the solar panel cable or a battery charger cable.

To connect the solar panel 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 the manual.

2. Connect the solar panel cable to the terminals (Figure 22). Observe the polarity (+ and -).

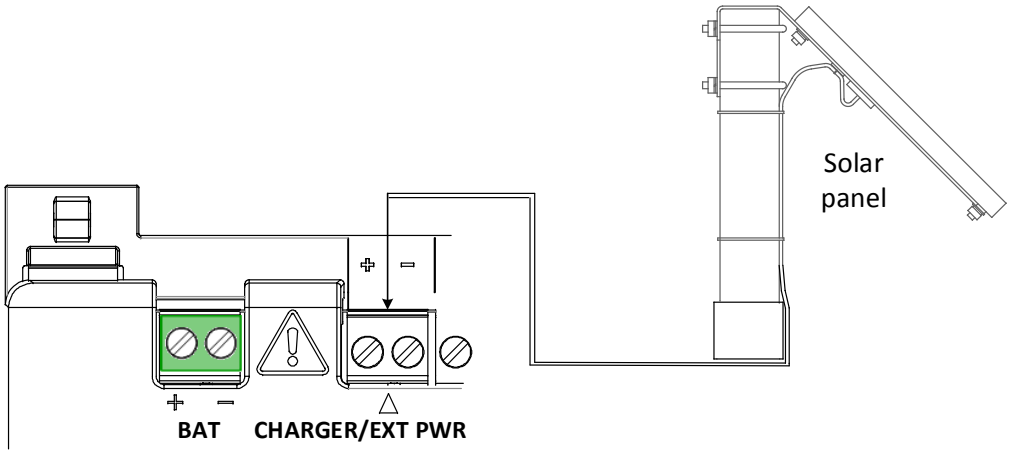


Figure 22: Charger (solar panel)

3. Continue to section 2.7, *Lithium battery* to continue the installation.

2.6.2 Connecting the external power supply

The RMC can receive power from an ABB approved alternate external power supply (9 to 30 Vdc).

DANGER – Bodily injury. To prevent injury, only a licensed electrician should install Vac wiring.

WARNING – Bodily injury and property damage. To maintain system certification, all wiring must comply with national and local electrical codes and applicable ABB certification drawings.

Do not use a 12 volt SLA battery when the external power supply is over 15.5 Vdc

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. Connect the external power supply cable to the terminals (Figure 23). Observe the polarity (+ and -).

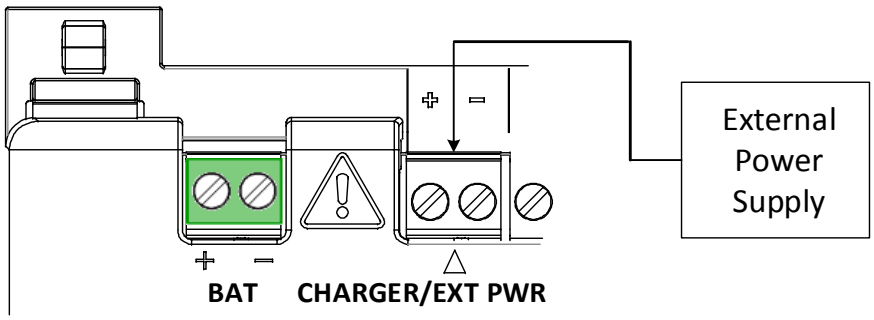


Figure 23: External power supply

3. Apply power to the external power supply.
4. Confirm that the power supply is supplying power to the RMC by observing that the LCD display is scrolling.

IMPORTANT NOTE: The scrolling sequence on the LCD display reads:

ABB TOTALFLOW RMC-100
BOOT 2105412-XXX
OS 2105411-XXX
Super CAP Charged
APP 2105457-XXX

The scrolling duration may vary for each item. When the DATE/TIME displays, the power-up sequence is completed.

If the display is not scrolling as listed above, perform a warm boot or press the reset switch. See section 6.7.2, *Warm restart*.

IMPORTANT NOTE: The super cap is a capacitor that serves as a short-term power reservoir. In the event of a loss of power or reset, the super cap 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.

The first time that the unit is powered up or if RMC is left powered off for several hours or longer, the boot time is approximately 2 minutes to charge the super cap. Once the super cap.is fully charged, the boot time is considerably less.

2.7 Lithium battery

The lithium battery serves to retain operation of the real time clock. The lithium battery backup 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 depletion of the lithium battery.

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 (Figure 24).

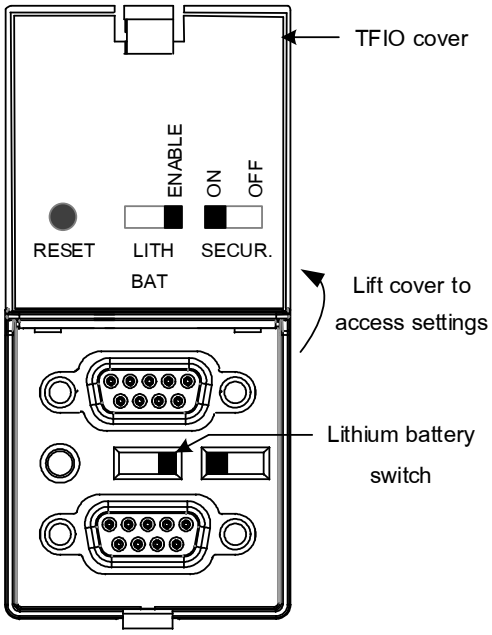


Figure 24: Lithium battery setting

3 Startup

This chapter describes the setup and configuration procedures to get a newly installed RMC system up and running. Complete the RMC configurations through the Windows-based interface software PCCU32 version 7.55 or newer.

3.1 User interface

3.1.1 PCCU32 interface

IMPORTANT NOTE: PCCU32 version 7.55 or newer is required to communicate with the RMC equipment for configuration. Previous versions of PCCU32 are not compatible.

3.1.1.1 Installing PCCU32

PCCU32 software operates in a Windows environment. The Windows environment features menus and help files with specific information to complete each step (depending on the equipment to set up). To install PCCU32:

1. Insert the PCCU32 CD into the computer's disc drive. If the CD drive is set to AutoPlay, the installation program should begin. Skip to step 3.
2. If the CD drive is not set to AutoPlay, go to the **Start** icon. Type Run D:\Disk1\setup.exe (D is the CD drive designation).
3. Follow the screen prompts during installation.
4. When installation is complete, click **Finish**. A new Totalflow PCCU32 window displays.

3.2 Establish local communication

Local communication with the controller can be established by direct connection of the laptop to the USB, Ethernet, or MMI ports. These ports are pre-configured from the factory for the local operator access. PCCU can be setup to use any of these ports. To configure the controller, connect to the preferred port, configure PCCU, and proceed to section 3, *Startup*.

3.2.1 Using the USB port

The following instructions are for a USB port connection. Table 27 provides cabling details to connect to the USB port.

Table 27: 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 25 illustrates USB communication between a host system and the RMC by a direct connection.

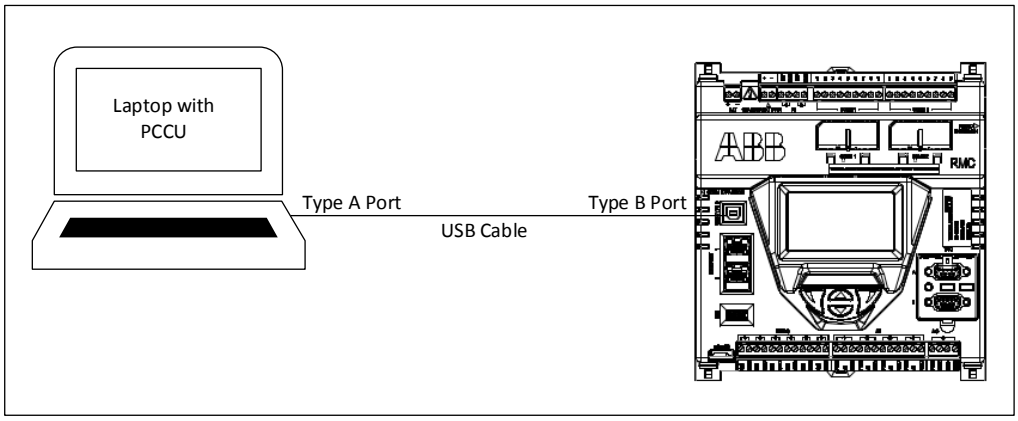


Figure 25: USB port for local operator access

To set up communication using the USB port:

1. Power on the RMC and the laptop.

9. Connect the USB cable. An annunciator in the LCD displays a lower case letter “u” for local USB connection.
10. Start PCCU.
11. On the PCCU32 tool bar menu, click **Setup**. The System Setup window displays (Figure 26).

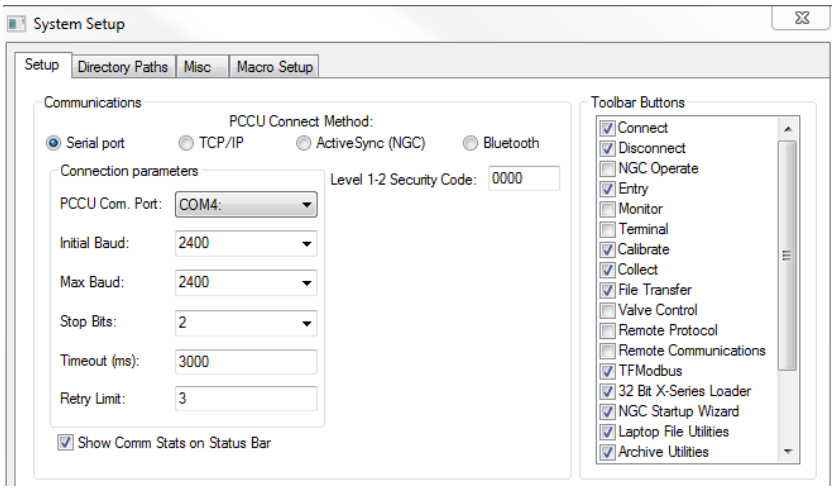


Figure 26: PCCU system setup (USB communication)

12. Under Communications in the Setup tab, click **Serial port** radio button
13. Select the **PCCU Com. Port** from the drop down list (the computer USB port that the cable is connected to).
14. Click **Close**.
15. On the PCCU32 tool bar, click **Entry** to connect to the device. When the connection is successful, the PCCU32 Entry screen displays.
16. 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 27).

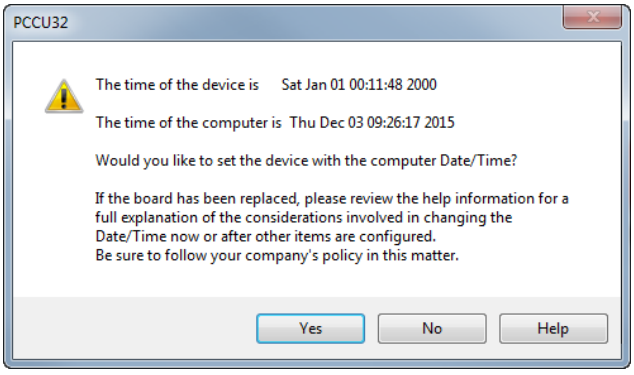


Figure 27: Synchronize date and time

17. Click **Yes**. The RMC calendar clock synchronizes with the laptop date and time.

3.2.2 Using the Ethernet ports

The Ethernet ports support local TCP/IP communications. The RMC Ethernet interface auto-configures to adapt to the Ethernet cable type used. Table 28 shows the cabling for Ethernet ports. The default RMC IP address (169.254.0.11) is needed for local communication.

Table 28: 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)	Straight-through Ethernet CAT 5 cable with RJ-45 connectors at both ends.	1681011 Maximum distance: 100 meters (328 feet)
Network device (Ethernet hub, switch or router)		
Other Totalflow devices: additional RMCs, flow computers, analyzers, etc.		

Figure 28 illustrates Ethernet communication between a host system and the RMC by a direct connection to an Ethernet port.

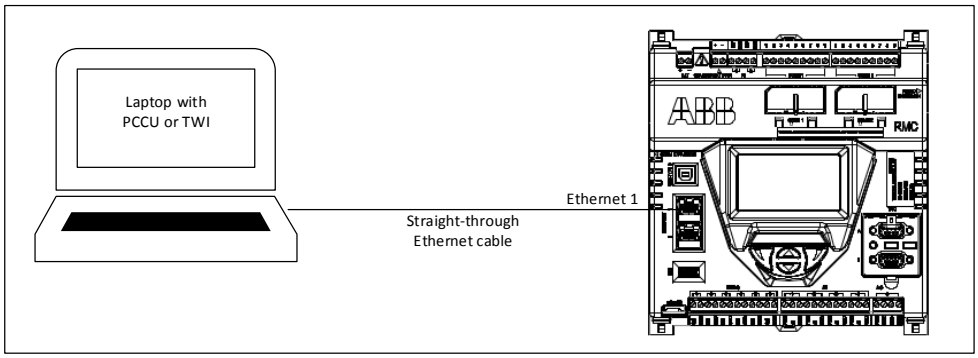


Figure 28: Ethernet port

3.2.2.1 Configuring the host system

If the laptop is configured to obtain the IP address automatically, there is no need to change the TCP/IP configuration. If the laptop has a static TCP/IP configuration, then configure for dynamic IP addressing and private addressing (Figure 29). These TCP/IP configuration boxes are examples for IP configuration in the Windows 7 system.

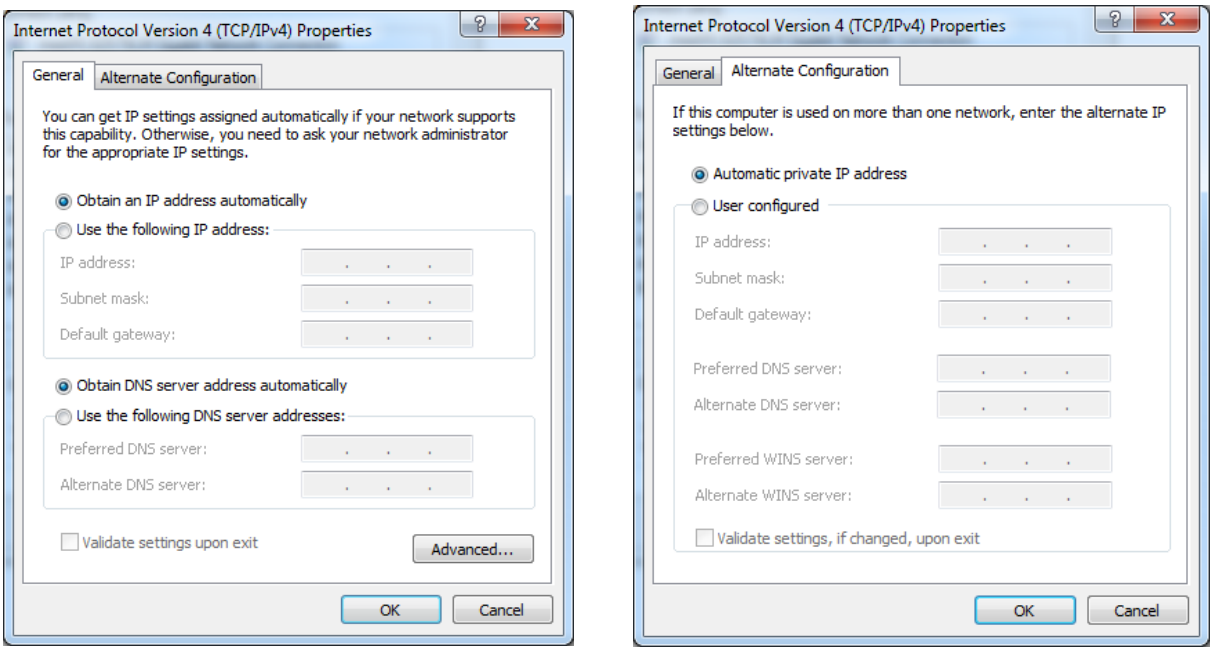


Figure 29: IP for host system

3.2.2.2 Setting PCCU32 and connecting

To configure PCCU32 for TCP/IP communication:

1. Power on the RMC and the laptop.
2. Connect the Ethernet cable.
3. Start **PCCU.**
4. On the PCCU32 top tool menu bar, click **Setup**. The System Setup window displays.
5. Under Communications in the Setup tab, click the **TCP/IP** radio button.
6. Under Connection Parameters in the Network ID or IP field, type the default static IP address (169.254.0.11).
7. Click **Close**.
8. On the PCCU32 top tool menu bar, click **Entry** to connect to the device. When a connection is successful, the device's Entry screen displays.

3.2.3 Using the MMI port

Table 10 provides the cabling specifications for the MMI port.

Table 10: 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

A circular military (MIL-C-26482) weather-proof connector is available only on the cabinet for outdoor use.

For laptops without the RS-232 port, use the USB port instead. Connect an adapter/cable (RS-232 to USB) and install the adapter drivers in the laptop to connect to the RMC MMI port.

To set up communication using the MMI port:

1. Power on the RMC and the laptop.

18. Connect the USB cable. An annunciator in the LCD displays a lower case letter L" for MMI connection.
19. Start PCCU.
20. On the PCCU32 tool bar, click **Setup.** The System Setup window displays.
21. Under Communications in the Setup tab, click **Serial port** radio button
22. Select the **PCCU Com. Port** from the drop down list.
23. Click **Close**.
24. On the PCCU32 tool bar, click **Entry** to connect to the device. When the connection is successful, the PCCU32 Entry screen displays.

3.3 Configure basic parameters

This section provides the instructions for the basic setup and configuration of the RMC after the local connection is established.

3.3.1 Configuring 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 29.

Table 29: Required station setup

Required 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.
Device ID/ Application ID	10 digit alphanumeric	The identifier uniquely identifies each device. For a single tube device, the ID identifies the device from others and is the same ID as the Station ID.
Location	24 digit alphanumeric	The identifier describes the location, such as the county name or a road number.
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 that the Lithium Battery Status shows **OK** (Figure 30)**.** If the status is Low Voltage or Not Connected, the field has a red bar.

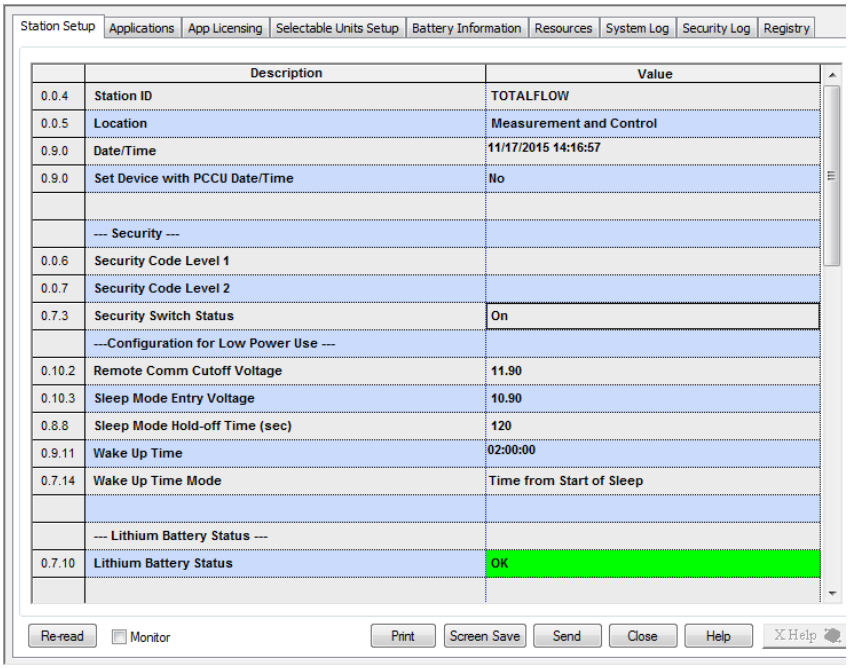


Figure 30: Station Setup screen

4. Change any other settings in the Station Setup tab as needed. Leave PCCU open on the Station Setup tab.

IMPORTANT NOTE: There are additional fields stored in WinCCU to uniquely identify the meter, including fields for entering the lease holder, producer, operator and buyer. These fields reside on the host computer in the ID manager, not on the RMC.

3.3.2 Configuring security

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 connections on the RMC (Figure 31).

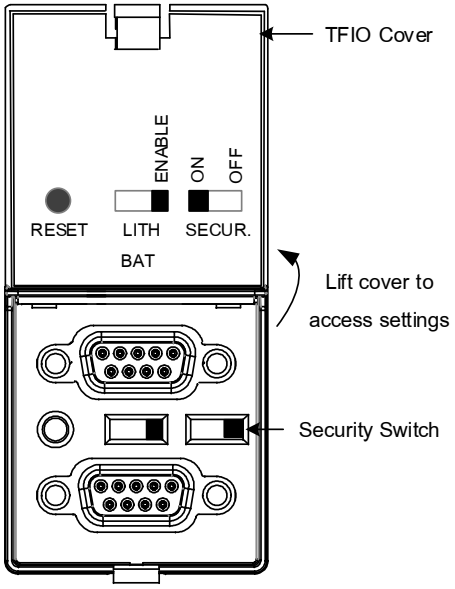


Figure 31: Security switch

2. Return to PCCU32 Station Setup tab.
3. Verify that the Security Switch status field is off (Figure 31). The security codes cannot be entered 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).
6. Return to the RMC and set the security switch to on.
7. Check PCCU32 that the security switch status is on to begin enforcement of the security codes.

NOTICE – Write down the security code for future use. The appropriate security code is needed each time PCCU32 is accessed to communicate with the RMC.

IMPORTANT NOTE: MODBUS® access to the RMC is not protected by the security codes in PCCU32 version 7.55 or WinCCU.

3.3.3 Changing the LCD display

The factory configuration has a default date and time display. The display configuration is backward compatible with the XSeries[G4].

To change the display to preferred settings:

1. On the Station Setup tab, scroll down to the LCD Display Date/Time Format (Figure 32).

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

Figure 32: LCD display date and time format

2. Select the preferred Date/Time Format (mmddyy or yymmdd).
3. Select the preferred Date Separator (slash, dash, or period).
4. Select the preferred Time Separator (colon or period).

3.4 Configure communications

3.4.1 Configuring the COMM ports

The configuration is for COMM 1 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 serial communication port:

1. Ensure the power LED on the COMM module is on (green).
2. In PCCU, click **Communications** on the navigation tree. The Communications Setup tab displays (Figure 33).

Port	Description
COM0:	Totalflow/COM0:
COM1:	(Unused)
COM2:	(Unused)
USB1:	Totalflow/USB
Ethernet	Totalflow/TCP
(Unassigned)	Communications-4
(Unassigned)	Communications-5
(Unassigned)	Coriolis Interface

Figure 33: Unused COM port

3. Verify the port is unused.
4. Select the appropriate port name (COM1 or COM2).

5. Click **Add New Device/Application**. The Add/Modify Communication device and application box displays (Figure 34)

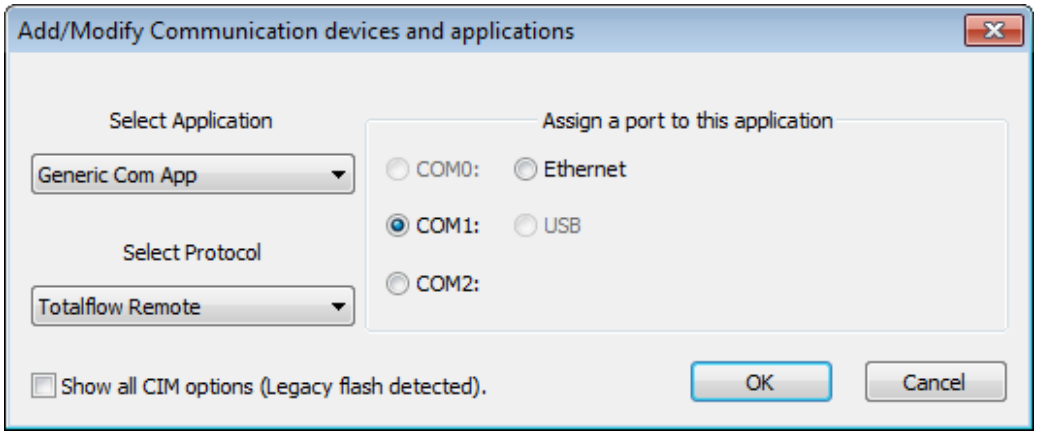


Figure 34: Add communication

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

IMPORTANT NOTE: The applications in the list 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 the user-defined **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.

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

11. Select the **Bus termination** check box only if the RMC is the last device on the RS-422 or RS-485 communication bus.
12. The default values for time outs and delays rarely need to be changed. Consult the communication equipment specifications before changing the settings.
13. Click **Send changes to device**. The new port name displays under Communication on the navigation tree.

The 4 LED lights are PWR, RTS, TXD, and RXD. The flashing LED lights on the top of the communication module show that data is being sent (TXD) and received (RXD). As long as the power is available, the PWR LED light should be on.

Figure 35 provides a communication configuration example for an ABB Totalflow product.

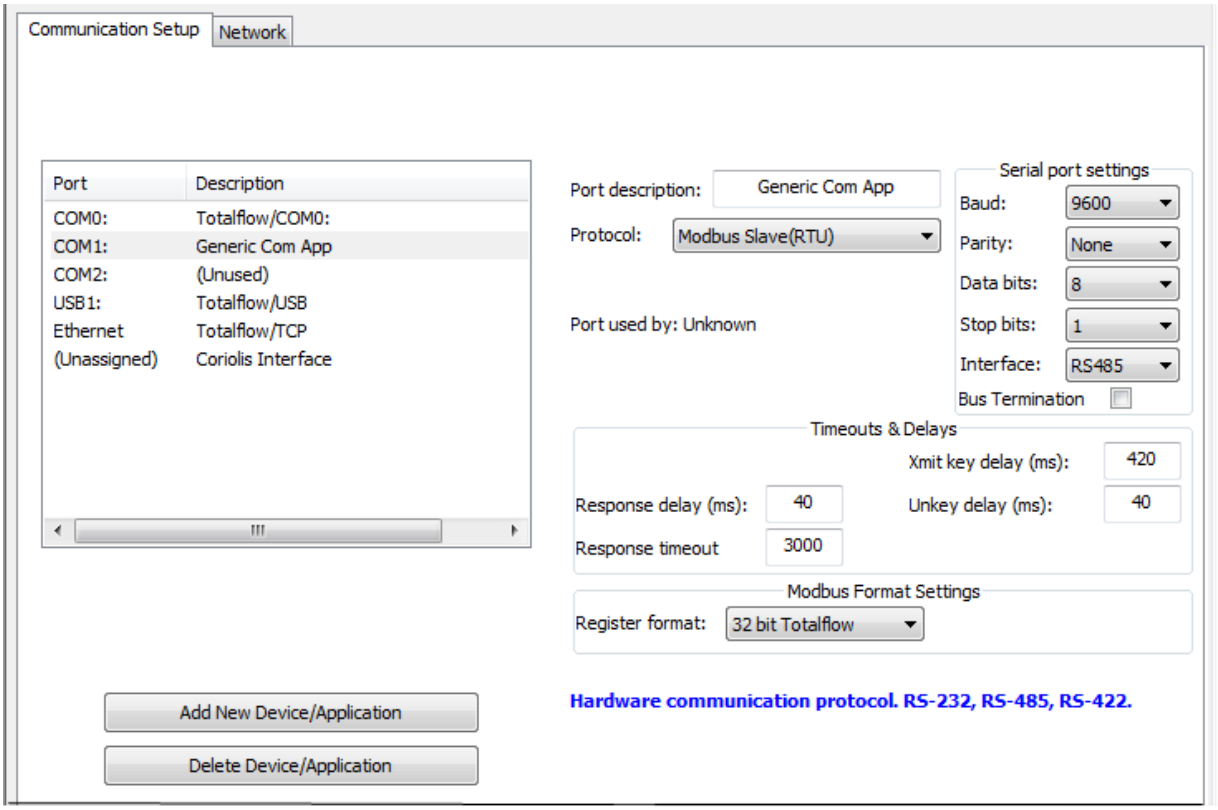


Figure 35: Serial communication port

Figure 36 provides an example for radio communication configuration.

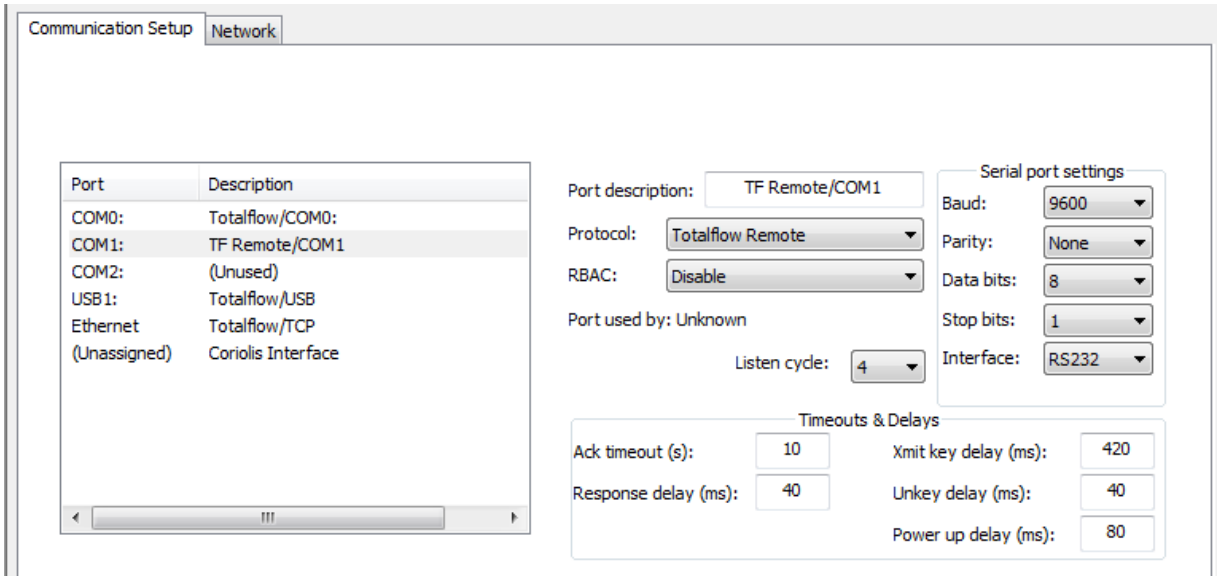


Figure 36: Radio communication port

3.4.2 Configuring Ethernet communication

When connecting to a network, configure the RMC with a valid public IP address. The RMC supports static (manual) or dynamic (DHCP) IP addressing.

IMPORTANT NOTE: The default setting for an Ethernet port is Enabled. A change to the state of an Ethernet port (enable or disable) requires a warm reboot of the RMC to take effect.

To configure the parameters for Ethernet communication:

1. Connect the Ethernet cable from the RMC to the network communication equipment (hub, switch, router, etc.).
2. Verify that the network Ethernet link is live.
3. Configure the network parameters:

d) Click **Communications** on the navigation tree. The **Communications Setup** tab displays.

e) Click the **Network** tab (Figure 37).

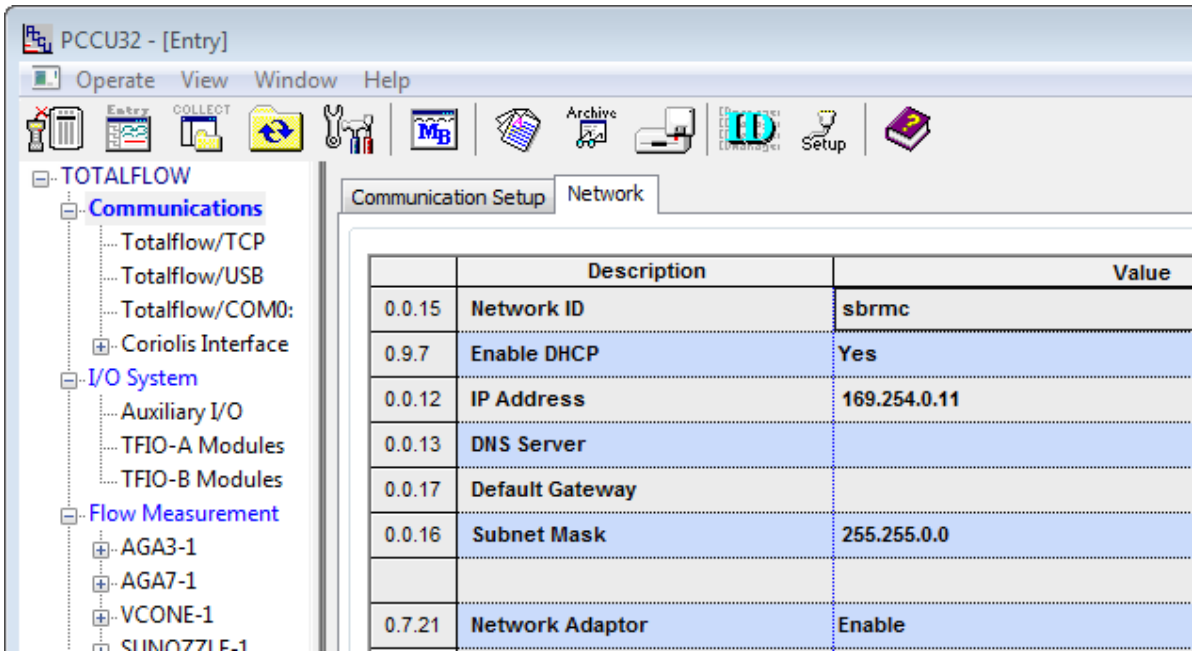


Figure 37: Ethernet remote communication setup

f) Verify that the Network Adaptor is set to **Enable.**

g) If using DHCP for dynamic addressing, change the Enable DHCP field to **Yes**.

h) If using static addresses, type each of the parameters: IP Address, Default Gateway, and Subnet Mask.

i) Click **Send**. An Information box displays a message to warm-start or reset the device for the changes to take effect.

4. Click **OK** and perform a warm-start or reset the device.

IMPORTANT NOTE: Once the RMC IP address is changed, any TCP/IP connection is lost. Use the new IP address to reestablish the connection.

25. Verify network configuration by pinging the RMC from the network. If the configuration is correct, the RMC should reply to the ping.

Figure 38 illustrates the use of Ethernet port 1 for connecting the RMC to a network

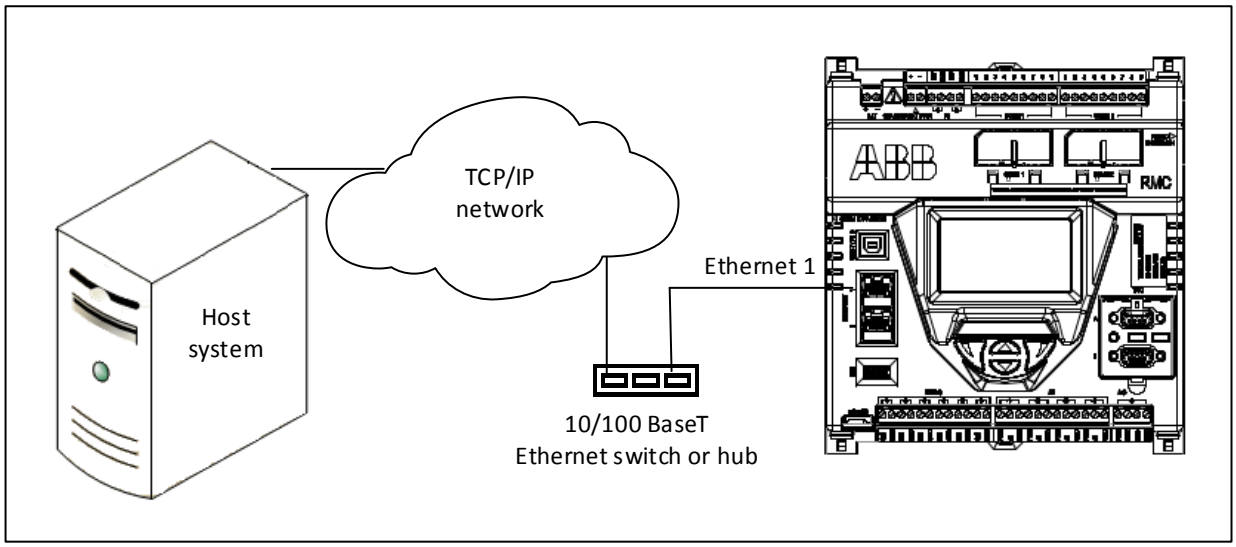


Figure 38: Ethernet for remote communication

3.4.3 Configuring serial COMM ports for switched power

If switching power for the device from the COMM 1 or COMM 2:

1. Click the **I/O System** option on the navigation tree.
2. Click the **Auxiliary I/O** option on the navigation tree.
3. Click the **Digital** tab (Figure 39).

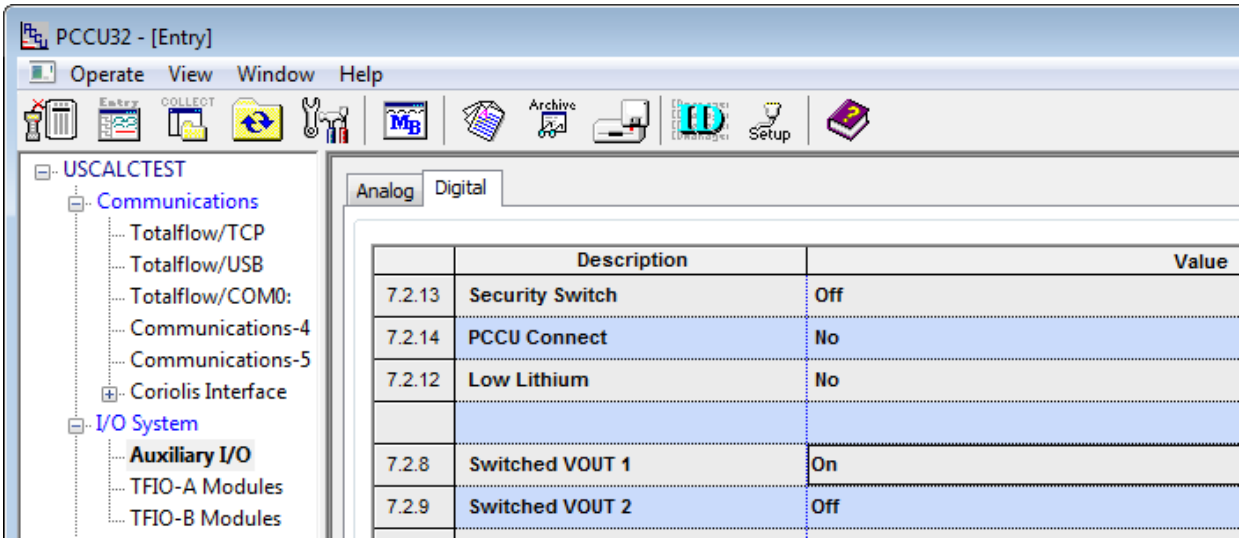


Figure 39: Serial COMM port for switched power

4. Set the Switched VOUT option to **On** for the respective port.
5. Click **Send**.

3.4.4 Configuring Ethernet for serial port expansion

The Ethernet ports can be configured to support third party Ethernet-to-serial modules to add serial communication port capacity. The modules may be used to connect external devices such as XMVs and other transmitters.

For information, see APPENDIX B – *RMC* serial port expansion with MOXA®.

3.5 Configure input and output

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

3.5.1 Change the view option

The default view is the advanced option. Change from Advanced to Expert view to configure the I/O. To change the view option:

1. Click **View** on the menu bar.
2. Select the **Expert** option (Figure 40).

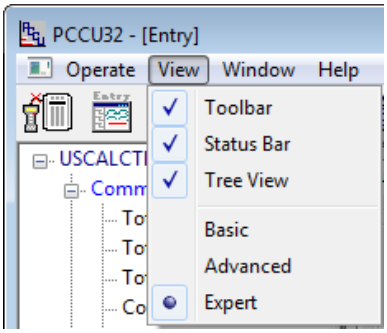
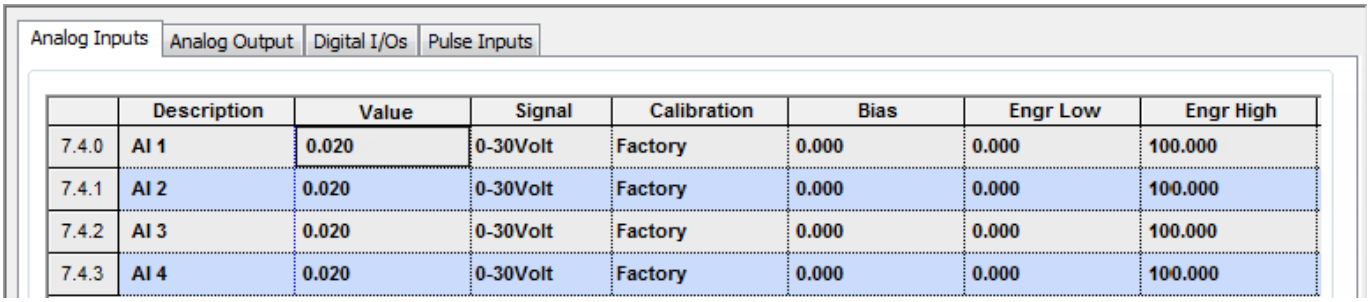


Figure 40: PCCU32 Expert view

3.5.2 Analog input configuration

To configure the analog input:

1. Click **I/O System** on navigation tree. The Analog Inputs tab displays (Figure 41).



	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

Figure 41: Analog input configuration

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

3.5.3 Analog output configuration

This configuration consists of defining 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.

When defining non-default engineering units for the first time, it is recommend that the AO is calibrated first. Engineering units can be defined from the AO calibration screen after calibration is completed. Engineering units defined on the calibration screen are automatically reflected in the AO tab screen (Figure 42).

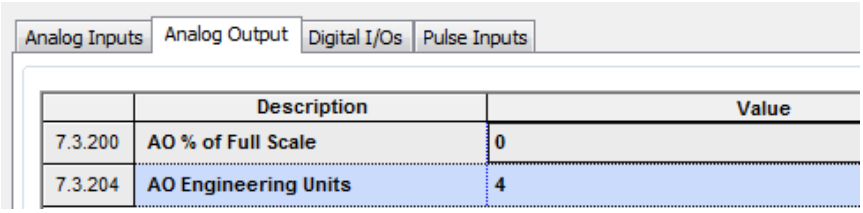


Figure 42: Analog output configuration

See section 5.1.2, *Analog output calibration*.

3.5.4 Digital input and 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. The built-in pull-up resistor is configurable for reading signals from devices with dry contact and open collector/drain output types.

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

To configure each digital input or output:

1. Click **I/O System** in navigation tree.
2. Click the **Digital I/Os** tab (Figure 43).

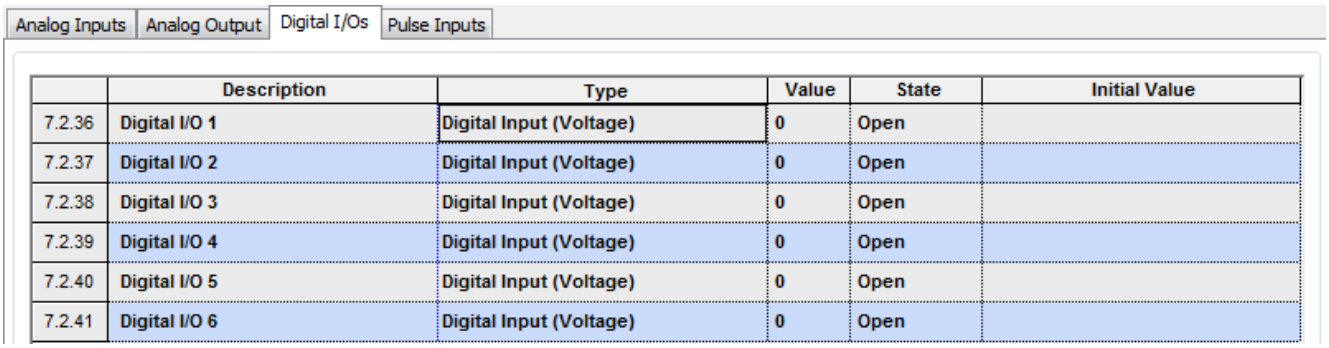


Figure 43: Digital input and output configuration

3. Select the **Type** from the drop-down list (Digital Input is the default).
4. Configure each Digital I/O as appropriate:

j) For digital input mode, select the low and high threshold voltage.

k) For digital output mode, select the current value and the initial value.

5. Click **Send**.

3.5.5 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 kHz.

To configure the pulse input:

1. Click **I/O System** in the navigation tree.
2. Click the **Pulse Inputs** tab (Figure 44).

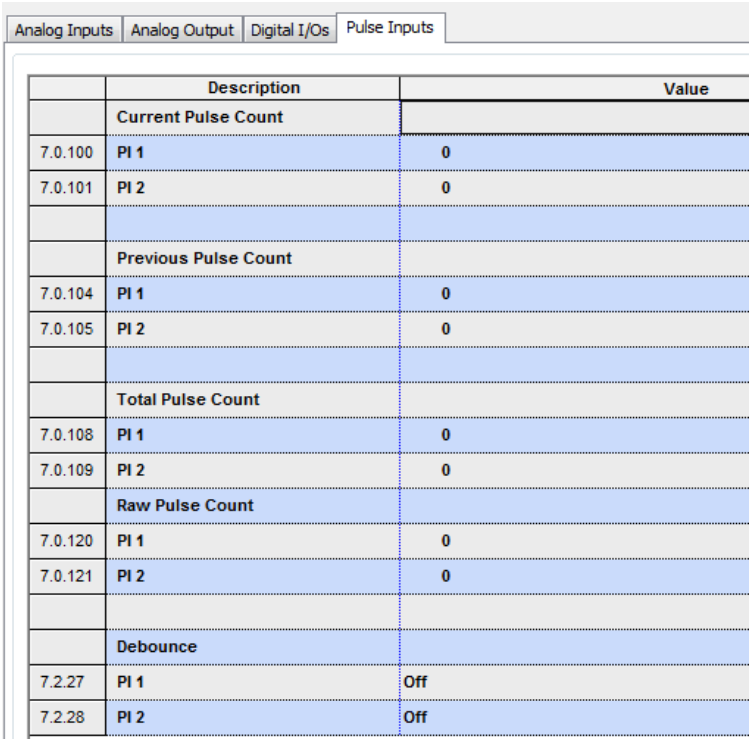


Figure 44: Pulse input configuration

3. Go to the Debounce area of the screen.
4. Select **On** if debounce is required. Set this for each PI port that requires debounce.
5. Click **Send**.

3.6 Configure TFIO interfaces

To scan and transmit data using the TFIO modules, the TFIO interface port must be enabled.

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

To configure the TFIO interfaces:

1. On the navigation tree under the I/O System, click TFIO-A Modules or TFIO-B Modules (Figure 45).

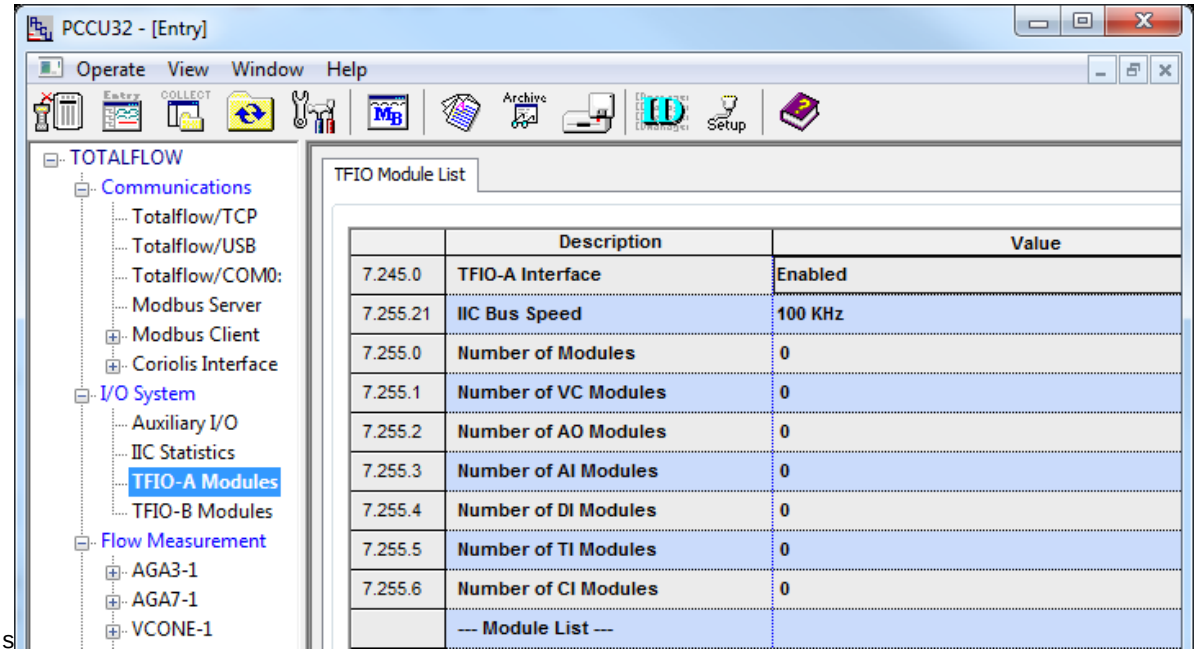


Figure 45: TFIO A configuration

2. If the TFIO Interface is disabled, change the setting to **Enabled**.
3. Refer to the *PCCU32 Help* for information.
4. Click **Send**.

4 Advanced setup

Additional procedures customize the RMC to meet individual site needs. Complete these steps in the PCCU Expert view.

4.1 Configure the LCD backlight

For the backlight setup, define the use of the backlight, what triggers the backlight, and the number of seconds for timeout to occur. The LCD Backlight Status is a read-only field that shows whether the backlight is off or on. The backlight remains on depending on display activity for the timeout period. With the backlight disabled, the backlight is always off. The default backlight timeout is 60 seconds. To set up the backlight:

1. On the Station Setup tab, scroll down to LCD Backlight (Figure 46).

	---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

Figure 46: LCD backlight settings

2. In the LCD Backlight Enable field, select an option (**Off** or **On**.)
3. In the LCD Backlight Trigger field, select an option (**Off**, **Always On**, **On for Local Connections**, or **On for Push Buttons**).
4. In the LCD Backlight timeout field, type the number of seconds that the backlight stays lit during inactivity before it turns off.
5. Click **Send** to save all of the station settings.

4.2 Configure low power use

The RMC goes into sleep mode when the power source drops below a specified voltage for a specified period of time. This is an effort to keep the battery from becoming so depleted that the RMC does not function properly. Sleep mode preserves the RMC's historical data that was collected prior to going to sleep. New flow measurements are not calculated during sleep mode.

While in sleep mode, the RMC can be woke up by accessing PCCU and connecting to RMC. The RMC will stay awake as long as PCCU is connected. If the battery is below the specified voltage when PCCU is closed, the RMC will go back to sleep mode after the specified period of time.

To establish the low power use:

1. Scroll to the Configuration for Low Power Use area (Figure 47), and in the Remote Comm Cutoff Voltage field, type the voltage for initiating communication cut-off mode.

	---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

Figure 47: Low power use

IMPORTANT NOTE: The RMC uses a specified voltage to shut down the communication ports and communication equipment (radio) that is being powered by the RMC. This function reduces power consumption so that the battery can recover.

While the RMC's power level stays at the specified voltage, the RMC is still functioning except for the remote communications.

RMCs with a 12 volt SLA battery should leave the default setting of 11.9 volts. RMCs which can handle a voltage range from 9 – 30 volts. For example, a 24 volt power supply may have a higher cutoff voltage.

Communication resumes when the voltage level returns and is higher than the specified voltage.

2. In the Sleep Mode Entry Voltage field, type the voltage for the RMC to go into sleep mode.

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

RMCs with a 12 volt SLA battery should leave the default setting of 10.9 volts. RMCs which can handle a voltage range from 9 – 30 volts (for example, a 24 volt power supply) may have a higher sleep mode voltage setting.

In sleep mode, the RMC is no longer functioning. It saves the last data values.

The RMC resumes functioning after a specified time period to wake up.

3. In the Sleep Mode Hold-off Time field, type the number of seconds for the RMC to have low power before the sleep mode begins.
4. In the Wake Up Time field, highlight the time group (hours, minutes, or seconds) to change, and type the time or use the up and down arrows to change the time for the RMC to wake up.
5. In the Wake Up Time Mode field, select the option (**Time from Start of Sleep** or **Time of Day**) to end the sleep mode.

4.3 Configure low charger alarm

When the Low Charger Alarm is enabled and the voltage from the charger is 0.4 volts below the battery voltage, the alarm ᴸC shows on the LCD display. If the Low Charger Alarm is disabled, the alarm does not display.

The Low Charger Alarm State is a read-only field that shows the state of the alarm: Not in Alarm or In Alarm.

To enable the alarm (available in Expert view only):

1. Scroll down to the Low Charger Alarm Enable area of Station Setup (Figure 48).

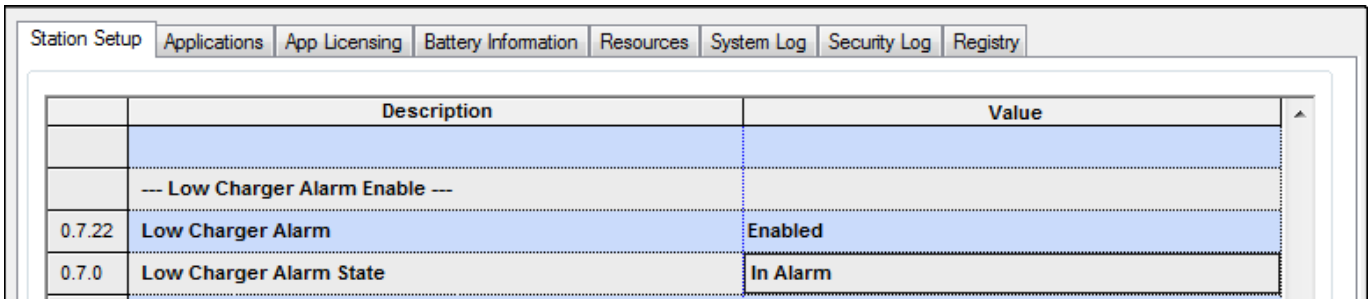


Figure 48: Low charger alarm

2. Select the **Enabled** option for Low Charger Alarm.

4.4 Customize the display

The maximum number of characters per row on the display is 21 (X location with a range 0 to 20). The size of a character is 8 x 6 pixels.

The maximum number of lines or rows on the display are 8 (Y location). Lines 3 and 6 are not used to serve as separator lines. Lines 7 and 8 are reserved for the annunciators Two pairs of rows are reserved: lines 1 (Y=0), 2 (Y=1), 4 (Y=0), and 5 (Y=1) for the display items with data, units, annunciators, and plot (optional). For both pairs, the top row (line) is assigned a Y location of 0. The second row (line) is assigned a y location of 1. These locations indicate position relative to the pair, not the entire height of the LCD (Figure 49).

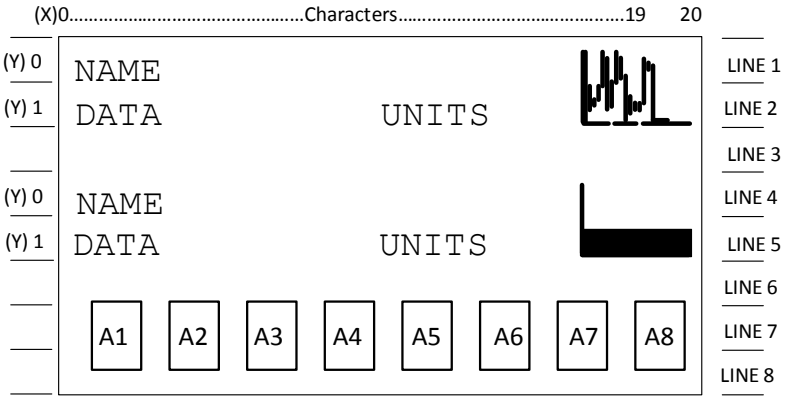


Figure 49: LCD display items

During operation, the LCD continuously scrolls through the operating parameters. Table 30 shows the typically displayed parameters. The display may be customized.

Table 30: RMC display item options

Display item	Description
DATE/TIME MM/DD/YY HH:MM:SS	Current Date and Time 24 hour clock
YEST DP LO NN PERCENT	Yesterday's Percent DP Low Limit Percent time below DP Low Set Point
YEST DP HI NN PERCENT	Yesterday's Percent DP High Limit Percent time above DP High Set Point
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 comes from with a factory default display group. The display groups and display items are programmable by the user (Table 30).

By default, each display item remains on the display for 5 seconds. The default may be changed to zero (the item is not displayed) or any value from 1 to 255 seconds. The engineering units and data format for the display may also be changed.

The annunciators are programmable by the user. By assigning the annunciator to an application, specific alarms display on the LCD (Table 31).

Table 31 Annunciator indicators

Indicator	Description
	System
(Blank LCD)	No annunciators displays. There is no power to the RMC.
ᴸL	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.
ᴸC	Low Charger: displayed 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	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
⍑	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.
+	Positive Acknowledge of receipt of request
V	Displayed when the valve control option is installed and no other valve control symbols are valid
=	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.)

Indicator	Description
↓	Valve is closing. (Close signal is being sent to the valve actuator.)
Ö	Valve RMC override conditions met (DP/SP override set point or Low Battery)
˪L	Local Lock-out is initiated.
	Measurement Application
H	Hold: displayed when HOLD flag is active. Also displayed when HOLD flag is active for the following: PCCU32 is being calibrated A to D converter cannot be read
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
	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

4.4.1 Setting the display

Other default displays are used when groups and items are set up. If the station is configured for measurement tubes or other applications, additional items scroll on the display.

The Scroll Lock Timeout identifies the amount of time that scrolling is locked when a group or display item is selected on the navigation tree (Figure 50).

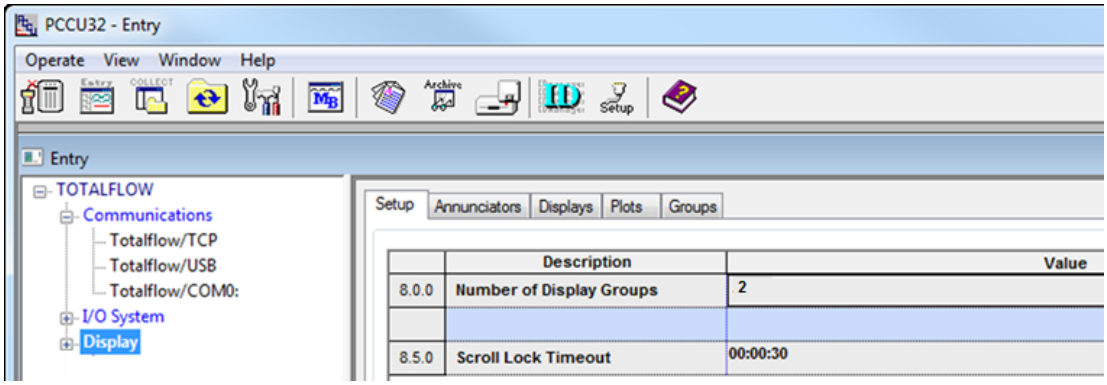


Figure 50: Display setup

To establish the number of display groups and the scroll lock timeout:

1. Click **Display** on the navigation tree to display the Setup tab.
2. In the Number of Display Groups field, type the number of the groups to scroll and display on the LCD.
3. In the Scroll Lock Timeout field, click the two-digit time group (hours, minutes or seconds) and type the time or use the up and down arrows to set the scroll lock time.
4. Click **Send** to save.
5. For more information, click **Help**.

4.4.2 Assigning annunciators

Determine what applications to assign to the annunciators. The application must be instantiated or it will not display in the selection list (Figure 51). A total of 8 annunciators may be assigned. To assign the applications to an annunciator:

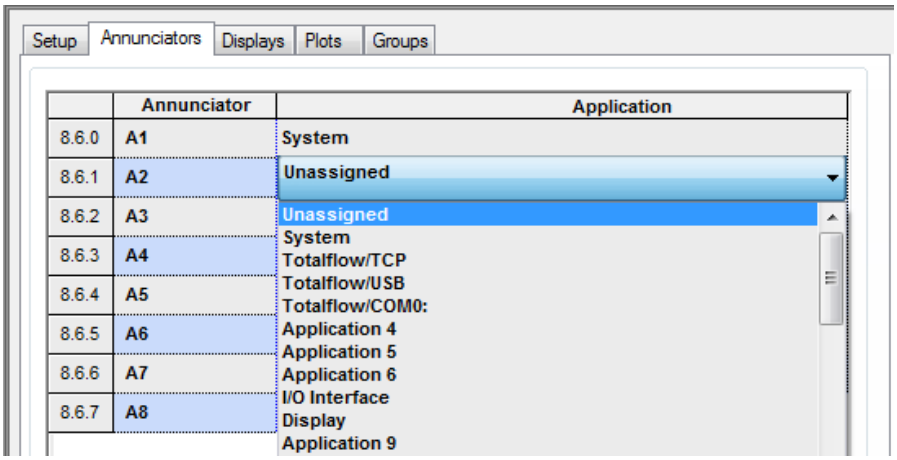


Figure 51: Assigning applications to annunciators

1. Click the **Annunciators** tab.
2. Select one application to assign from the drop-down list for an annunciator as needed. Repeat until all necessary annunciators are assigned.
3. Click **Send** to save.
4. For more information, click **Help**.

IMPORTANT NOTE: Use only the applications needed. The more applications, groups and items set up, the more storage is required in the system.

4.4.3 Configuring a display group

The default group file name is Grp0000#.dg and the default description is Display Group #. The number goes up incrementally for each additional group (Figure 52).

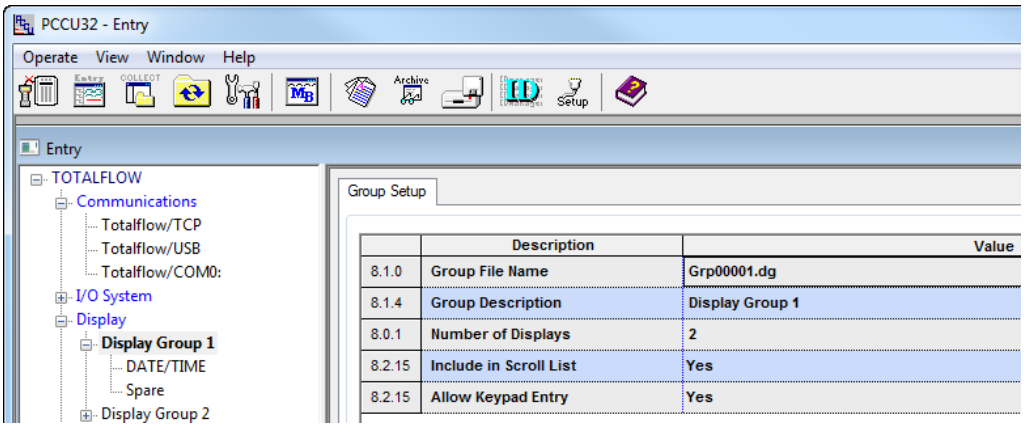


Figure 52: Group setup

To change the default description and identify the number of items for each group:

1. Click the Display Group number on the navigation tree to display the Group Setup tab.
2. In the Group Description field, change the group description to a desired name.
3. In the Number of Displays field, type the number of items to display for the group.
4. In the Include in Scroll List field, select **Yes** to include the group in the scroll list.
5. Click **Send** to save and click **Re-read**. The new description displays under Display on the navigation tree.
6. For more information, click **Help**.

IMPORTANT NOTE: The groups and display items can be set up in the Display tabs: Displays, Plots, and Groups. All of the groups and display items are identified in a spreadsheet via Display tabs. The setup may be completed all in one place. For first time users, it may be easier to do the set up for groups and display items individually.

4.4.4 Configuring group display items

The number of display items assigned to the group is set up in the Group Setup tab. The number of display items are listed on the navigation tree for the group. DATE/TIME is the default for the first display item of each group. This cannot be deleted but it may be changed to another name. The default label is Spare for the group's other display items. A Spare label may be changed to something more meaningful.

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

To set up each display item:

1. Click the group name on the navigation tree, then select a group item (the DATE/TIME or a Spare) under the group.
2. In the Item Setup tab, type the new Name of Display Item.
3. Type the item's Register number. To find the registry number, click the Station ID name and click the Registry tab. Find the name entered for the Name of Display Item or application registry.
4. The Display Interval default is zero. In the Display Interval field, type the number of seconds for the item to display.
5. In the Units field, type the unit of measurement to display with the item's value.
6. In the X Location for Name field, enter the number of character locations from the left edge for the display item name to begin. The zero default has the name begin on the left edge.
7. In the Y Location for Name field, enter 0 or 1. The default is zero for the item name to display on the first line.
8. Type the numerical format for the type of data that will be displayed. For example, values with 9 digits:

l) 9.0 for whole number or integer value; no decimal point.

m) 9.1 for 9 digits with 1 decimal point.

n) 9.2 for most cases of floating point numbers.

o) 9.3 for when three digits past the decimal are needed for more accuracy.

9. Click **Send** to save.
10. Click **Re-read** to refresh and update the screen with the changes.
11. For more information, click **Help**.

NOTICE – The number of groups and display items can be decreased only by typing a lower number in the Display Setup tab for groups and in the Group Setup tab for display items. The last item on the list is the item removed if the number of displayed items is decreased by 1; the last two items on the list are the items removed if the number of displayed items is decreased by 2. If the first item on the list is the one to be removed, all of the items will have to be removed. A specific group or item cannot be targeted to be deleted out of order.

4.4.5 Configuring the plot for a display item

The plot for a display item is optional. Configure the plot after the display item is added. The plot displays simultaneously with the display item. Two options are available for the plot size (Figure 53). When using the wider plot size, the item name or units may overwrite the plot and have to be shortened in the Item Setup tab.

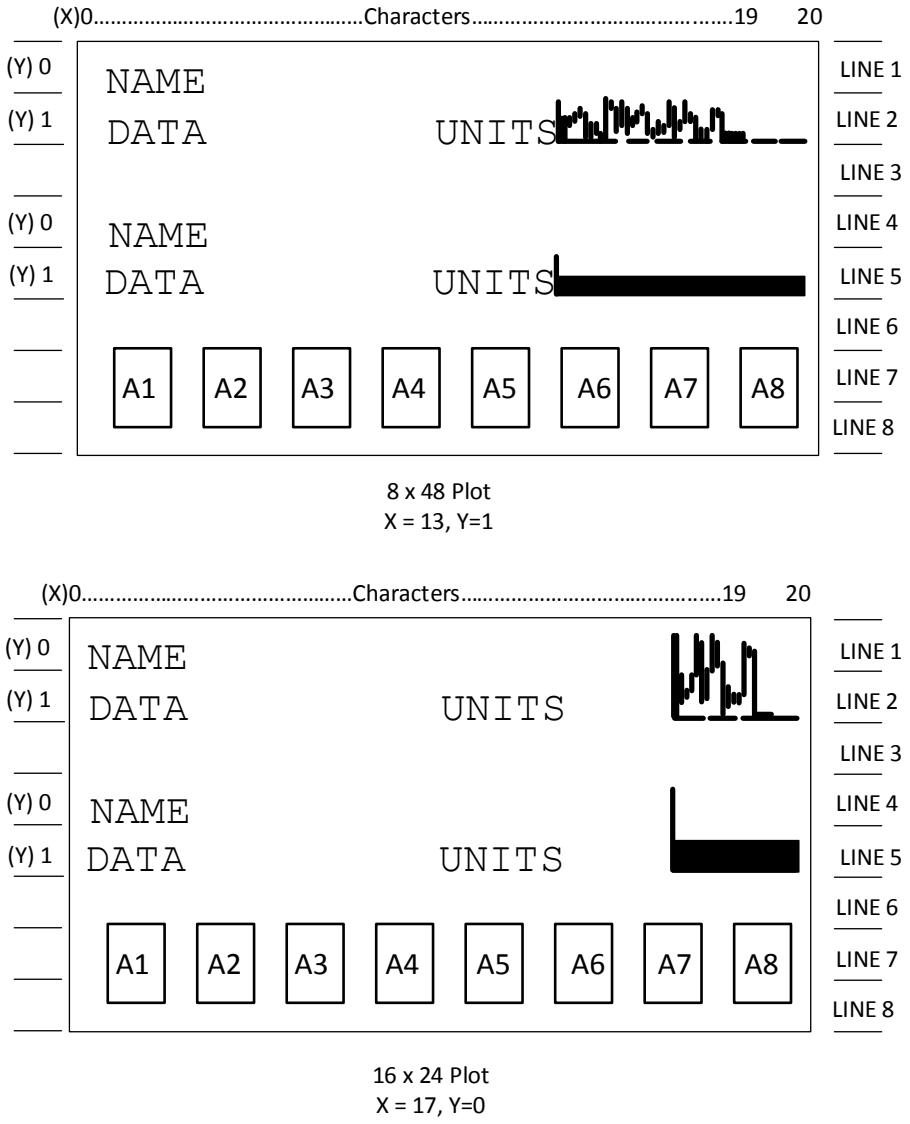


Figure 53: Plot sizes

To set up the plot for the item:

1. Click a display item on the navigation tree.
2. Click the **Plot** tab.
3. In the Annunciators or Plot field, select the option to display on the LCD:

p) 16 x 24 plot size

q) 8 x 48 plot size

4. Select the option for the Plot Type and the plot sizes:

r) Current: live data

s) Array: Previously collected data

t) Horizontal Bar: current data display in horizontal bar plot

u) Vertical Bar: current data display in vertical bar plot

5. Select the option (**left to right** or **right to left**) for the Scroll Direction.
6. Select the Line Width option (**Fill** or line width number).
7. Select **Yes** or **No** for the Left Border, Right Border, and Bottom border.
8. If Array was selected as the Plot Type, type the register location for the array.
9. Click **Send** to save.

Table 32 identifies the available plot types and plot sizes.

Table 32: Plot types and sizes

Plot Type	8 x 48 Plot Size	16 x 24 Plot Size
Current		
Array		
Horizontal bar		
Vertical bar		

4.5 Enable SSH/SFTP

To enable network communications and SSH/SFTP service on the RMC:

1. Click **Communications** in the navigation tree.
2. Click the **Network** tab.
3. Configure valid network parameters (IP Address, Default Gateway, and Subnet Mask). See section 3.4.2, *Configuring Ethernet communication* for more information.
4. In the Network Adaptor field, select **Enable**.
5. In the SSH/SFTP field, select **Enabled**.
6. Click **Send** to save the configuration.

Refer to the Help files for more information.

5 Calibration

The calibration mode enables the calibration of the analog inputs and analog outputs.

5.1.1 Analog input calibration

The calibrations for analog input may be a 3-point or a 5-point calibration.

Table 33: AI calibration points

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

Determine the measurement range for the device attached to the AI.

5.1.1.1 Connecting calibration equipment

For the analog input calibration, a calibrator simulates the external device attached to the RMC's AI. The calibrator applies the signal (voltage or current) values that would be expected from the external device.

NOTICE – Property damage. Ensure that the voltage or current values from the calibrator do not exceed the analog input acceptable ranges. And ensure that the signal is the same type as the type the AI is configured for.

IMPORTANT NOTE: The wire length from the external device to the AI affects the calibration. When connecting the calibrator, make sure to use wires with the length required from the RMC to the external device. Or place the calibrator at the location where the external device is installed.

To prepare and connect the calibration equipment:

1. Disconnect the wires from the external device if already connected (the RMC AI wiring should already be done if section 3, Startup instructions were followed).
2. Set the calibrator to the correct signal type (voltage or current) that the AI is configured for.
3. Connect the calibrator to the wire ends that were removed from the external device. Observe the polarity and connect to the correct wire: positive probe to the signal wire and the negative probe to the negative or ground wire.

Figure 54 shows the setup of equipment to calibrate an AI with voltage or current.

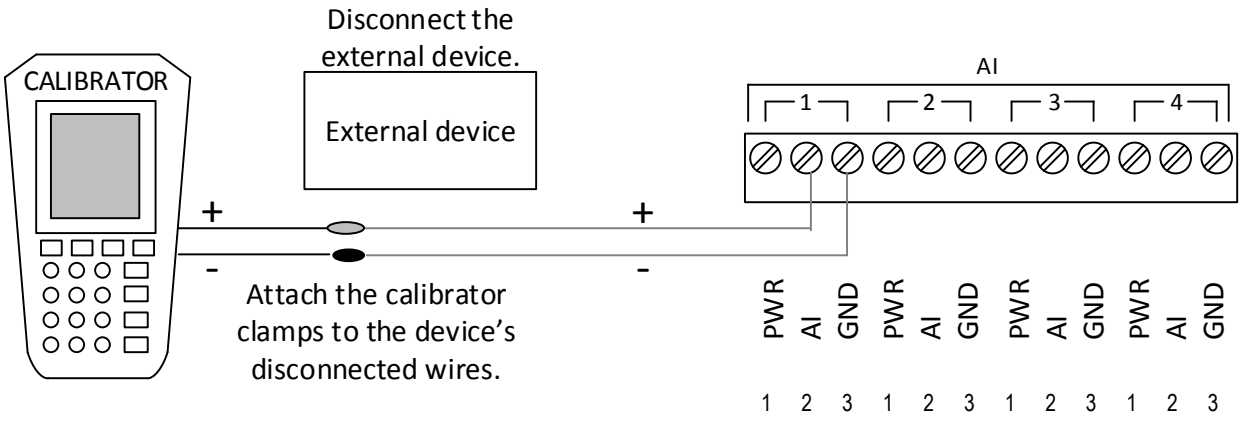


Figure 54: AI calibration equipment

5.1.1.2 Analog input calibration (voltage mode)

To calibrate the analog input:

1. Access PCCU32 version 7.55 or newer and click the **Entry** icon in the toolbar.
2. To verify the correct signal to the analog input is voltage:

v) Click **I/O System** in the navigation tree. The Analog Inputs tab displays.

w) Verify that the **Signal** field is set to 0-30 volts for AI 1 to be calibrated (Figure 55).

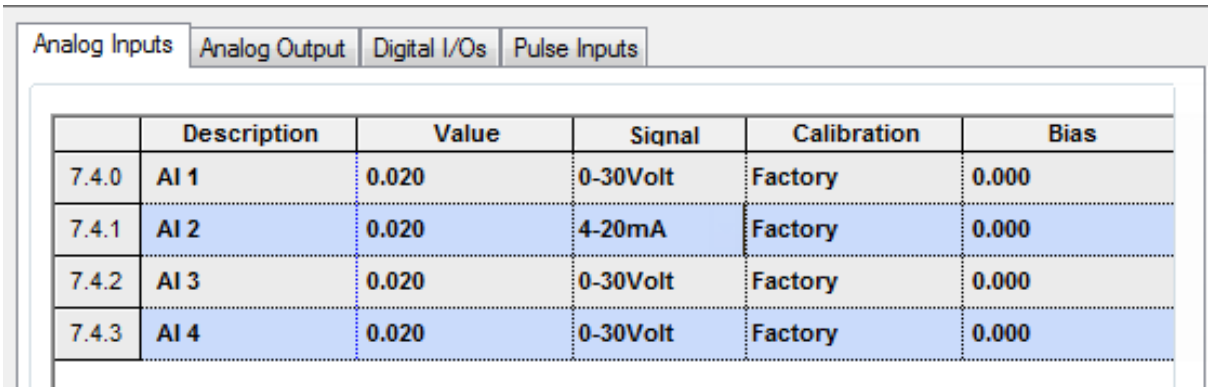


Figure 55: AI 1 set to voltage mode

26. Verify that the calibrator is set to voltage signal type.
27. Turn the calibrator on to supply the signal.

3. Click the **Calibrate** icon on the PCCU toolbar (roll the mouse over the icons and the icon name displays. The Calibrate icon contains the tools.)
4. Click **Onboard I/O** then **Analog Inputs** on the navigation tree.
5. Click the **AI** tab to be calibrated (Figure 56).

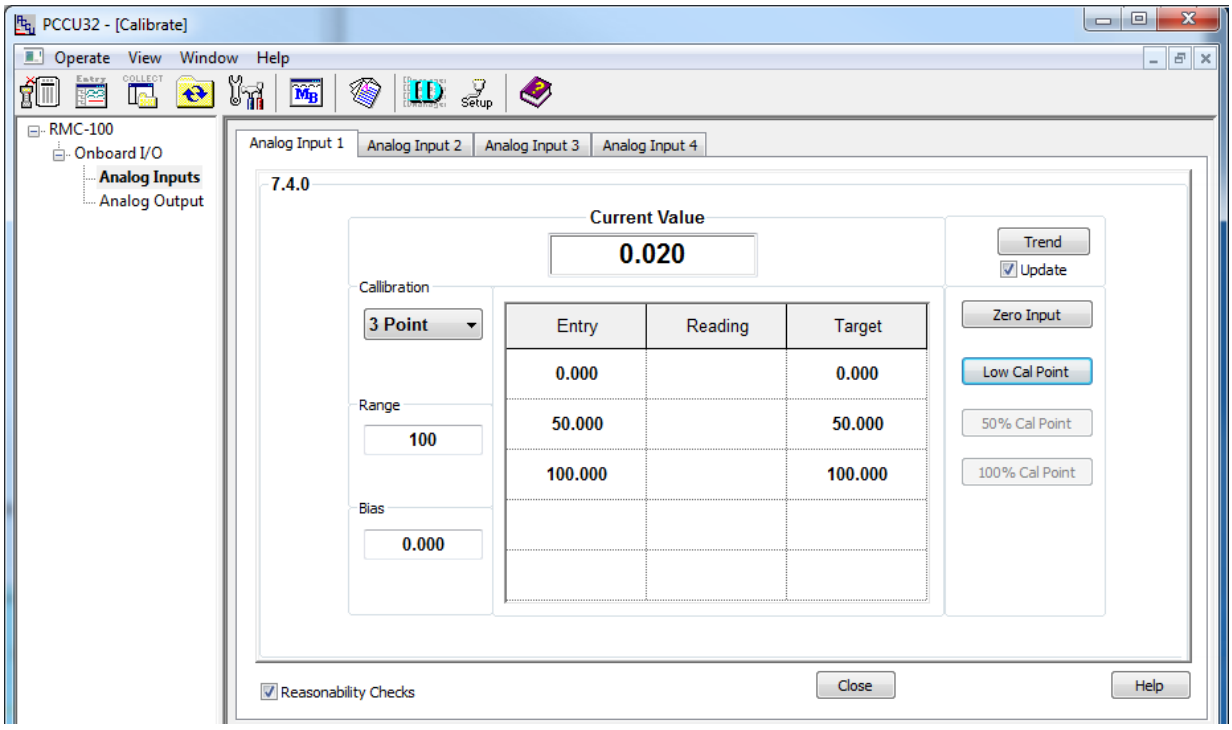


Figure 56: AI voltage default calibration values

6. Select the number of calibration points. A button for each calibration value displays. The 3 Point calibration is used in these instructions.
7. Verify that only the Zero Input and Low Cal Point buttons are enabled. The system enables the buttons in the order required for the calibration.
8. Click the **Range** field. The Analog Input Range box displays.
9. Type the external device measurement range (range example in these instructions is 100). The values in the Target column of the table are updated to reflect the new range.
10. Click **OK** and continue with low-range calibration.

x) Click **Low Cal Point**. The Enter Low Calibration Value box displays with the target low value automatically calculated. For example, if the range defined is 0-100, the value display is 0.000.

y) 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.

z) Observe the value in the Current Reading field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator (Figure 57).

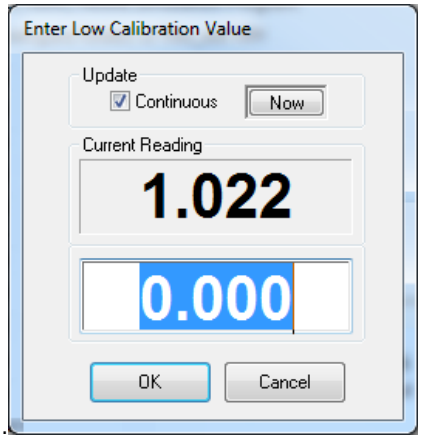


Figure 57: Low calibration value for voltage

aa) If the low range value in the field is accepted, click **OK**.

11. Verify that the 100% Cal Point button is enabled and continue with high-range calibration.

bb) Click **100% Cal Point**. The Enter 100% Calibration Value box displays with the target high value automatically calculated. For example, if the ranged defined is 0-100, the value display is 100.000.

cc) 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.

dd) Observe the value in the Current Reading field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator.

ee) If the high range value in the field is accepted, click **OK**.

12. Verify that the 50% Cal Point button is enabled and continue with mid-range calibration:

ff) Click **50% Cal Point**.

gg) 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 1-5 Vdc, apply 2 Vdc.

hh) Observe the value in the **Current Reading** field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator.

ii) If the mid-range value in the field is accepted, click **OK**.

13. When "Calibration Complete" displays, click **OK**.

14. Verify the **Entry** values are updated and the Current Value field displays the calibrated value based on the range defined (Figure 58).

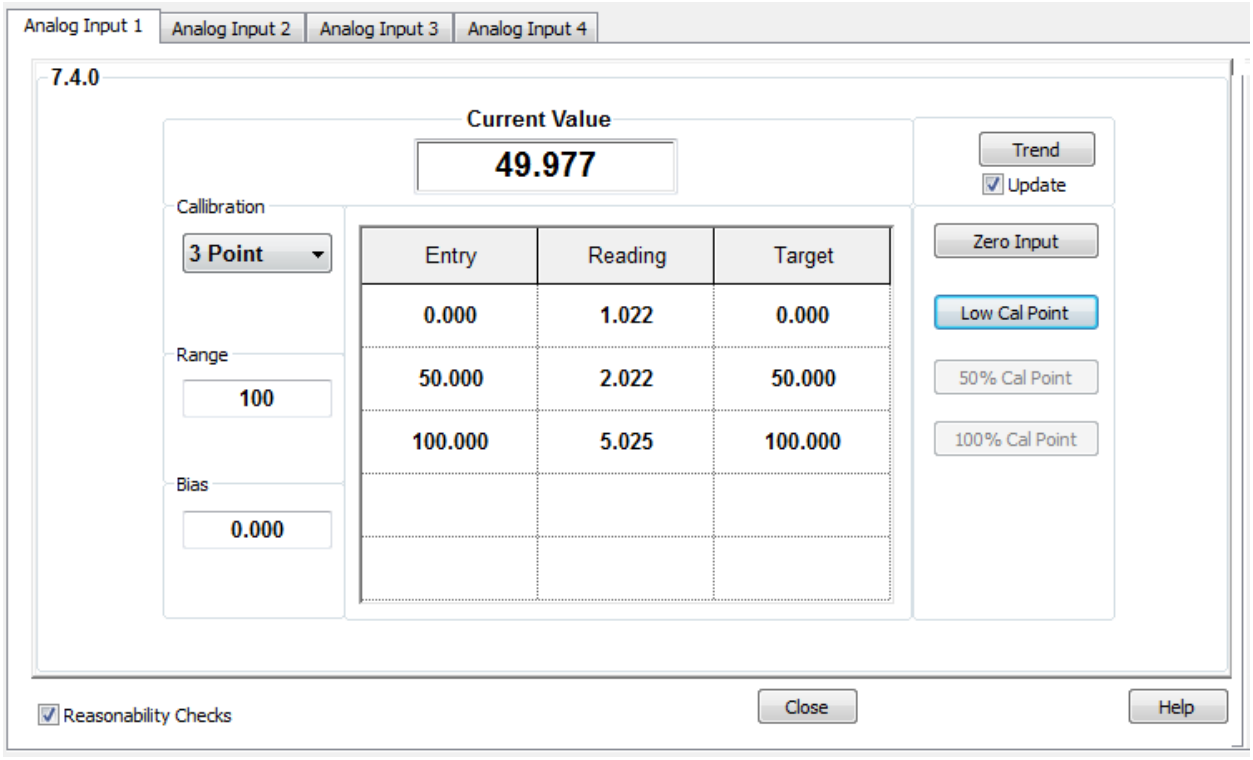


Figure 58: Calibrated AI example (voltage mode)

15. Remain in the calibration screen and keep the calibrator connected to the AI.
16. To verify the calibration, proceed to 5.1.1.4, *Verify analog input calibration.*

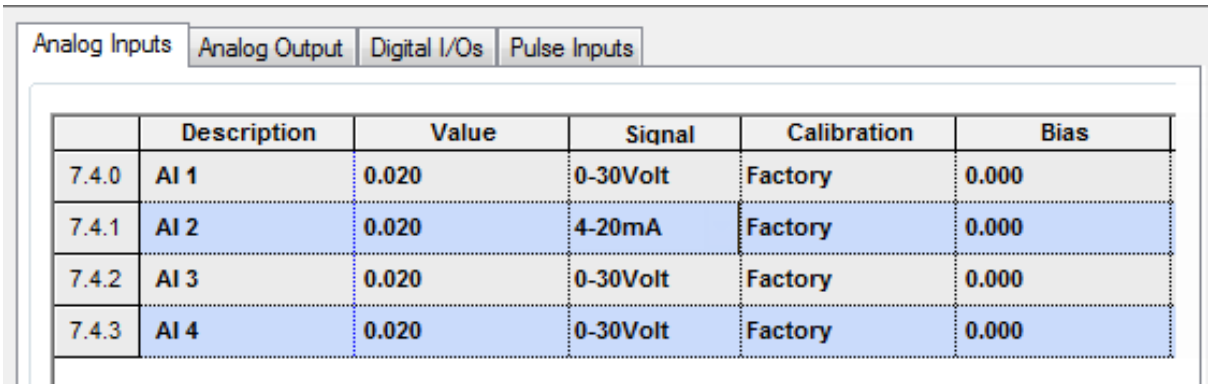
5.1.1.3 Analog input calibration (current mode)

To calibrate the analog input with 3 points:

1. Access PCCU32 version 7.55 or newer and click the **Entry** icon in the toolbar.
2. To verify the correct signal to the analog input in PCCU32 is current:

jj) Click **I/O System** in the navigation tree. The Analog Inputs tab displays.

kk) Verify that the **Signal** field is set to 4-20 mA for AI 2 to be calibrated (Figure 59).



	Description	Value	Signal	Calibration	Bias
7.4.0	AI 1	0.020	0-30Volt	Factory	0.000
7.4.1	AI 2	0.020	4-20mA	Factory	0.000
7.4.2	AI 3	0.020	0-30Volt	Factory	0.000
7.4.3	AI 4	0.020	0-30Volt	Factory	0.000

Figure 59: AI 2 set to current mode

3. Verify the calibrator is set to current signal type.
4. Turn the calibrator on to supply the signal.
5. Click the **Calibrate** icon on the PCCU toolbar.
6. Click **Onboard I/O** then **Analog Inputs** on the navigation tree.
7. Click the **AI** tab to be calibrated (Figure 60).

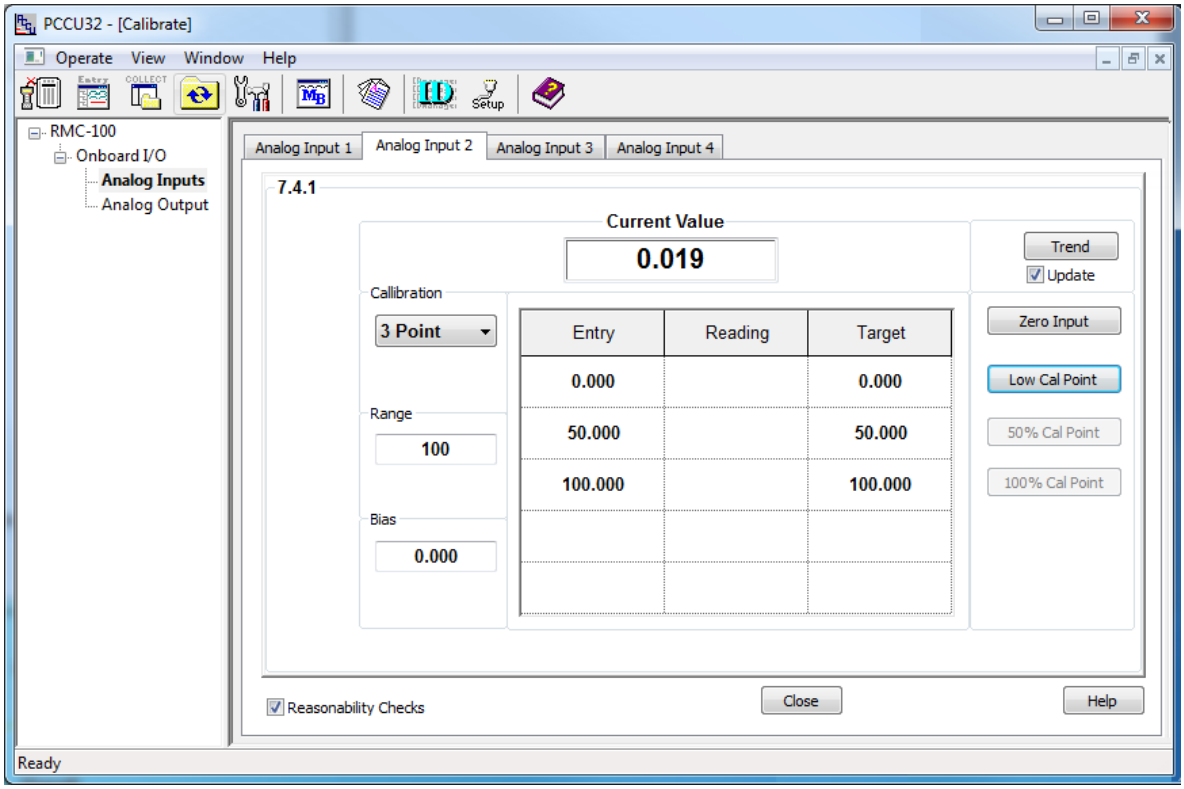


Figure 60: AI current default calibration values

8. Select the number of calibration points. A button for each calibration value displays. The 3 Point calibration is used in these instructions.
9. Verify that only the Zero Input and Low Cal Point buttons are enabled. The system enables the buttons in the order required for the calibration.
10. Click the **Range** field. The Analog Input Range box displays.
11. Type the external device measurement range (range example in instructions is 100). The values in the Target column of the table are updated to reflect the new range.
12. Click **OK** and continue with low-range calibration.

ll) Click **Low Cal Point**. The Enter Low Calibration Value box displays with the target low value automatically calculated. For example, if the range defined is 0-100, the value display is 0.000.

mm) 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.

nn) Observe the value in the Current Reading field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator (Figure 61).

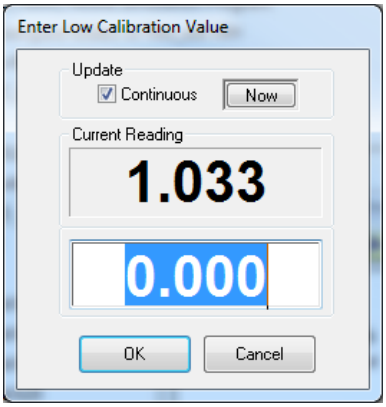


Figure 61: Low calibration value for current

oo) If the low range value in the field is accepted, click **OK**.

13. Verify that the 100% Cal Point button is enabled and continue with high-range calibration.

pp) Click **100% Cal Point**. The Enter 100% Calibration Value box displays with the target high value automatically calculated. For example, if the ranged defined is 0-100, the value display is 100.000.

qq) 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.

rr) Observe the value in the Current Reading field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator.

ss) If the high range value in the field is accepted, click **OK**.

14. Verify that the 50% Cal Point button is enabled and continue with mid-range calibration:

tt) Click **50% Cal Point**.

uu) 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 8 mA.

vv) Observe the value in the Current Reading field. Wait until the value stabilizes. The value should be close to the voltage applied by the calibrator.

ww) If the mid-range value in the field is accepted, click **OK**.

15. When the "Calibration Complete" displays, click **OK**.

16. Verify the Entry values are updated and the Current Value field displays the calibrated value based on the range defined (Figure 62).

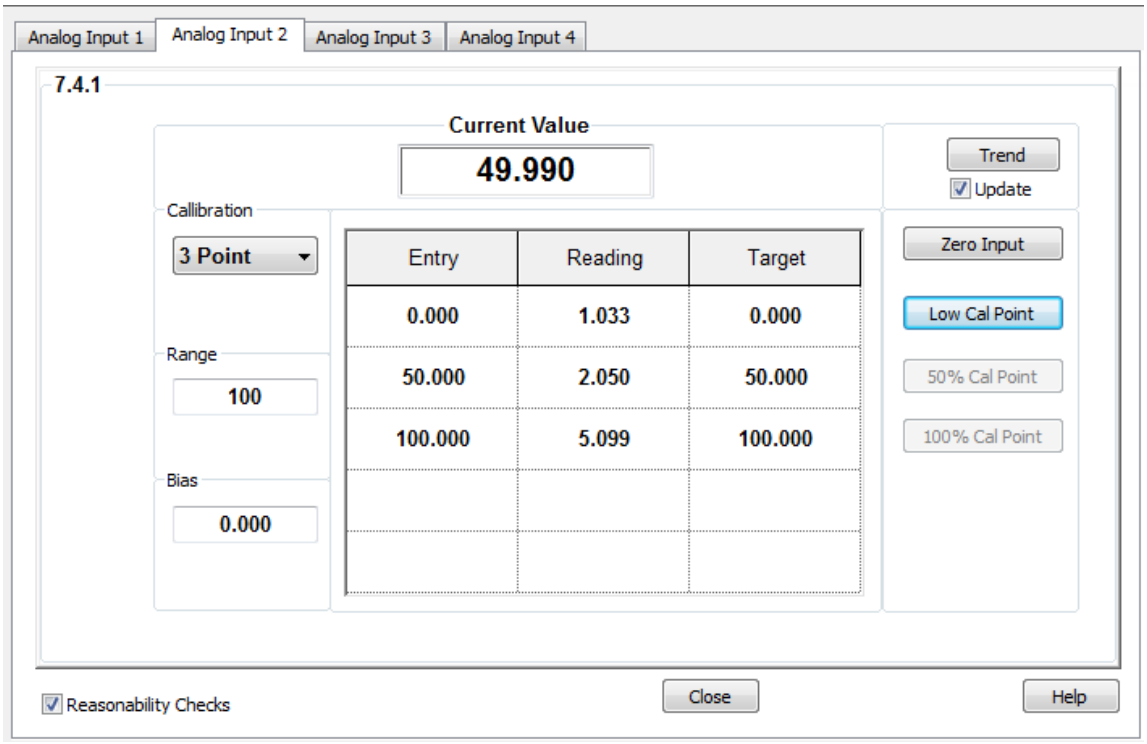


Figure 62: Calibrated AI example (current mode)

17. Remain in the calibration screen and keep the calibrator connected to the AI.
18. To verify the calibration, proceed to section 5.1.1.4*, Verify analog input calibration.*

5.1.1.4 Verify analog input calibration

After calibration is completed, the Current Value field should display the calibrated values based on the range defined. To verify the values, continue to use the calibrator to apply different input signal values to the AI and verify that the value displayed in the Current Value field reflects the calibration range.

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

To verify the analog input calibration:

1. Adjust the calibrator to apply the minimum (low) value of the signal range.
2. Wait for the value displayed in Current Value field to stabilize.
3. Verify that the Current Value field displays a value equal or close to the target range 0% (low) value (Figure 63).

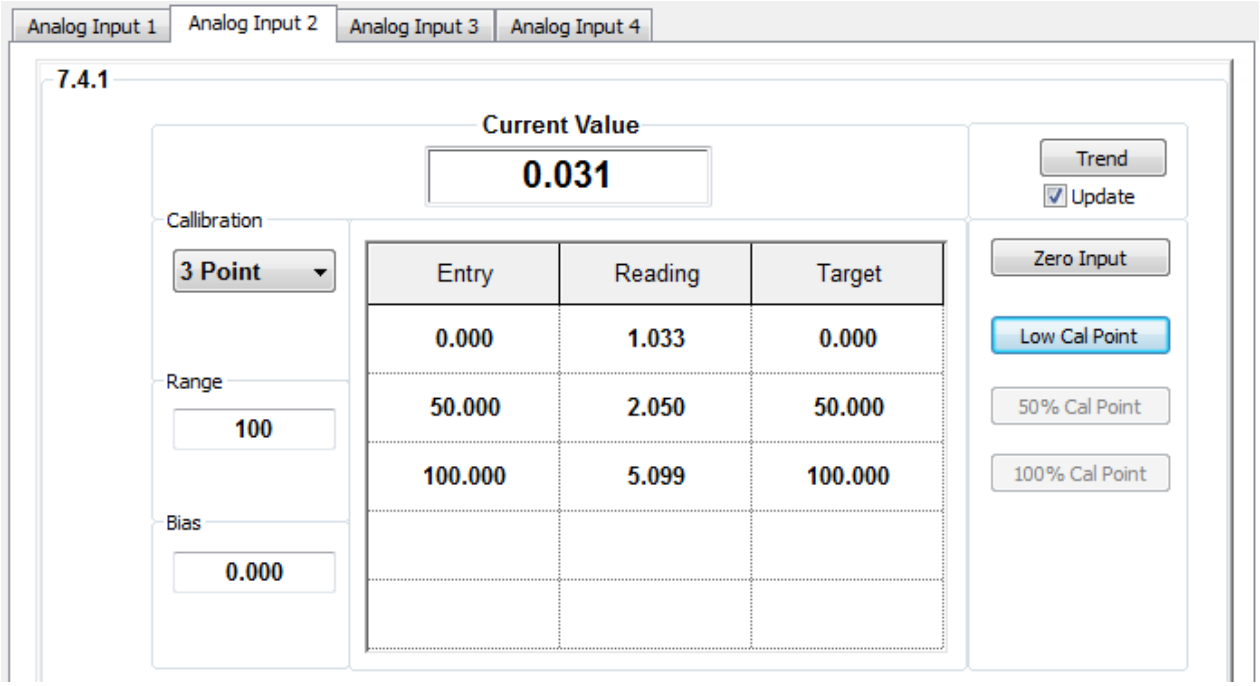


Figure 63: Low range value verification

4. Adjust the calibrator to apply the high (100%) value of the signal range.
5. Wait for the value displayed in Current Value field to stabilize.
6. Verify that the Current Value field displays a value equal or close to the target range 100% (high) value (Figure 64).

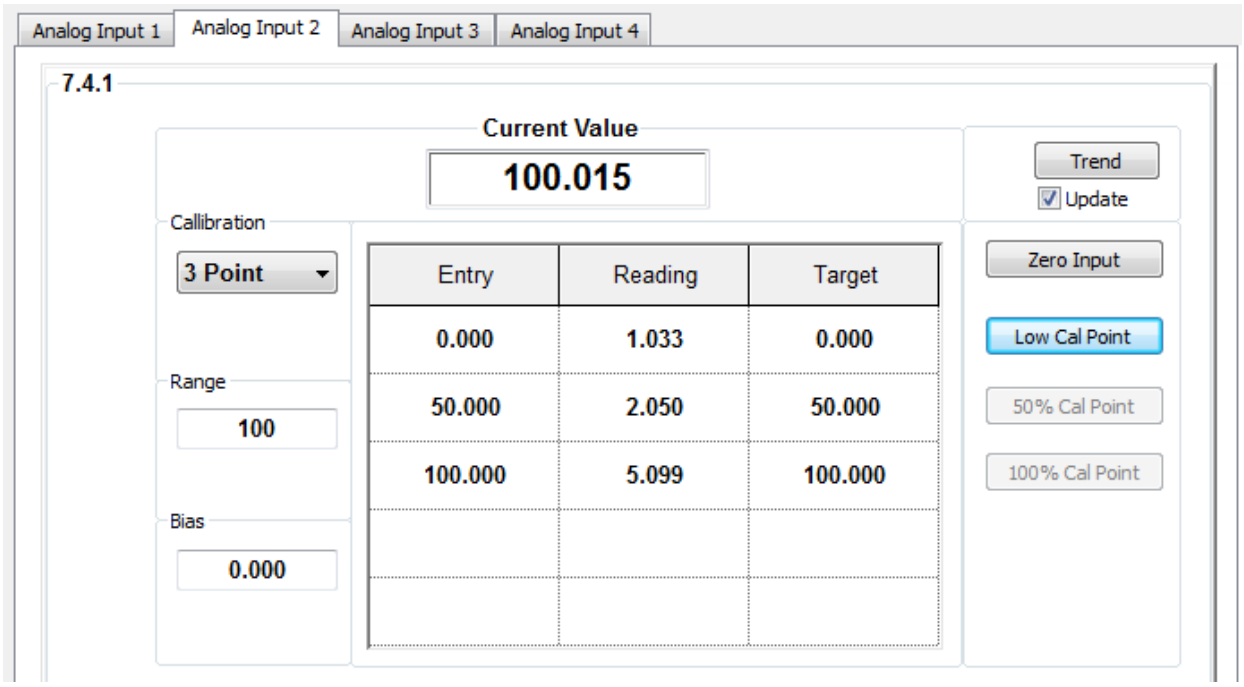


Figure 64: High range value verification

7. If all the values displayed are correct, calibrate the next AI or click **Close** to exit the calibration screen. When calibration for all required AIs is successfully completed, remove the calibrator.
8. If errors are found, proceed to section 5.1.1.5, *Repeat Calibration in case of* errors

5.1.1.5 Repeat Calibration in case of errors

If the displayed values are not valid or do not stabilize, the calibration may not be correct.

To perform the calibration again:

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 displays (Figure 65).

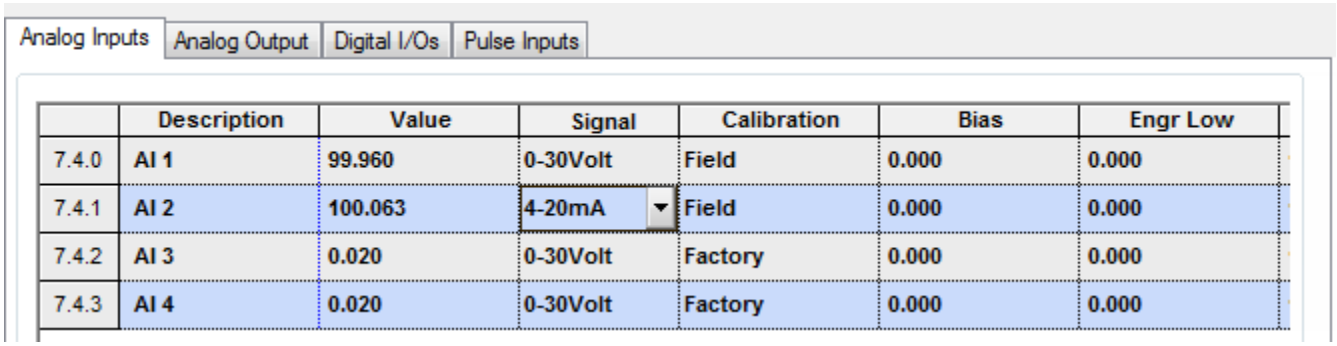


Figure 65: Analog inputs after calibration

4. In the Calibration column, set the appropriate AI back to **Factory**.
5. Click **Send**.
6. Click **Onboard I/O** then **Analog Inputs** on the navigation tree.
7. Repeat the calibration procedure in section 5.1.1.2, *Analog input calibration (voltage mode)* or section 5.1.1.3, *Analog input calibration (current mode)*.
8. Repeat the steps in section 5.1.1.4, *Verify analog input calibration*.

5.1.2 Analog output calibration

Calibration of the analog output (AO) ensures accuracy of the output signal.

The calibration screen has two modes:

– Auto Mode – provides a read-only view of the current AO, calibration, and engineering unit values.

– Manual Mode – for calibration. When calibrating, the manual mode in PCCU32 instructs the RMC to ignore live values for the period of time the RMC is being calibrated. This prevents real-time calculations from being affected during calibration. The RMC uses the last known values at the time calibration mode was entered. To exit the manual mode, unplug the PCCU cable to the RMC or exit Calibration.

5.1.2.1 Analog output calibration with no load

This is the calibration when no load is connected to the analog output. The procedure applies when the port is in source or sink mode.

Figure 66 shows the setup of equipment to calibrate an AO in source and sink mode.

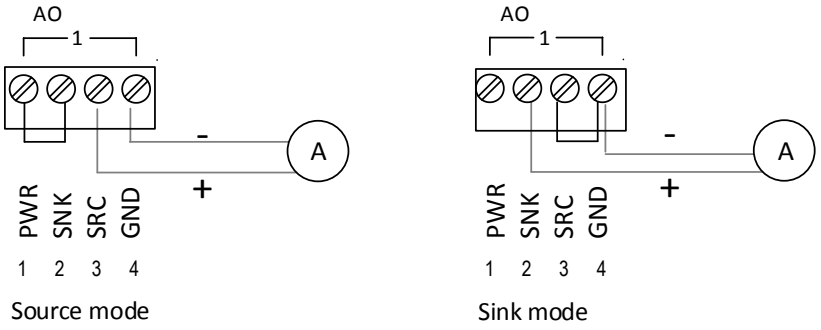


Figure 66: AO calibration with no load

To calibrate the AO:

1. Connect the equipment based on the preferred mode (source or sink) with no load as shown in Figure 66.
2. Access PCCU32 version 7.55 or newer and click the **Entry** icon in the PCCU toolbar.
3. Click the **Calibrate** icon in the toolbar.
4. Click **Onboard I/O** then **Analog Output** on the navigation tree.
5. Click the **Manual Mode** radio button (Figure 67).

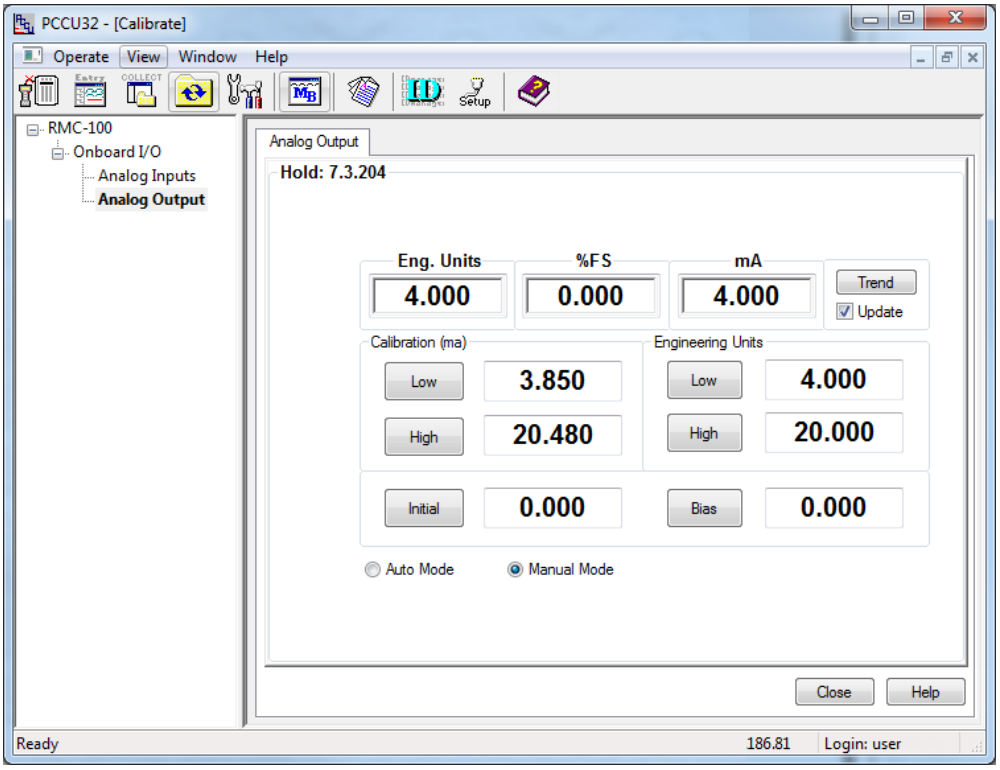


Figure 67: Analog output manual mode

6. Click **Low** in the Calibration (mA) column. The Enter Low Value box displays.
7. Check the ammeter reading. The value displayed should be approximately 4 mA.
8. Type the measured value displayed by the ammeter (Figure 68).

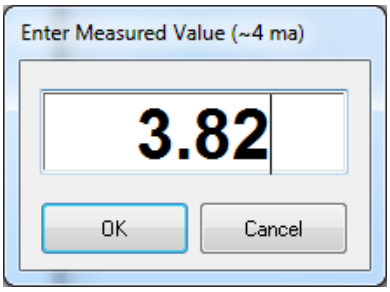


Figure 68: Low AO measured value

9. Click **OK**.
10. Click **High** in the Calibration (mA) column. The Enter High Value box displays.
11. Check the ammeter reading. The value displayed should be approximately 20 mA.
12. Type the measured value displayed by the ammeter.
13. Click **OK**.
14. When "Calibration Complete" displays, click **OK**. The Engineering Units, %FS, and mA fields should display full scale values (Figure 69).

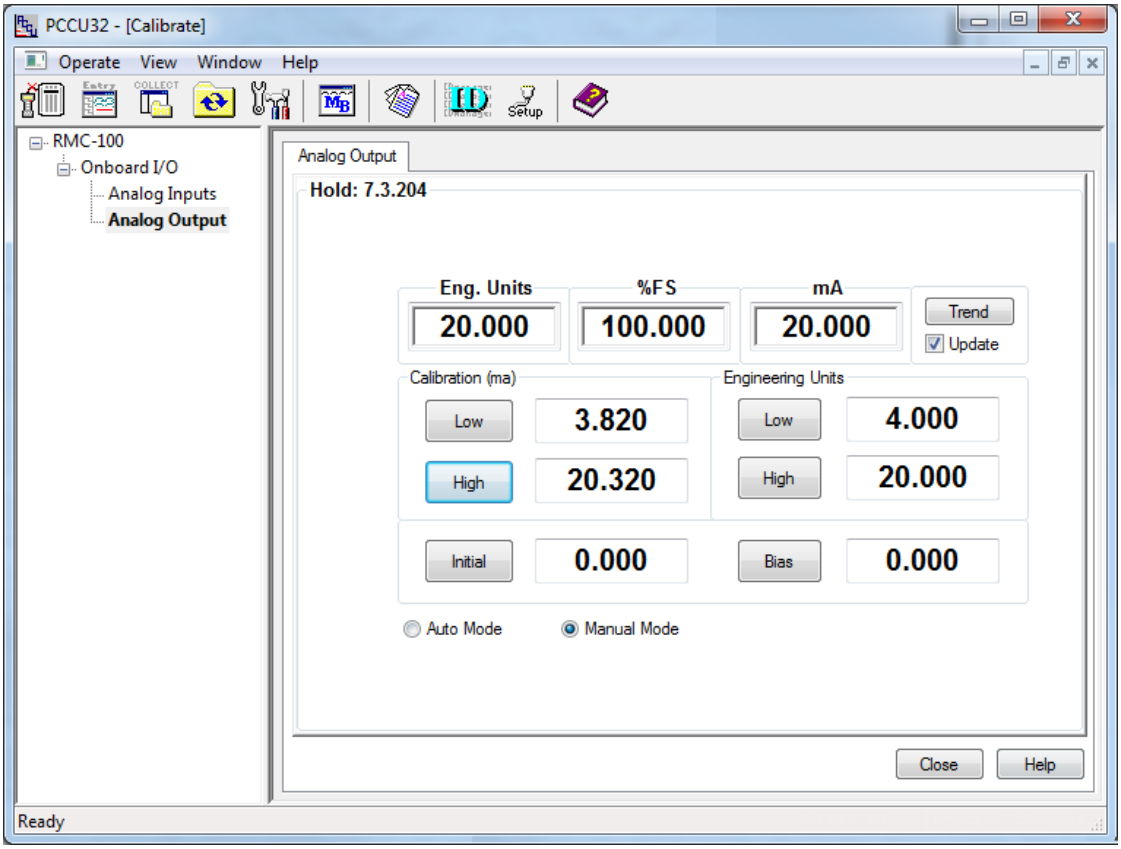


Figure 69: Calibrated AO example

15. Test the calibration by typing different values in the %SF or mA fields.
16. Verify that the ammeter's measured value matches the value displayed in the mA field.
17. If a different calibration range is not required, click **Close** to exit the calibration.

5.1.2.2 Define engineering units

The engineering units fields allow the definition of a scale different from the default 4-20 mA range. The values represent engineering units scaled across the 4-20 mA range. For example, a pressure measurement value range of 1 to 1000 PSI can be represented by the default output range where 0 is represented by 4 mA and 1000 is represented by 20 mA. The engineering units associated with the analog outputs depend on the external device specifications or the application driving the AO.

Engineering units may be entered at any time while the analog output screen is in manual mode. For accuracy, calibrate the AO first.

To enter engineering units:

1. Click **Manual Mode**.
2. Click **Low** in the Engineering Units column. The Enter Low Value box displays Figure 70).

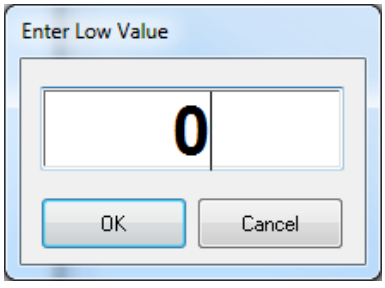


Figure 70: Low value engineering unit

3. Type the value that represents zero or the low end of the range.
4. Click **OK**.
5. Click **High** in the Engineering Units column. The Enter High Value box displays
6. Type the value that represents the full scale or the high end of the range.
7. If a bias value is required, click **Bias** in the Engineering Units column. The Enter Bias Value box displays.
8. Type the bias value.
9. Click **OK**.
10. Test the engineering units display by typing different values in the %FS or mA fields and verify that the Eng. Units field reflects values based on the range defined (Figure 71).

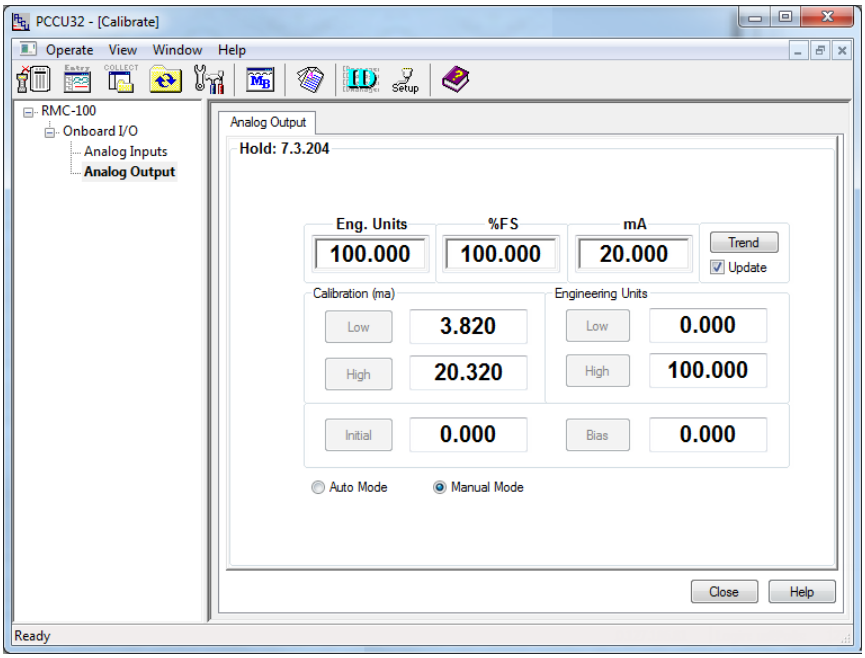


Figure 71: AO example - engineering units

11. Click **Close** to exit the calibration.

5.1.2.3 Driving the AO from a register

Analog outputs can be driven from a register by using one Periodic option from the Operations application. One of the Periodic options is (R1 -> Out). This is where the value in the register, specified by R1, is written to the Out register at the frequency specified by an interval time. 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 is displayed in the upper-left corner of the AO Calibration screen. From Entry mode, the AO register is the Engineering Units register displayed in the Analog Output screen.

6 Service and maintenance

The Service and Maintenance chapter provides:

– standard maintenance information which includes cleanliness, collecting data, software updates, and backup.

– instructions about how to remove and install components of the RMC

6.1 Maintaining cleanliness of the RMC

If the RMC installation is exposed to external environmental conditions, it is important that it be regularly inspected for cleanliness both internally and externally. Foreign contaminants can cause damage to interior mounted components, rendering the RMC inoperable.

The solar panel should be kept clean for maximum charging.

6.2 Collecting data

This procedure collects and saves the measurement data to a file in the laptop. This ensures that the measurement data in a system that has been in operation does not get lost.

To collect the data to save:

1. Open PCCU32.
2. Click the **Collect** icon on the PCCU toolbar (Figure 72). The Collect data screen displays (Figure 73).

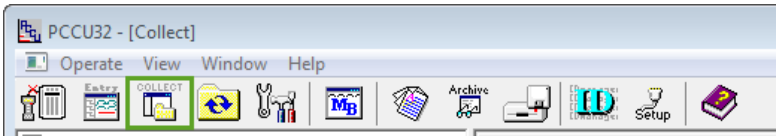


Figure 72: Collect icon in toolbar

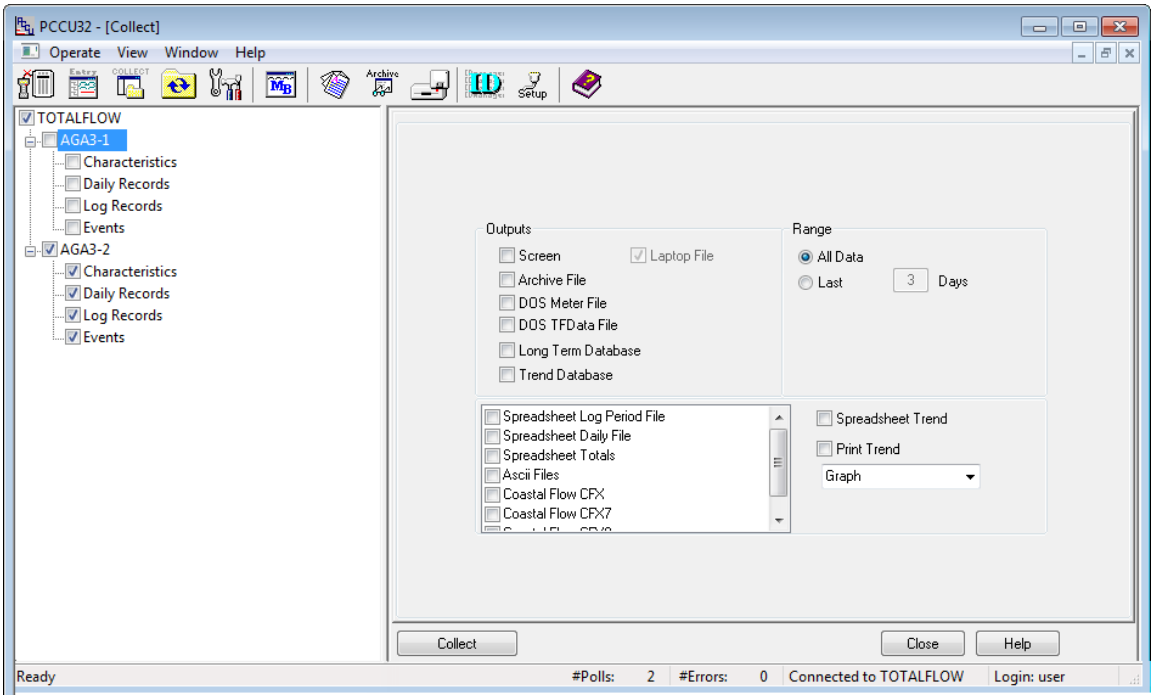


Figure 73: Collect data screen

3. Select the measurement device on the navigation tree to collect the desired data.
4. Click **Help** for more information.

6.3 Saving configuration files

The RMC startup (cold) and running (warm) configurations contain the application configuration files. To save the device configuration complete the procedures included in this section. The first procedure saves the running (warm) configuration to the startup (cold) configuration (cold configuration update). The second procedure saves the updated cold configuration using the device loader.

Saving the running (warm) configuration is not the same as saving the startup (cold) configuration. The running (warm) configuration is not saved by the loader. Follow the first procedure if needing to preserve any configuration changes.

6.3.1 Saving running (warm) config to cold config

This procedure saves the running (warm) configuration to the cold or startup configuration. Any changes made after starting the device will be saved.

1. Open PCCU32.
2. Click the **Entry** icon on the toolbar.
3. Click the top node on the navigation tree. The Station Setup tab displays.
4. Scroll down to Backup (Figure 74).

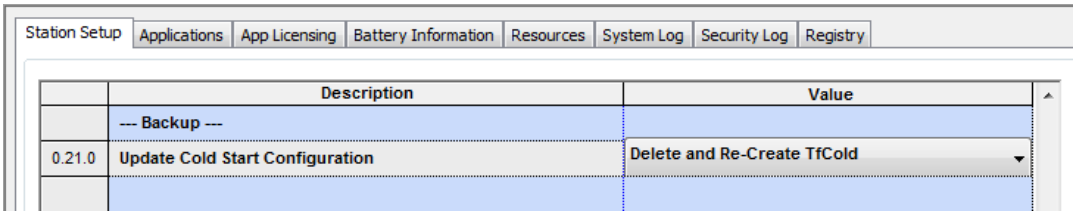


Figure 74: Backup

IMPORTANT NOTE: If there are calibration files included in the warm configuration, the calibration files are also saved during the startup configuration update.

5. Select the backup option (**Merge with exiting TfCold** or **Delete and Re-create TfCold**) from the drop-down list.
6. Click **Send**. The cold start configuration is updated.

6.3.2 Saving with the loader

The loader saves the device's startup (cold) configuration. This procedure saves a copy of the startup configuration and saves it into a laptop for backup. Saved startup configuration files are also referred to as configuration packages.

IMPORTANT NOTE: If calibration files are stored in the startup configuration, they are automatically included in the created configuration package.

The calibration files saved are linked with the device's electronic board serial number and are not applicable to any other device. If the configuration package is used in another device, the calibration files cannot be sent.

To save the device configuration:

1. Open PCCU32.
2. Click the **Loader** icon in the toolbar. A message box displays (Figure 75).

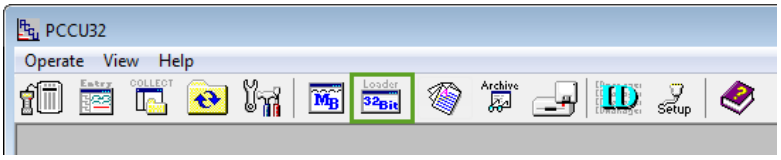


Figure 75: Loader icon

3. Click **Yes**.
4. Verify or type the connection setup parameters and click **Connect**. The Loader screen displays (Figure 76).

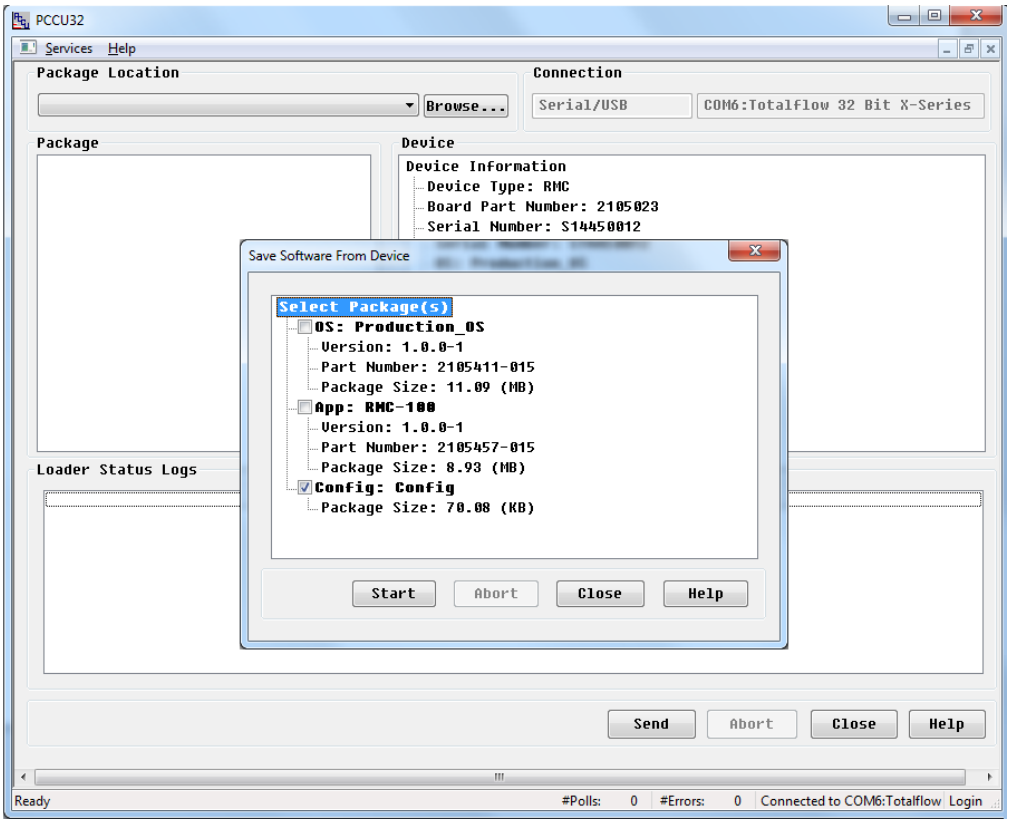


Figure 76: Save from loader

5. Click **Service** in the menu bar. The Save Software from Device box displays.
6. Click **Help** for more information.

6.4 Restoring configuration files

This procedure sends an application configuration package to replace the device's existing startup (cold) configuration. The configuration package is the backup package created from the same device. Use this procedure when restoring the device to a known working configuration in case of file corruption or other problems.

To send (restore) the device configuration file:

1. Open PCCU32.
2. Click the **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 **Browse**. The browser window displays.
6. Locate and select the configuration file package and click **Open**. The selected package details display in the **Package** field (Figure 77).

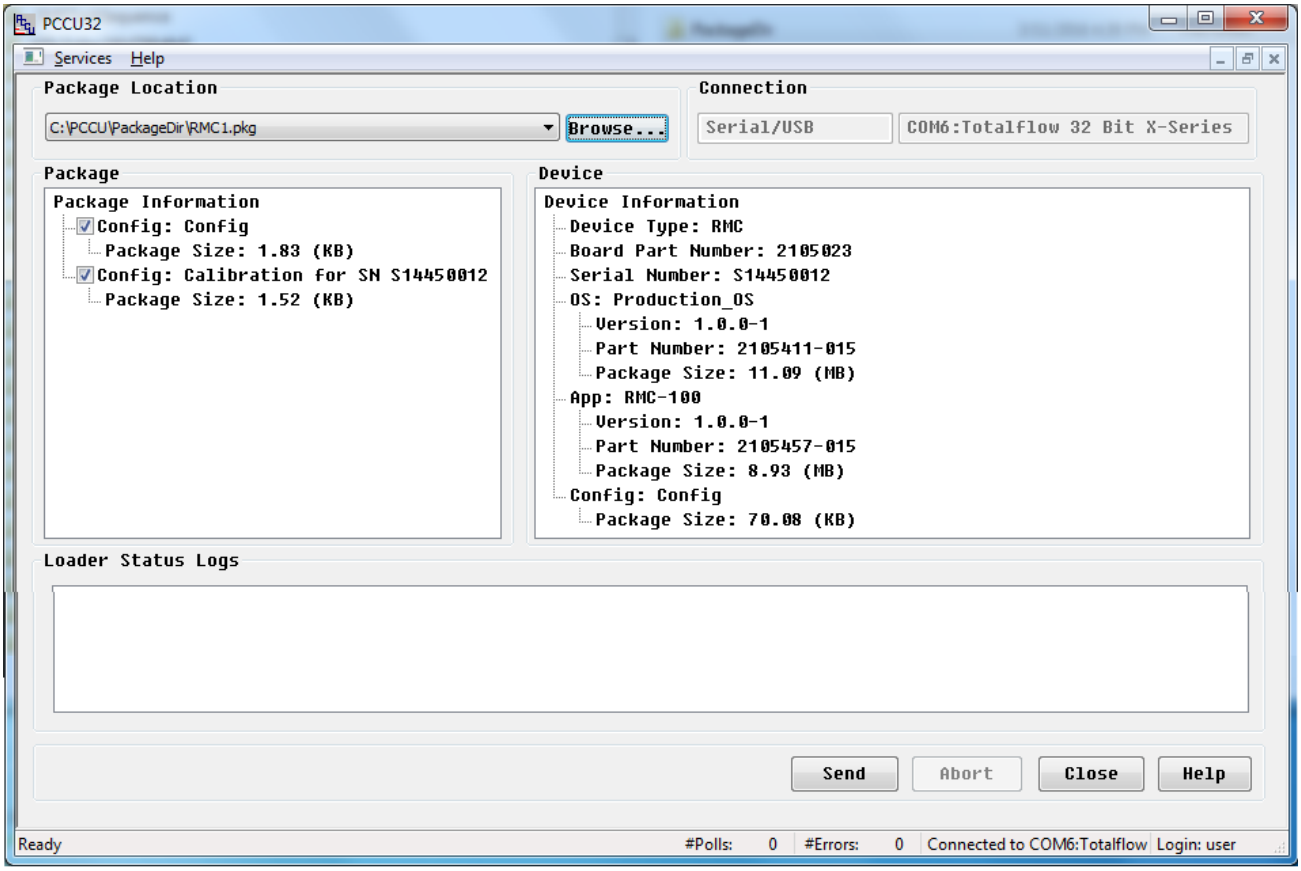


Figure 77: Restore a device configuration file

7. Verify Config package is displayed and selected in the Package field (check box is selected).
8. Verify the Calibration (if needed) is selected (check box is selected)
9. Click **Send**
10. Monitor the progress in the Loader Status Logs field for status messages during the package download.
11. Verify that the messages indicate the package has been sent successfully, the system has been restarted, and the new configuration is active. The "Device info updated" message displays when the configuration update is successfully completed.
12. Verify the Device field displays the new configuration package information.

6.5 Using a configuration package from another RMC

This procedure sends an application configuration package to replace the existing startup (cold) configuration. The configuration package has been saved from another RMC. This saves time in configuration when the configuration in both RMCs is similar.

IMPORTANT NOTE: Calibration data present in a configuration package generated from another device will not be downloaded. Calibration data is specific to each device and linked to a device's electronic board serial number.

To send the device configuration:

1. Open PCCU32.
2. Click the **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 **Browse**. The browser window displays.
6. Locate and select the configuration file package and click **Open**. The selected package details display in the Package field(Figure 78).

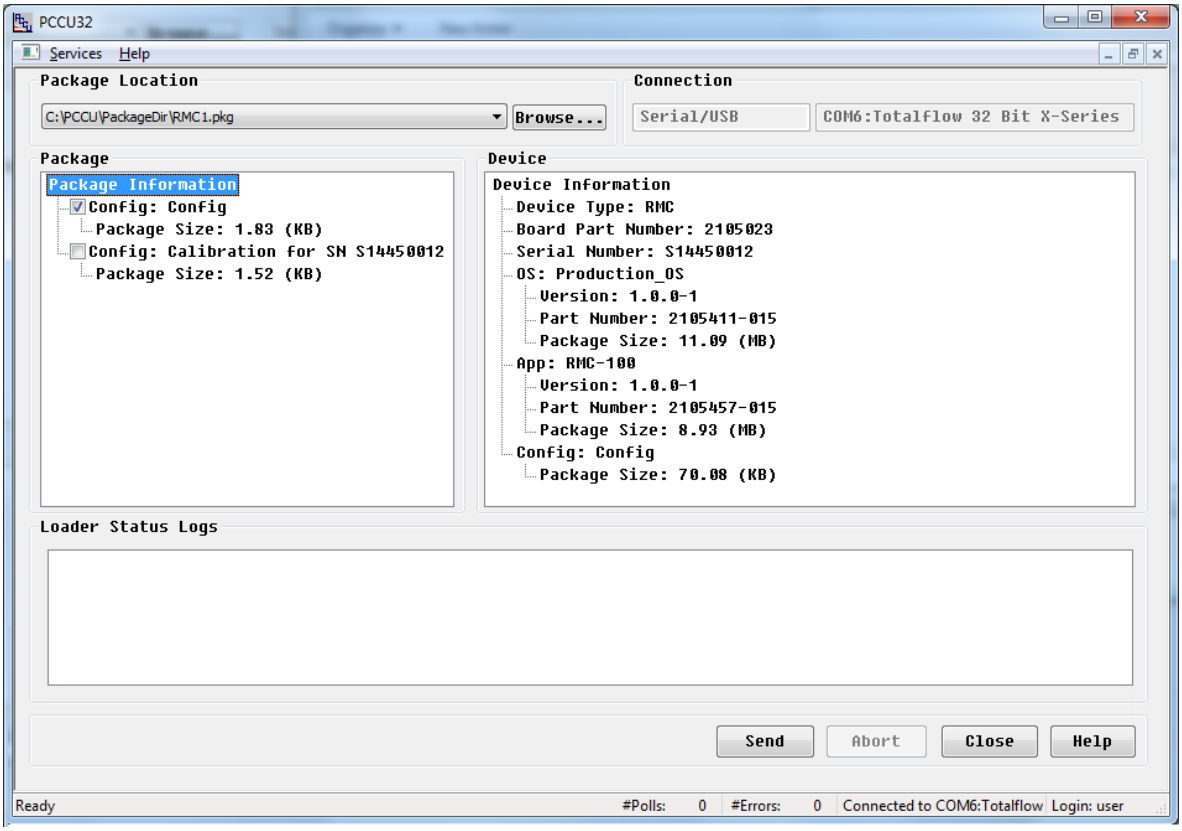


Figure 78: Using configuration file from another RMC

7. Verify the Config package is included in the Package field.
8. Verify the Config package is selected (check box is selected) and click **Send**.
9. Monitor the progress in the Loader Status Logs field for status messages during the package download.
10. Verify that the messages indicate the package has been sent successfully, the system has been restarted, and the new configuration is active. The **"**Device info updated" message displays when the configuration update is successfully completed.
11. Verify the Device field displays the new configuration package information.

6.6 Updating software

The update software procedures updates the device software. Update packages are periodically released by ABB Totalflow. Software updates may be needed for the following reasons:

– Major functionality or applications are added

– Enhancements to existing application are added

– Software bugs are fixed

Software packages typically contain the main Totalflow application (Totalflow.exe). If the updated version of the OS is required to support the changes in the main application, the package may also include the OS and boot software.

Software updates should not affect the configuration of a device, however, it is always best practice to save the configuration and other data before any updates.

IMPORTANT NOTE: In some instances, updating the application software may require updating the Boot and Operating System software. If only the application sub-package is selected and sent, the loader will reject the download, indicating that the application sub-package is incompatible with the software currently in the device. In this case, select the Boot and Operating System software check boxes in addition to the App and try to send again.

After all software has been sent, the system will restart automatically and activate the new software.

To update the software:

1. Download the update files from the internet ABB Library to a laptop.
2. Open PCCU32.
3. Click the **Loader** icon in the toolbar. A message box displays.
4. Click **Yes**.
5. Verify or type the connection setup parameters and click **Connect**. The Loader screen displays.
6. Click **Browse**. The browser window displays.
7. Locate and select the update file package and click **Open**. The selected package details display in the Package field (Figure 79).

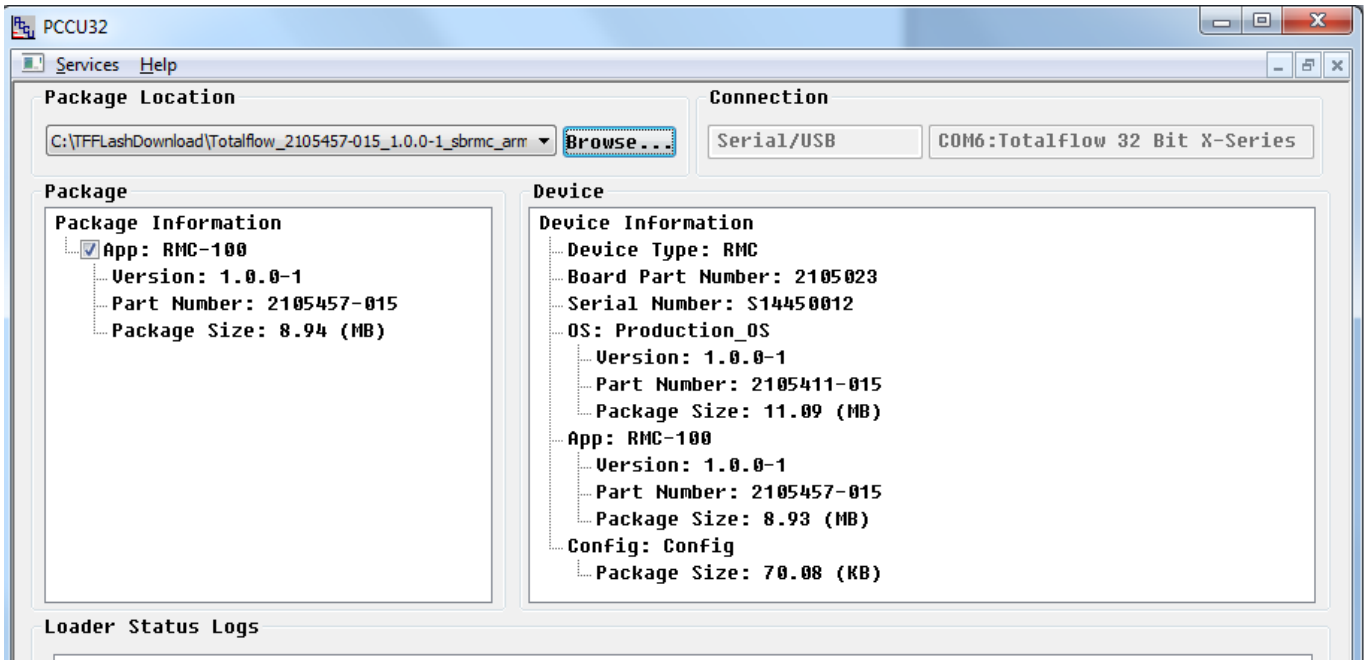


Figure 79: Update software with loader

8. In the Package field, verify that the RMC-100 package version is the required version for the update.

9. To update the main application (App), ensure the RMC-100 check box is selected. If there are other items in the package that are not needed, clear those check boxes.
10. Click **Send**.
11. Monitor the progress in the Loader Status Logs field for status messages during the package download.
12. Verify that the "Device info updated" message displays indicating the package had been sent and activated successfully.

IMPORTANT NOTE: Updates to the main application (App) may require an update to PCCU.

6.7 System restart

The RMC can be reset through a cold or warm start procedure. The decision to use these procedures should only be made by an experienced technician. Table 34 identifies the type of restart procedures and the causes for the restart.

Table 34: Restart types

Restart type	Cause description	More information
Cold start	The RMC restarts and uses the startup (cold) configuration. A cold start is caused by:	
	– A new configuration has been sent to the device. The restart is automatic.	
	– Restart from the device loader (cold restart in the Services menu)	See section 6.7.1.1
	– Restart from the terminal mode using factory configuration	See section 6.8
Warm start	The RMC restarts and uses the running (warm) configuration. A warm restart is caused by:	
	– Pressing the **Reset** button	See section 6.7.2.1
	– Restart from the device loader (warm restart in the Services menu)	See section 6.7.2.2
	– Restart from the terminal mode	See section 6.7.2.3
	– Restart from the **System shutdown/reset** command	See section 6.7.2.4

6.7.1 Cold start

The cold start procedure restarts the RMC with the startup (cold) configuration.

NOTICE – Data loss. Before restarting, back up the:
Running configuration, see section 6.3.1, *Saving running (warm) config to cold*
Configuration data, see section 6.3, *Saving configuration files*
Measurement data, see section 6.2, *Collecting data*

The different methods for performing a cold start are provided in the following instructions. Follow the method needed.

6.7.1.1 Cold start using the device loader

To complete a cold start using the cold configuration:

1. Open PCCU.
2. Click the **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** in the menu bar, **Restart** option, and **Restart using Startup (Cold) configuration option** (Figure 80).

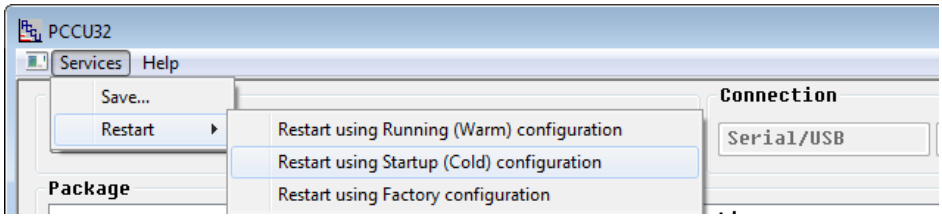


Figure 80: Cold start with device loader

6. Click **Help** for more information.

6.7.1.2 Cold boot using terminal mode

A cold restart using the terminal mode involves typing a command in PCCU. If an error is made while typing, begin the procedure again.

A cold restart in the terminal mode (BOOT=COLD) deletes the running configuration and collection data (tfData) and after boot up, uses the startup configuration (tfCold) to start a new running configuration.

To complete a cold restart in terminal mode:

1. Open PCCU.
2. Click the **Entry** icon in the toolbar. The Entry screen displays.
3. Click **Operate** in the menu bar and select the options **Communications** then **Terminal (**Figure 81**)**. The Terminal screen displays (Figure 82).

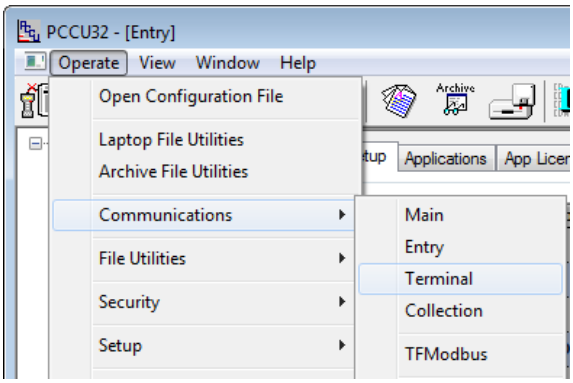


Figure 81: Terminal menu option

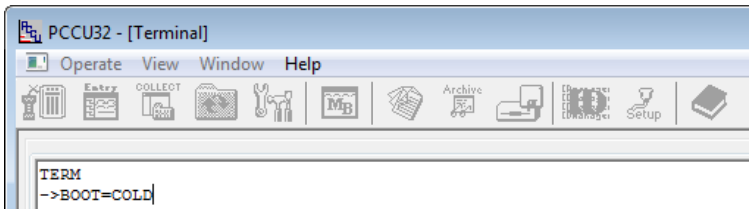


Figure 82: Terminal screen – cold boot

4. At the at the terminal prompt (->), type the command **BOOT=COLD**.

6.7.2 Warm restart

A warm start does not clear the data stored in RAM. The warm start will only reset the RMC microprocessor and not disturb any data that has been stored in RAM. A warm start should be used when taking the RMC out of service to perform maintenance or troubleshooting. A warm start can be used when a power or communication interruption caused the RMC microprocessor to lock-up. The system restarts using the running configuration.

The different methods for performing a warm start are provided in the following instructions. Follow the method needed.

6.7.2.1 Warm restart with reset button

To complete a warm start with the reset button:

1. Lift the cover over the TFIO ports.
2. Press and release the **Reset** button (Figure 83).

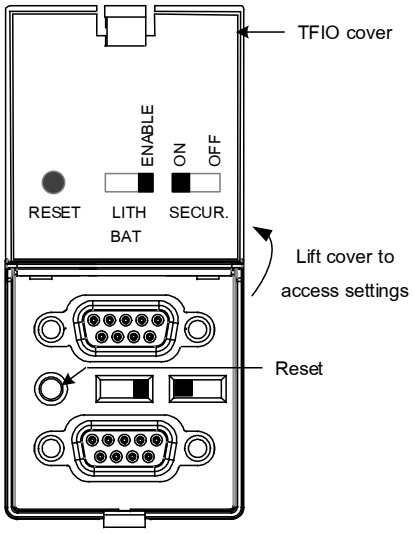


Figure 83: Reset button

3. Observe the display. The LCD shows that the unit is shutting down and restarting.

IMPORTANT NOTE: If the RMC seems to be stuck or is not restarting, do a forced restart. Press and hold the reset button for 8 seconds.

6.7.2.2 Warm restart using the device loader

To complete a warm start using the device loader:

1. Open 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** in the menu bar, **Restart** option, and **Restart using Running (Warm) configuration** option (Figure 84).

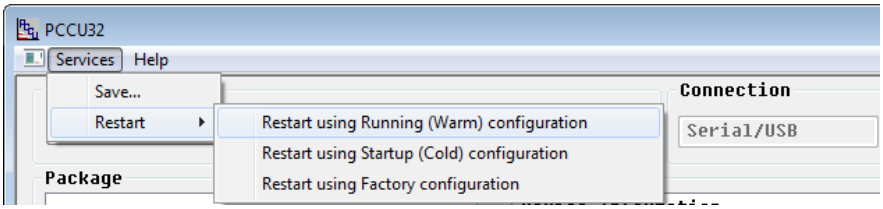


Figure 84: Warm start with device loader

6. Click **Help** for more information.

6.7.2.3 Warm restart using terminal mode

To complete a warm restart in terminal mode:

1. Open PCCU.
2. Click the **Entry** icon.
3. Click **Operate** in the menu bar and select the options **Communications** then **Terminal (**Figure 85**)**. The Terminal screen displays (Figure 86).

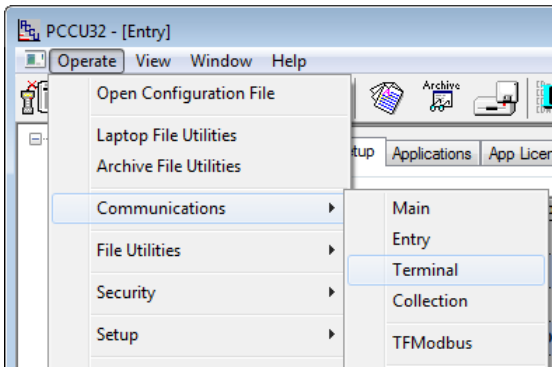


Figure 85: Terminal menu option

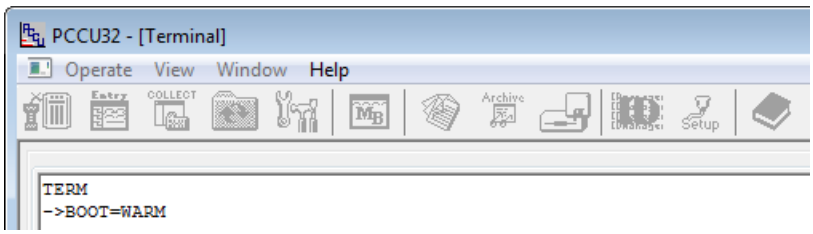


Figure 86: Terminal screen – warm boot

4. At the terminal prompt (->), type the command **BOOT=WARM**.

6.7.2.4 Warm restart from station setup

To complete a restart from the **Station Setup** tab in expert view:

1. Open PCCU.
2. Click the **Entry** icon.
3. Click the top node on the navigation tree. The **Station Setup** tab displays.
4. Scroll down to **System Startup/Shutdown** (Figure 87).
5. Click **Yes** in the System Shutdown/then Reset field.
6. Click **Send**.

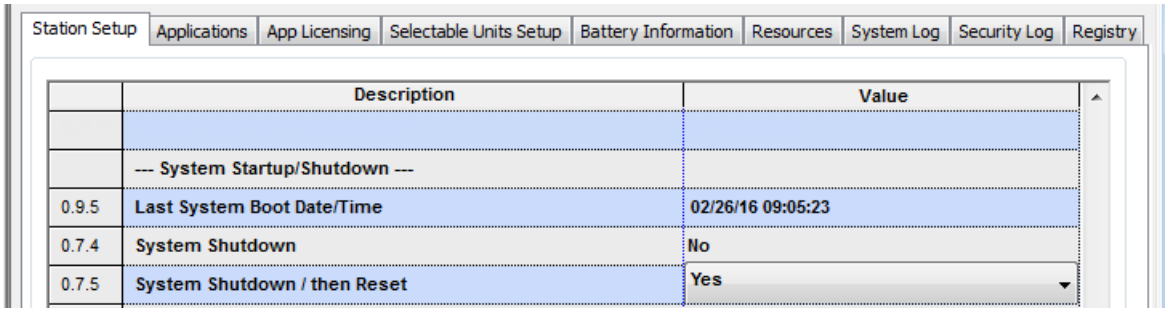


Figure 87: Warm start from station setup tab

6.8 Restoring factory configuration

This procedure restores the device's startup configuration to its factory defaults.

NOTICE – Data loss. All previous configurations are erased.

To restore factory configuration:

1. Open 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** in the menu bar, **Restart** option, and **Restart using Factory configuration** option **(**Figure 88**).**

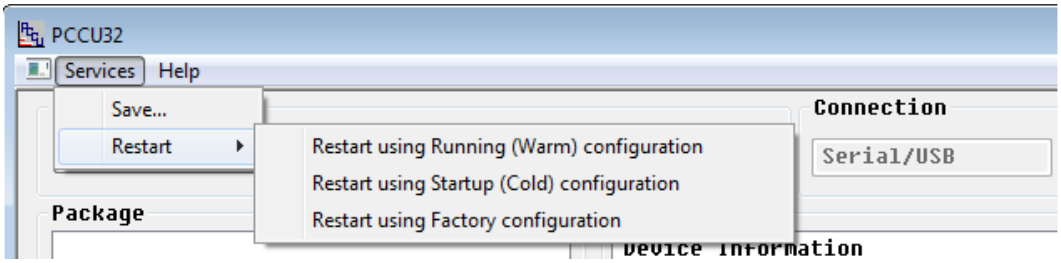


Figure 88: Restore factory configuration

6. Click **Help** for more information.

6.9 Changing the clock

When any applications are instantiated on the RMC, changing the clock could affect the time when log period entries are made. The clock is changed to protect the integrity of accounting audit trails. Examples of why the clock may be changed include daylight savings time and time drift of the instantiated applications.

Table 35 identifies how to handle the different types of clock changes.

Table 35: Types of Clock Changes

Type of clock change	Description
Clock change not crossing an hour boundary	When the next log period entry is made, the clock is not altered. Example: If present time is 4:15 p.m. and the clock is changed to 4:05 p.m. of the same day, the daily flow record is the same. Entry reflects averages accumulated over a 70 minute time-period (15 minutes plus 55 minutes).
Forward clock change crossing an hour boundary	Forces a log period entry for part of hour that has accumulated since last hourly entry. The RMC then advances to the newly defined data flow record boundary and begins maintaining the day's data in the newly defined boundary. Example: If present time is 4:55 p.m. and clock is changed 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, and this period is also based on a 55 minute accumulation.
Backward clock change crossing an hour boundary	Hourly entry is made for the part of the hour that has accumulated since making the last hourly entry. This is same as for a Forward clock change crossing 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 is written, and this log period is based on a 60-minute accumulation.

Use the **Date/Time** field in the Station Setup tab within PCCU to make the time changes.

IMPORTANT NOTE: A backward clock change uses two (2) records to maintain data integrity. This assures that previously recorded data is not overwritten. If it is necessary to make small backward time changes of less than one hour, it is best to wait until current hour has progressed far enough to make a change that does not cross an hour boundary.

6.10 Parts list

Table 36 provides the part numbers for spare parts used with the RMC.

Table 36: RMC replacement and spare parts

Accessory	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

6.11 Returning parts for repair

If returning a Totalflow component for repair, securely wrap it in protective anti-static packaging. Before returning the component, call the ABB main office number listed on the last page of the manual for a Return for Authorization Number (RA). Affix the number to the outside of the return package.

Returned parts shipments must be prepaid by customer. Any part, not covered by original system warranty, will be shipped to customer, FOB.

6.12 Removing the RMC from the DIN rail

To remove the RMC from the DIN rail:

1. Insert a slotted screwdriver in the slot of the DIN rail release clip.
2. Gently push the screwdriver handle down to release the clip and remove the RMC from the DIN rail (Figure 89).

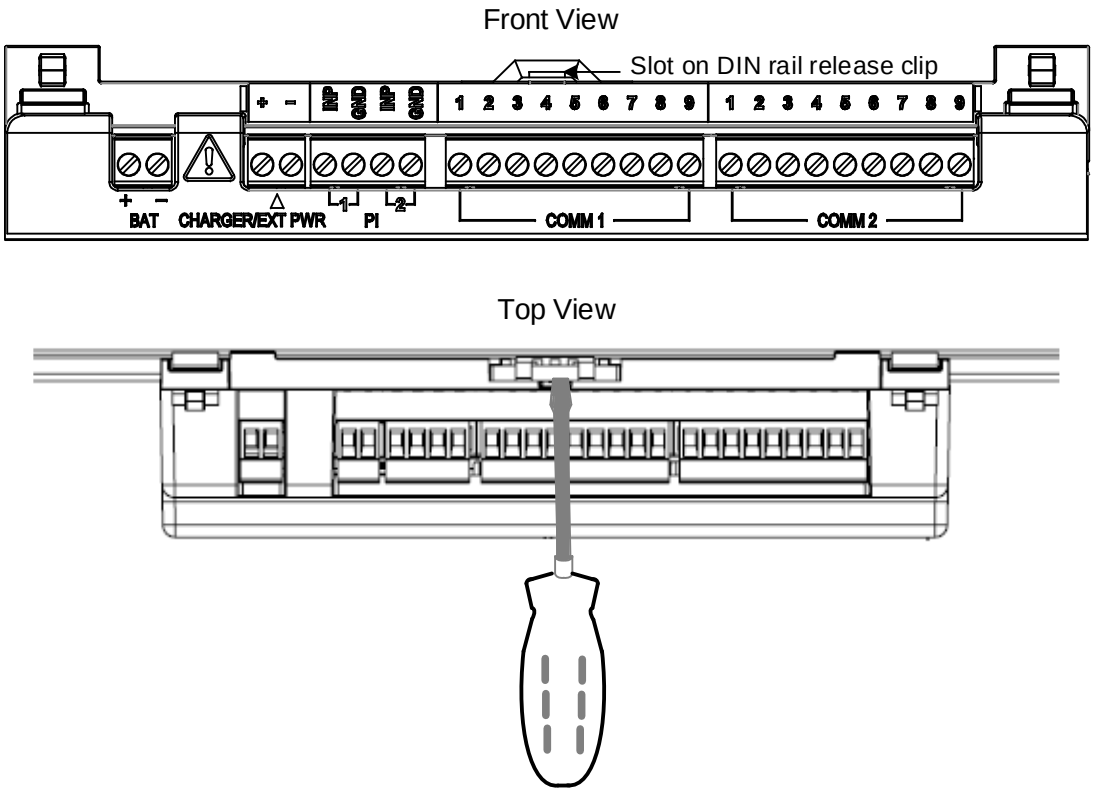


Figure 89: Remove from DIN rail

6.13 Removing the cover from the base

To remove the housing cover from the base:

1. Insert a slotted screwdriver into the slot (Figure 90). A slot is located on each corner of the RMC.

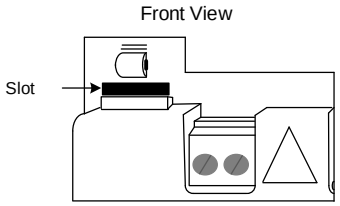


Figure 90: Remove top housing from base

2. Gently pry the clip loose by pushing the handle of the screwdriver away from the body of the RMC (two top slots, push up; two bottom slots, push down).
3. When all four corners are released, remove the top housing from the base.

6.14 Replacing the lithium battery

IMPORTANT NOTE: Replacing the lithium battery should only be done while the RMC is fully powered by the battery or charging system so that the real time clock continues to function. If all power is removed from the RMC, including the lithium battery, the real time clock will need to be changed by following the instructions in section 6.9, *Changing the clock*.

To replace the lithium battery:

1. Test that the new battery voltage is 3.6 Vdc to verify it is fully charged.
2. Collect data from the RMC following the instructions in section 6.2, *Collecting data.*
3. Back up configuration files by following the instructions in section 6.3, *Saving configuration files*.
4. Disconnect the charger/external power cable from the RMC.
5. Disconnect the battery cable from the RMC.
6. Disconnect all I/O connections.
7. Remove the housing cover by following the instructions in section 6.13, *Removing the cover from the base*.
8. Grasp the battery on each side and pull from the bracket.
9. Insert a new lithium battery into the bracket. Observe the polarity (+/-) of the lithium battery and the battery bracket.
10. Replace the battery cover.
11. Replace the housing cover.
12. Connect all I/O connections.
13. Connect the battery cable to the BAT connector.
14. Connect the battery charger to the CHARGER/EXT PWR connector.
15. Open PCCU and the Entry screen.
16. A message box displays asking to synchronize the date and time.
17. Click **Yes**. The RMC calendar clock synchronizes with the laptop date and time.
18. Restore the configuration files, if necessary, following the instructions in section 6.4, *Restoring configuration.*

6.15 Replacing the 12 Vdc battery

These instructions detail the removal and replacement of the 12 Vdc battery.

NOTICE – Property damage. When removing the battery, do not remove the lithium battery from the electronic board (RMC board) in order to keep the real time clock functioning.

To replace the 12 Vdc battery:

1. Ensure the LL battery alarm does not display on the LCD, or measure the lithium battery to make sure it registers more than 3.0 V.
2. Collect data from the RMC following the instructions in section 6.2, *Collecting data*.
3. Back up configuration files by following the instructions in section 6.3, *Saving configuration files*.
4. Disconnect the charger/external power cable from the RMC.
5. Disconnect the battery cable from the RMC.
6. Disconnect all I/O connections.
7. Put a new battery in place.
8. Connect all I/O connections.
9. Connect the battery cable to the BAT connector.
10. Connect the battery charger to the CHARGER/EXT PWR connector.
11. Check the LCD for normal operational readings.
12. Restore the configuration files, if necessary, following the instructions in section 6.4, *Restoring configuration.*

6.16 Replacing the electronic board

NOTICE – Property damage. The electronic board inside the RMC housing is susceptible to damage by static electricity or improper handling. To prevent this from occurring, the user should wear a grounding strap when handling the board.

A grounding strap is a conductive device used to make connection between the person handling the board and a high quality ground point. Before handling the board, the user must install a ground strap on their body; then connect it to a grounded point. This discharges electrical static buildup from the body to ground, preventing static from discharging to the board.

NOTICE – Risk of data loss. Before removal of the RMC board, be certain any data has been saved to an external storage medium. Failure to do so could result in data loss when the RMC board is removed.

To remove and replace the board:

1. Collect measurement data by following the instructions in section 6.2, *Collecting data*.
2. Back up configuration files by following the instructions in section 6.3, *Saving configuration files*.
3. Remove the charger from the CHARGER/EXT PWR connector and remove the battery from the BAT connector.
4. Remove all terminal connectors, cabling, and communication modules.

IMPORTANT NOTE: Pull all the terminal connectors straight out. If rocked back and forth, the pins could bend and become damaged. A small screwdriver can help pry them straight out.

5. Remove the RMC from the DIN rail.
6. Remove the housing cover.
7. Remove the screws holding the electronic board to the housing base.
8. Position the new electronic board and replace the screws to hold the board to the housing base.
9. Replace the housing cover.
10. Press the RMC onto the DIN rail.
11. Reconnect all the communication modules, cabling, and terminal connectors.
12. Reconnect the power.

6.17 Replacing the LCD Assembly

The LCD assembly (consisting of the LCD display and 4-key directional buttons) is mounted on the electronic board. The entire display assembly is removed to replace the LCD board. To remove and replace the display assembly:

1. Collect data from the RMC following the instructions in section 6.2, *Collecting data.*
2. Back up configuration files by following the instructions in section 6.3, *Saving configuration files.*
3. Disconnect the charger/external power cable from the RMC.
4. Disconnect the battery cable from the RMC.
5. Disconnect all I/O connections.
6. Remove the housing cover from the RMC.
7. Remove the four screws holding the display assembly board on the mounting standoffs.
8. Lift the display assembly board from the mounted standoffs and gently remove the LCD connector from the connector on the electronic board.
9. Gently press the new LCD connector onto the connector on the electronic board.
10. Position the new display assembly board and align the screw holes on the board with the standoffs.
11. Replace the four screws. Do not over tighten.
12. Replace the housing cover on the RMC.
13. Connect all I/O connections.
14. Connect the battery cable to the BAT connector.
15. Connect the battery charger to the CHARGER/EXT PWR connector.
16. Check the LCD for normal operational readings.

6.18 Maintaining the credit key

ABB provides a secure USB flash drive with the application licenses in the form of credits. The specified number of credits is four. Check the credit key to ensure there are enough credits for all of the required applications. Call the ABB main office listed on the last page of this manual to purchase additional credits.

Maintenance of credit keys includes:

– Adding more credits to the credit key.

– Transferring credits from an ABB Totalflow device to the credit key

– Transferring credits from the credit key to an ABB Totalflow device.

– Moving credits from one credit key to another credit key.

– Moving credits from one ABB Totalflow device to another ABB Totalflow device.

At the Station Setup screen, click the **App licensing** tab and click **Help** button for information to maintain the credit key as needed.

IMPORTANT NOTE: If the credit key is inserted into a different USB port on the computer or laptop, install the credit key for that USB port. Install the credit key on each available USB port if the same USB port will not be used each time the credit key is inserted.

6.18.1 Verify the applications

The applications have been instantiated according to the purchase order for the RMC and the credit purchased. To verify that the purchased applications are instantiated:

1. Click the station ID name in the top node of the navigation tree. The Station Setup tab displays.
2. Click the **Applications** tab.
3. Verify that the application names are identified in the Type list.
4. If an application or device is not in the list and needs to be added, click **Add App**. The Add New Application box displays (Figure 91).

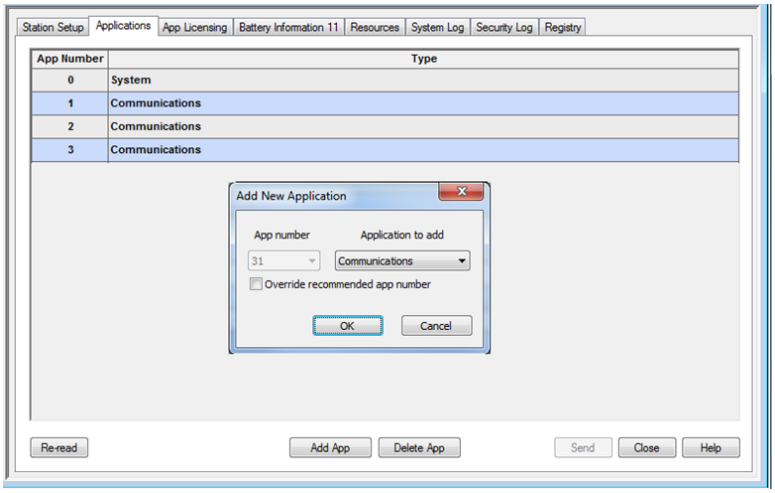


Figure 91: Applications list

5. Click the down arrow to display the list of applications.
6. Click the application to add and click **OK**.
7. Click **Send** to save the application.

7 Troubleshooting

7.1 Troubleshooting support

Call the ABB main office number listed on the last page of this manual.

Before calling:

– Note the model and serial number. Serial number is on a label affixed to the back of the base in the DIN rail slot.
– Be prepared to give the Technical Support representative a detailed description of the problem.
– Note any alarms or messages as they appear.
– Prepare a written description of the problem.
– Know the software version, board and optional part numbers.

8 APPENDIX A – Local Ethernet connection with systems supporting APIPA

ABB Totalflow equipment is configured from the factory with a private IP address (169.254.0.11) from the address range reserved for Automatic Private Internet Protocol (IP) Addressing (APIPA).

Most systems (laptops) running Windows® operating systems support APIPA and are capable of automatically configuring a private IP address that is compatible with the RMC's default address.

If the laptop is configured for automatic addressing (DHCP is enabled), first-time direct connection between the RMC and the laptop does not require any configuration of IP parameters in either system.

When connecting to the controller for the first time, type the static address in the PCCU setup for communication and establish the connection

The IPv4 address range for APIPA is 169.254.1.0 to 169.254.254.255 with a netmask of 255.255.0.0.

9 APPENDIX B – RMC serial port expansion with MOXA®

The goal of the procedures included in this section is to add serial port capacity to the RMC. A third-party Ethernet-to-serial module, MOXA® may be used. Communication between the RMC and the module is set up using Ethernet. The encapsulation of serial communication traffic by the Ethernet interface is transparent to the serial devices attached to the MOXA® module. From the external device perspective, connecting to the MOXA® module is equivalent to connection to any of the onboard COMM ports.

The serial ports on the MOXA® module can be used for connecting any external serial device: radios, measurement transmitters, etc. The number of additional serial ports depends on the MOXA® model. Figure 92 shows the connections for a MOXA model Nport IA5440AI.

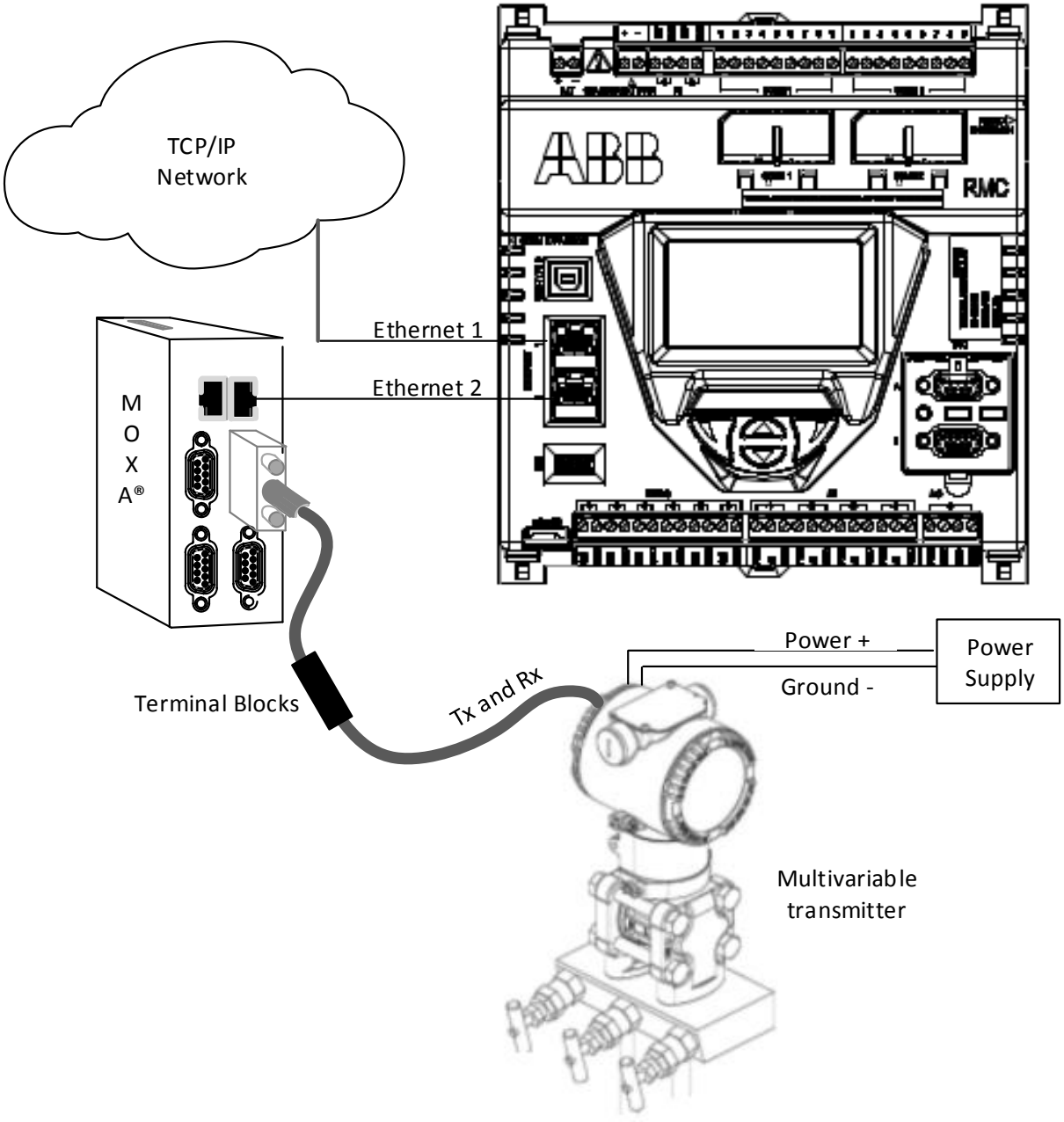


Figure 92: Using MOXA®

9.1 Configuring the MOXA® module

The following procedure describes the configuration of the required parameters for the MOXA® module to operate with the RMC. The procedure includes steps to configure the module's IP network parameters manually (static addressing), the serial port configuration, and the mode of operation. For additional configuration options, refer to the MOXA® module user manual.

The requirements are:

– The host system or laptop used to configure the module should have a web browser or the application shipped with the module (N port device manager).

– Ensure the RMC Ethernet or network adaptor has been enabled and has been configured with a valid IP address.
  – If using public IP addressing, obtain a valid address, subnet mask and gateway to assign to the module.
  – If using private addressing, assign the IP address compatible with the factory default RMC IP address.

Top 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 with the module will be lost.

1. Ensure the module is powered on.
2. Configure the laptop with a private IP address compatible with the default address on the MOXA® module.
3. Using an Ethernet cable, connect the laptop Ethernet port to the module's Ethernet port 1.
4. Start 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 IO network parameters:
   a. Click **Network Settings** on the navigation tree.
   b. Type the valid IP parameters (IP address, Subnet Mask, Gateway, etc.).
   c. Verify the IP Configuration is set to **Static**.
   d. Take note of the IP address to use later. The IP address is a required parameter when configuring the RMC for communication with the module.
   e. Click **Submit**.
6. Configure each serial port:
   a. Click **Serial Settings** on the navigation tree.
   b. Select the desired port.
   c. Select the appropriate configuration for each of the settings, ensuring they match those of the device attached to the port.
   d. Click **Submit**.
7. Configure operating settings for each port:
   a. Click **Operating Settings** on the navigation tree.
   b. Select the desired port.
   c. Click the **Operation Mode** drop down list and select the TCP server.
   d. Take note of the Local TCP port number for later use. Unique TCP port numbers are assigned by default to each serial port. This port number is a required parameter when configuring the RMC for communication with the port.
   e. Click **Submit**.
8. Click Save/Restart for all configurations to take effect.
9. Disconnect the laptop from the module.

10. Use an Ethernet cable to connect the module's Ethernet port 1 to the RMC's Ethernet port 2.
11. Reconfigure the laptop with the appropriate network parameters and connect the laptop to the network.
12. Verify the module is connected and responding (ping the module's new IP address over the network and verify that there is a response.)

9.2 Configuring 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 each communication application required to handle each serial port and assigns it to the Ethernet interface. The choice of application, associated parameters, and protocol depends on the type of device connected to the serial ports. If all serial ports in the MOXA® module are used, there should be 4 communication applications added and configured.

When considering what type of communication application to use for each serial port, note that there are special purpose communication applications that have been created for specific types of equipment. For example, the XMV Interface is the application used when XMVs (Totalflow multivariable transmitters) are the devices being connected to the serial ports. If connecting Totalflow devices to the serial port, check to see if any of the special purpose applications available can be used. For other devices, choose the Generic Com App.

To configure the RMC:

1. Click **Communications** on the navigation tree. The Communication Setup tab displays.
2. Click **Add New Device Application**. The Add/Modify Communication devices and applications box displays (Figure 93).

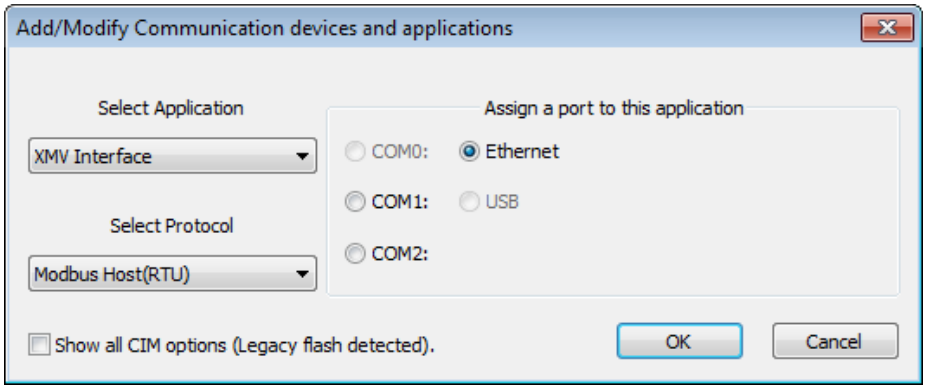


Figure 93: Adding communication application and protocol to Ethernet

3. Click **Ethernet**.
4. Select the communication application required for the serial port from the **Select Application** drop-down list.

xx) Choose the special-purpose application for the type of device connected. For example, to connect the XMV to the serial port, select **XMV Interface**.

yy) Choose **Generic Com App** if the available applications do not apply to the type of device being connected.

5. Select the protocol for the application from the **Select Protocol** drop-down list.
6. Click **OK**. The Communication Setup screen updates to reflect the new application added (Figure 94) and assigned to the Ethernet interface.
7. Type the user-defined port description.
8. At the Ethernet Port Settings, type the MOXA® module's TCP/IP parameters for the port.

zz) In the **Address** field, type the module's IP address.

aaa) In the **Port num** field, type the TCP port number assigned to the serial port

9. Click **Send changes to device**.
10. Verify the Ethernet interface displays with the defined port name in the communication setup screen (Figure 94).

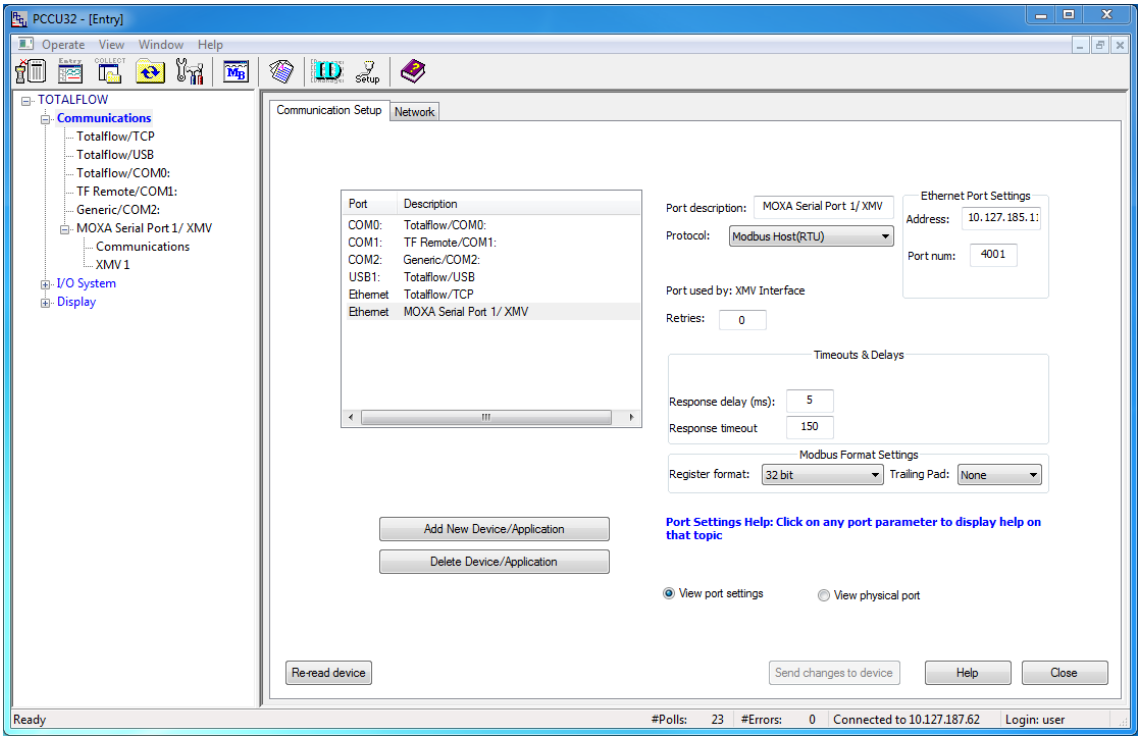


Figure 94: Ethernet communication setup

11. Verify the communication application displays on the PCCU32 navigation tree.
12. Select the communication application in the navigation tree and select the appropriate tabs. See Figure 95 for an example of XMV interface mapped to a MOXA® serial port and Figure 96 for the communication setup.

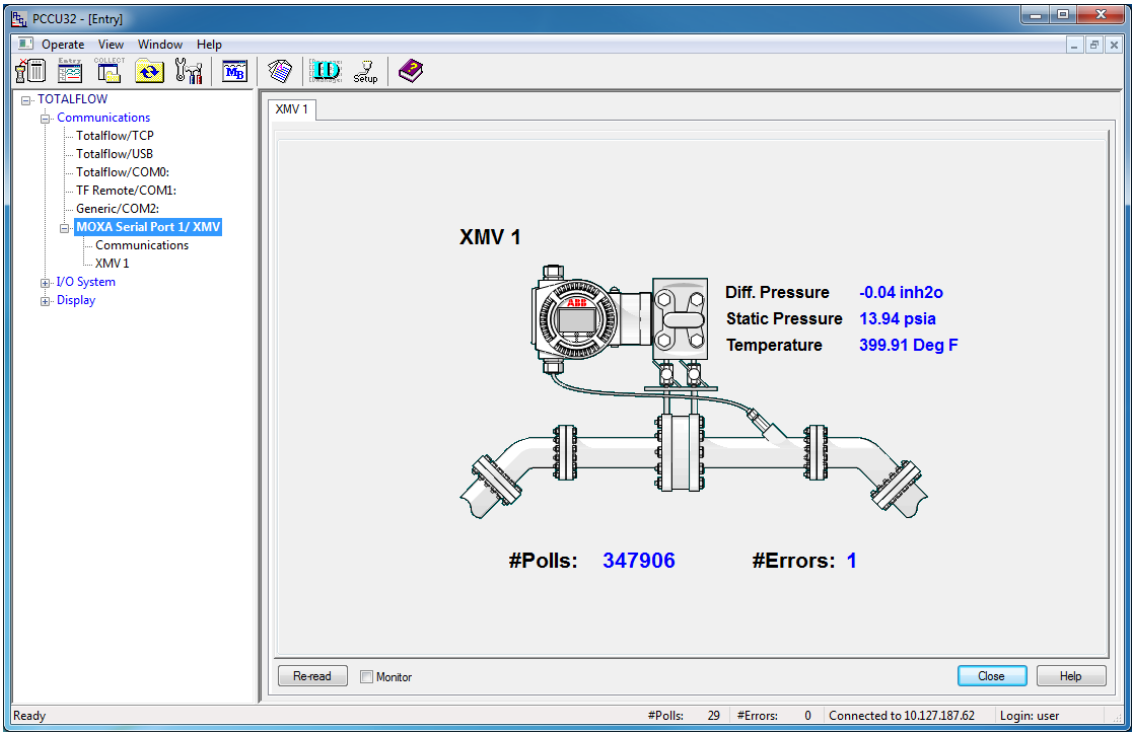


Figure 95: XMV application assigned to MOXA® serial port

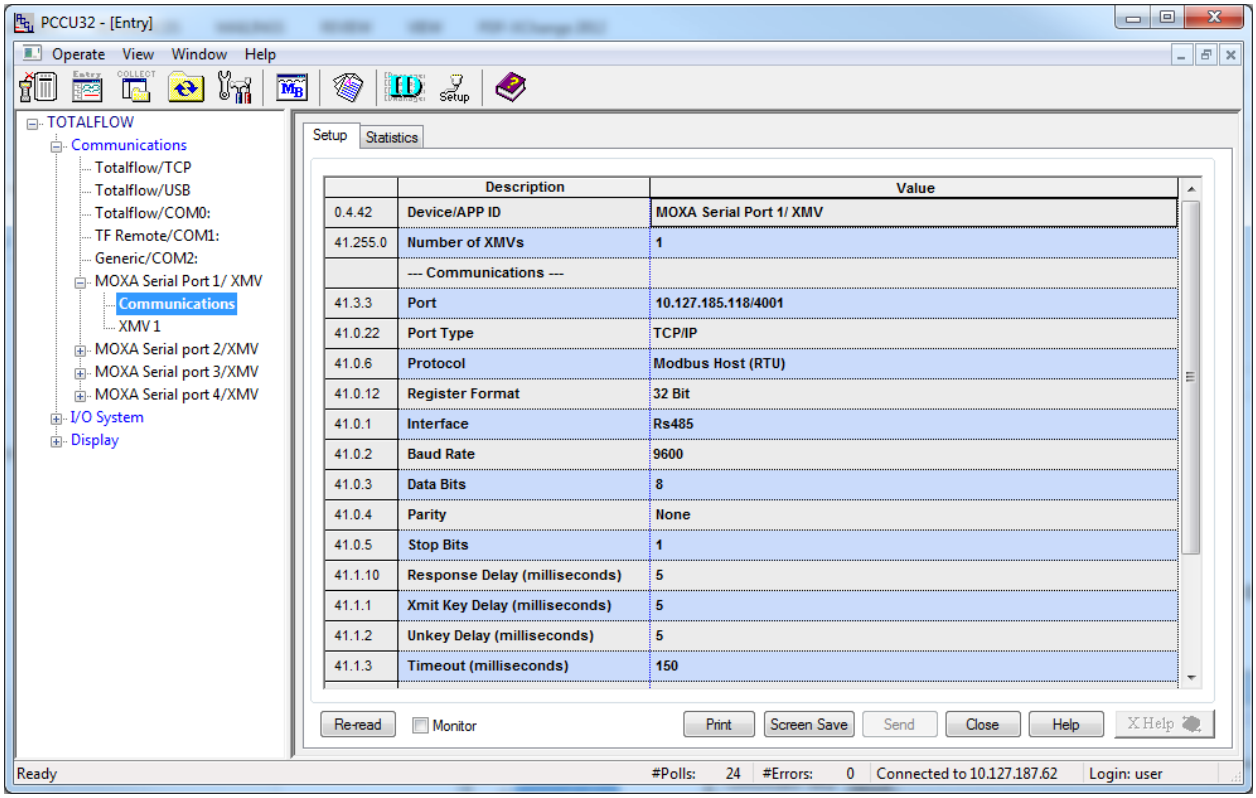


Figure 96: XMV communication setup

13. Repeat steps 2 – 12 for each serial port as needed. If all ports are used and configured, there should be four applications to handle the communication for each port (Figure 97).

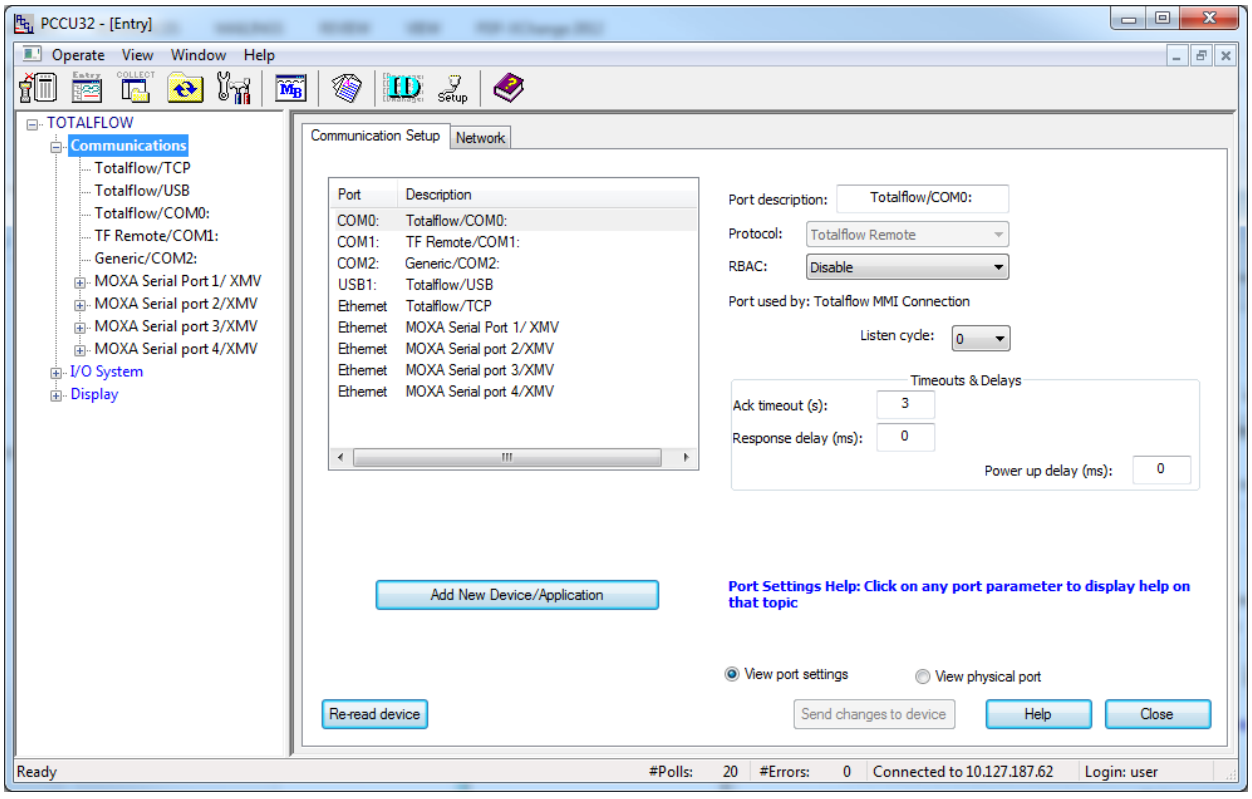


Figure 97: XMV applications mapped to four MOXA® ports

10 APPENDIX C – PRODUCT WARRANTY

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company‘s published specification. Periodic checks must be made on the equipment's condition. In the event of a failure under warranty, the following documentation must be provided as substantiation:

– A listing evidencing process operation and alarm logs at time of failure.

– Copies of all storage, installation, operating and maintenance records relating to the alleged faulty RMC.

11 APPENDIX D - GLOSSARY

Term	Description
ABB Inc.	Asea, Brown and Boveri, parent company of Totalflow
ac	See *alternating current.*
ADC	See *analog-to-digital converter.*
AGA	American Gas Association, a trade group representing natural gas distributors and pipelines
AGA3	American Gas Association Report No. 3. AGA3 1985 (wet gas), *Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids*. Method for calculating gas volume across an Orifice Plate. This method requires two pressure readings: Differential Pressure (DP) and Static Pressure (SP). AGA3 1992, *Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids.* Addresses standards for flow rate, orifice diameter and differential pressure. Part 1-*General Equations and Uncertainty Guidelines* Part 2-*Specifications and Installation Requirements* Part 3-*Natural Gas Applications* AGA3 2012, *Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids*. Revision of Part 1-*General Equations and Uncertainty Guidelines*. It gives equations and guidelines for computing flow through orifice meters.
AGA7	American Gas Association Report No. 7, *Measurement of Natural Gas by Turbine Meters*. Addresses the use of outputs from electronic pulse signal-generating devices. Provides method for calculating gas volume using axial-flow turbine flow meters (pulse meters). This method requires one pressure reading, Static Pressure (SP).
Ah	See *ampere hour.*
AI	analog input
alternating current	an electric current in which the flow of electric charge periodically reverses direction
Amp, A	See *ampere.*
ampere	the unit of electrical current. Also milliamp (one thousandth of an ampere) and micro ampere (one millionth of an ampere). One ampere corresponds to the flow of about 6 x 10^{18} electrons per second.
ampere hour	the quantity of electricity measured in ampere hours (Ah) which may be delivered by a battery under specified conditions. A current of one ampere flowing for one hour
analog	a system in which data is represented as a continuously varying voltage/current
analog input	data received as varying voltage or current
analog output	a voltage or current signal that is a continuous function of the measured parameter. Data that is transmitted as varying voltage/current
annunciator	display of a status on a screen
antenna	a length of wire or similar that radiates (such as a transmitting antenna) or absorbs (such as a radio antenna) radio waves. The two basic types are: Yagi (directional) or Omni (bi-directional).
ANSI	American National Standards Institute, a neutral venue for common standards agreements and sole US representative for ISO and for IEC, via US National Committee (USNC)
AO	analog output
asynchronous	a communications protocol where information can be transmitted at an arbitrary, unsynchronized point in time, without synchronization to a reference time or clock
audit trail	using the long term archive files to justify changes made to records that more accurately reflects the correct data. Peripheral information used to edit data is recorded without exception to justify the accuracy of the edited data records.
AWG	American Wire Gauge
counts	the number of time intervals counted by the dual-slope AD converter, and displayed as the reading of the panel meter, before the addition of the decimal point
CPU	central processing unit
current	Current is measured in amperes (mill amperes and microamperes). It is the passage of electrons. Conventional current flows from positive to negative. Electrons flow from negative to positive, called “electron flow.”

11 APPENDIX D - GLOSSARY

Term	Description
dc	See *direct current*.
DI	See *digital input*.
differential pressure, DP	the pressure difference between two points in a system. For example, it is the difference in pressure between the upstream and downstream taps of an orifice plate, used to measure volume passing through the orifice.
data acquisition	gathering information from sources such as sensors and AMUs in an accurate, timely and organized manner. Modern systems convert this information to digital data, which can be stored and processed by a computer.
data collection	physically, locally, or remotely retrieving data stored with a Totalflow unit. This data is typically stored in records located in a database format.
debounce	Debouncing is any kind of hardware device or software that ensures that only a single signal will be acted upon for a single opening or closing of a contact. When you press a key on your computer keyboard, you expect a single contact to be recorded by your computer. In fact, however, there is an initial contact, a slight bounce or lightening up of the contact, then another contact as the bounce ends, yet another bounce back, and so forth. A similar effect takes place when a switch made using a metal contact is opened. The usual solution is a debouncing device or software that ensures that only one digital signal can be registered within the space of a given time (usually milliseconds).
default	a value assigned, or an action taken, automatically unless another is specified
differential pressure, DP	the pressure difference between two points in a system. For example, it is the difference in pressure between the upstream and downstream taps of an orifice plate, used to measure volume passing through the orifice.
digital	a signal which has distinct states, either on or off (0 or 1). Digital computers process data as binary information having either true or false states.
digital input	the signal received in binary format, rather than analog
digital output	the signal emitted in binary format. It is an output signal which represents the size of an input in the form of a series of discrete quantities.
DIN	Deutsches Institut für Normung. German Institute for Standardization; a set of standards recognized throughout the world
DIN rail	the rail on which the RMC and TFIO modules are mounted. It allows TFIO modules to snap on and slide right and left.
direct current, dc	a current that does not change in direction and is substantially constant in value
DMM	digital multi-meter
download	a Totalflow procedure in which any file(s) located on a laptop computer or storage device may be copied to the onboard memory of a Totalflow host device for purposes of restoring, configuration or repair
DO	See *digital output*.
DP	See *differential pressure*.
duty cycle	the total time to one on/off cycle. It usually refers to the on/off cycle time of a temperature controller.
E^2Prom, EEPROM	See *electrically erasable programmable read-only memory*.
electrically erasable programmable read-only memory	ROM that can be erased with an electrical signal and reprogrammed is also referred to as the S drive. It is a persistent drive that will not lose its memory unless manually reprogrammed. Totalflow's XFC and XRC have a serial EEPROM (also called E^2Prom) on board, which generally holds registry, application configuration and warranty information (non-volatile).
EN	Euro Norm (European standard)
environmental conditions	all conditions to which equipment may be exposed during shipping, storage, handling, and operation
ESD	See *electrostatic discharge*.
event	an important incident; an occurrence, especially one that is particularly significant
expansion slots	the spaces provided in a computer for expansion boards that enhance the basic operation of the computer
float charge	voltage at which a battery is maintained after being fully charged

Term	Description
FOB	free on board, a trade term requiring that the seller pays for the transportation to deliver goods to the buyer
fuse	a short length of wire designed to melt and separate in the event of excessive current
ground	1) an electronically neutral circuit with the same potential as the surrounding earth. Normally, a non-current carrying circuit intended for safety purposes. 2) a large conducting body (as the earth) used as a common return for an electric circuit and as an arbitrary zero of potential 3) reference point for an electrical system
grounding strap	a conductive device used to make connection between the person handling the board, and a high quality ground potential
hardware	the physical components of a computer system, such as the circuit boards, plug-in boards, chassis, enclosures, peripherals, cables, and so on. It does not include data or computer programs.
HART	communication interface
hertz	cycles per second. A measure of frequency or bandwidth
high current bulk charge	When a charge source is first applied to a discharged battery, charge current begins to flow, typically at the maximum rate of the charge source for some period of time. Because most of the charge is delivered at the maximum charger rate, the first step of the charge cycle is called the bulk charge step. The battery voltage steadily rises during the bulk step.
hold	HOLD is an external input which is used to stop the AD process and freeze the display. BCD HOLD is an external input used to freeze the BCD output while allowing the AD process to continue operation.
host	the primary or controlling computer in a multiple part system
hub	a market or supply area (pooling or delivery) where gas supply transactions occur that serve to facilitate the movement of gas between and among interstate pipelines. Transactions can include a change in title, a change in transporter, or other similar items.
hysteresis	the maximum difference between output readings for the same measured point, one point obtained while increasing from zero and the other while decreasing from full scale. The points are taken on the same continuous cycle. The deviation is expressed as a percent of full scale.
IEC	International Electro technical Commission
IEC 61131	the international standard on programmable controllers and their peripherals
I/O	See *input/output*.
I^2C	inter-integrated circuit. Serial communications bus to I/O modules (developed by Phillips Semiconductor)
icon	a graphic functional symbol display. A graphic representation of a function or functions to be performed by the computer
ID	identification number. Each unit must have an ID number assigned to it. Units are communicated to by this ID number, therefore the ID assigned in the software must agree with the hardware.
impedance	the total opposition to electrical flow (resistive plus reactive)
input	that part of a circuit that accepts a signal for processing
input impedance	the resistance measured across the excitation terminals of a transducer
input/output	the transfer of data to/from a computer system involving communications channels, operator interface devices, and/or data acquisition and control interfaces
interface (communications)	1) interface is normally used to imply not only the physical layer, but also the logical link layer for each interface. A description of interface may include the onboard port (the connector mounted on the board for external use) and the electrical, protocol specifications. 2) to describe the exact specification such as a standard name (RS-232, USB 2.0, etc.)
interface (computer)	the hardware that provides communication between various items of equipment
ISA	Instrument Society of America
kHz	electronic abbreviation for kilohertz
LCD	See *liquid crystal display.*
LED	light emitting diodes
LevelMaster	intelligent digital level sensor designed for custody transfer accuracy in demanding level measurement applications in tanks. LevelMaster is the name of Totalflow's tank gauging system.

11 APPENDIX D - GLOSSARY

Term	Description
liquid crystal display	a reflective display that requires very low power for operation
MODBUS®	the MODBUS® protocol standard for hardware transmitter communications. The MODBUS® protocol is fully described in the document entitled “Gould MODBUS® Protocol Reference Guide” published January, 1985 by Gould Inc., Programmable Control Division Andover, Massachusetts.
multivariable transducer, XMV	a smart multivariable transducer that is an external stand-alone transmitter measuring static pressure (SP), differential pressure (DP) and flowing temperature (T_f). This refers to both the transducer portion of the transmitter and the circuitry required to supply measurements via MODBUS® communications to the host device.
NAK	See *negative acknowledgement.*
negative acknowledgement	a response over a remote communication device, such as a ping. Basically, saying, “I don’t acknowledge your request!” This is the opposite of ACK. NAK is a slang term that means that you disagree or do not acknowledge something.
noise	1) an undesirable electrical signal. Noise comes from external sources such as the ac power line, motors, generators, transformers, fluorescent lights, soldering irons, CRT displays, computers, electrical storms, welders, radio transmitters;, and internal sources such as semiconductors, resistors, and capacitors. 2) unwanted disturbances superimposed upon a useful signal that tends to obscure its information content
nonvolatile memory	a storage medium that maintains all data, even after suffering a loss of power. Examples of nonvolatile memory include read-only memory and flash memory. In the RMC, all historical files are retained without the need for a lithium battery.
output	that part of a circuit where the processed signal is available
PCCU	portable collection and calibration unit. Windows version of PCCU32 communications software to process, archive and collect data from the Totalflow equipment. It is generally run from a laptop.
PI	See *pulse input.*
PPM, ppm	parts per million
PROM	See *programmable read-only memory.*
program	a list of instructions that a computer follows to perform a task
programmable read-only memory	computer memory which data can be written to. ROM is used for storing programs (eg, operating systems) and characteristic files on a permanent basis (non-volatile).
protocol	a formal set of conventions governing the formatting and relative timing of message exchange between two communicating systems
pulse input	any digital input to a meter (usually a turbine) that is used to measure pulses over a time period. This calculates volume and flow rate for each period of time.
RAM	See *random access memory*.
radio frequency interference	electromagnetic radiation which is emitted by electrical circuits carrying rapidly changing signals, as a by-product of their normal operation, and which causes unwanted signals (interference or noise) to be induced in other circuits
random access memory	read/write volatile memory, generally used for application variables and the file system. Data stored is lost if power is removed (volatile).
range	the lower and upper limits
RBUS	communication abbreviation for results bus
read-only memory	computer memory in which data can be routinely read but written to only once using special means when the ROM is manufactured. ROM is used for storing data or programs (eg, operating systems) on a permanent basis.
real time	data acted upon immediately instead of being accumulated and processed at a later time
real time operating system	Any operating system where interruptions are guaranteed to be handled within a certain specified maximum time, thereby making it suitable for the control of hardware in embedded systems and other time-critical applications. RTOS is not a specific product but a class of operating systems
RMC	remote module controller
Recommended Standard 232, RS-232	the standard interface for full-duplex data communication conducted with two way independent channels. It employs unbalanced signaling and refers to point-to-point communications between one driver and one receiver in a 4-wire bus system. The RS-232 (single-ended) transmits at a relatively slow data rate (up to 20K bits per second) and short distances (up to 50 ft. at the maximum data rate).

Term	Description
Recommended Standard 422, RS-422	the standard interface for half-duplex communications conducted with a dual-state driver. It employs balanced signaling and refers to multi-drop communications between one driver and up to ten receivers, known as “straight-through” cabling in a 4-wire bus system. The RS-422 (differential) transmits at a much faster data rate (up to 100K bits per second) and longer distances (up to 4000 ft at the maximum data rate).
Recommended Standard 485, RS-485	the standard interface for half-duplex communications conducted in the tristate or common mode. It employs balanced signaling and refers to true multi-point communications between up to 32 drivers and 32 receivers, in 2-wire bus system. The RS-485 (differential) transmits at a fast data rate (up to 100K bits per second) and long distances (up to 4000 ft at the maximum data rate). It also supports more nodes per line because it uses lower impedance drivers and receivers.
register	a storage device with a specific capacity, such as a bit, byte or word
relay	electromechanical device containing a coil and set of contacts. The contacts close when the coil is activated.
remote	not hard-wired; communicating via switched lines, such as telephone lines. It usually refers to peripheral devices that are located at a site away from the CPU.
remote controller, XSeries.	Totalflow’s XSeries remote controller is a low power, microprocessor-based unit designed to meet a wide range of automation, monitor, control, alarming and measurement applications.
remote modular controller	same as remote controller (RMC)
remote terminal unit, RTU	an industrial data collection device similar to a PLC, designed for location at a remote site, which communicates data to a host system by using telemetry (such as radio, dial-up telephone, or leased lines)
resistance	the measure of the ability of a material to pass a current
resistive thermal detector, RTD	a metallic probe device that measures temperature based upon its coefficient of resistivity
resistor	passive component with a known resistance. The value of resistance is usually shown by a set of colored bands on the body of the component.
resolution	the smallest significant number to which a measurement can be determined. For example, a converter with 12 bit resolution can resolve 1 part in 4096.
restore	a Totalflow procedure in which all the station or configuration files are restored to the SDRIVE or tfCold chip from the file located on the laptop. This process is very helpful prior to doing a cold start when the user wants to continue using the configuration and station files.
RFI	See *radio frequency interference*.
ROM	See *read-only memory.*
RRTS	communication abbreviation for remote ready to send
RS-232	See *Recommended Standard 232*.
RS-422	See *Recommended Standard 422*.
RS-485	See *Recommended Standard 485*.
RTD	See *resistive thermal detector*.
RTU	See *remote terminal unit.*
RX	communication abbreviation for receive data
save	a Totalflow procedure in which all the station or configuration files are copied from the RDRIVE, the SDRIVE, or tfCold chip, to a file created on a laptop computer
SCADA	See *supervisory control and data acquisition.*
schematic	another name for a circuit diagram
scroll	to move all or part of the screen material up to down, left or right, to allow new information to appear
SD card	secure digital card
Sdrive	Totalflow’s Serial E^2 PROM solid state memory chip, located on the main board (volatile memory, affected by a cold start), used to store configuration or station files
serial I/O	a common form of data transmission, in which the bits of each character are sent one at a time over the line
set point	a level or control point in a feedback system

11 APPENDIX D - GLOSSARY

Term	Description
short circuit	a connection of comparatively low resistance accidentally or intentionally made between points on a circuit between which the resistance is normally much greater. It is also called a “bridge” or “short” such as when solder from two tracks touch on a computer board.
signal	any communication between message-based devices consisting of a write to a signal register
sink	device such as a load that consumes power or conducts away heat
SLA	sealed lead acid, a type of battery
sleep mode	the status of the RMC when the power source drops below a specified voltage for a specified period of time. This is an effort to keep the battery from being so depleted that the RMC does not function properly and to save the battery itself. Sleep mode preserves the RMC’s historical data that was collected prior to going to sleep but does not calculate flow measurements during sleep mode. While in sleep mode, the RMC can be woken up by interfacing PCCU to it. The RMC will stay awake as long as the PCCU is connected. If the battery is below the specified voltage when PCCU is closed, the RMC will go back to sleep mode after the specified period of time.
SP	See *static pressure.*
SRAM	See *static random access memory.*
static random access memory	the place in the computer where programs reside when running. The user can access any part of the memory, and it can easily be overwritten with new values. SRAM is much more expensive and physically larger than DRAM, but it is also much faster.
supervisor control and data acquisition	a common computer function in process control applications, where programmable logic controllers (PLCs) perform control functions but are monitored and supervised by a computer
surge	a sudden change (usually an increase) in the voltage on a power line. A surge is similar to a spike, but is of longer duration.
Sw VOUT	Switched voltage out cycles the power to equipment to save power.
termination	the placement of a connector on a cable
TBUS	communication abbreviation for transmit bus
TCP/IP	Transmission Control Protocol / Internet Protocol The basic communication format for the Internet, and for much of what happens on a corporate network. Virtually all networked computers have an “IP address” with the format xxx.xxx.xxx.xxx (xxx can range from 0 to 255 in most cases). Find the IP address of a computer running Windows by going to the start menu, selecting run, and entering "**cmd**". A DOS box will be displayed on the screen. Type "**ipconfig**" to get the IP address.
terminal connector	a circuit board with screw terminals or other connector system that allows convenient connection of field signals and power to a data acquisition or communication system.
terminal mode	man machine interface tool used as an engineering interface with equipment
termination	placement of a connector on a cable
tfCold	Totalflow’s Serial E^2 PROM solid state memory chip, located on the main board (volatile memory, affected by a cold start), used to store configuration or station files
TFIO module	Totalflow Input/Output module
tolerance	The allowable percentage variation of a characteristic
Totalflow	product line of ABB Inc., maker and distributor of the XSeries flow computers (XFC and XRC)
transducer	a transmitter for converting energy from one form to another, specifically the measurement of pressure differential in natural gas gate stations, for example, converting pressure to voltage or current
transfer rate	the rate, measured in bytes, at which data is moved from source to destination after software initialization and set up operations; the maximum rate at which the hardware can operate
transmitter	a circuit that accepts signals or data in and translates them into a form that can be sent across a medium (transmitted), usually over a distance. The medium can be wireless or wired.
TX	communication abbreviation for transmit data
UL	Underwriters Laboratories, Inc. is an independent laboratory that establishes standards for commercial and industrial products.
uniform resource locator, URL	Informally referred to as a web address, it is a reference to a web resource that specifies its location on a computer network and a mechanism for retrieving it.

Term	Description
universal serial bus, USB	an external peripheral interface standard for communication between a computer and external peripherals over a cable using bi-serial transmission. It supports both isochronous and asynchronous data transfers.
USB	See *universal serial bus.*
Vac	volts of alternating current
vents	an opening that serves as an outlet for warm air, smoke, fumes, or gases to exit from confinement
Vdc	volts of direct current
web server	the hardware and software required to make web pages available for delivery to other connected networks
volt	the unit of voltage or potential difference. One thousand volts = 1kV.
voltage	electrical pressure, the force, which causes current to flow through a conductor. Voltage must be expressed as a difference of potential between two points since it is a relational term. Connecting both voltmeter leads to the same point will show no voltage present although the voltage between that point and ground may be hundreds or thousands of volts.
voltmeter	a meter for reading voltage. Reading voltage is one of several functions of a multi-meter.
volatile memory	storage medium that loses all data when power is removed
VOUT	voltage output from the battery source
WINCCU	Windows central collection unit. Windows version of software to process, archive and manipulate data collected from the Totalflow products.
window	the graphical user interface element in a defined area of a system
write	to record data in a storage transmitter or on a data medium
XFC^{G4}	Totalflow's new Generation 4 extendable XFC equipment featuring technology that is expandable and flexible for changing needs
XMV	See *multivariable transducer.*
XRC^{G4}	Totalflow's Generation 4 extendable XRC equipment featuring technology that is expandable and flexible for changing needs
XSeries	Totalflow's extendable equipment series featuring technology that is expandable and flexible for changing needs

CONTACT US

ABB Inc., Measurement & Analytics

Quotes: mailto:totalflow.inquiry@us.abb.com
Orders: mailto:totalflow.order@us.abb.com
Training: mailto:totalflow.training@us.abb.com
Support: mailto:upstream.support@us.abb.com

+1 800 442 3097 (opt. 2)

http://www.abb.com/upstream

Main Office - Bartlesville
7051 Industrial Blvd.
Bartlesville, OK 74006
USA
Tel: +1 918 338 4880
+1 800 442 3097
Fax: +1 918 338 4699

Texas Office – Houston
3700 W Sam Houston Pkwy South
Suite 600
Houston, TX 77042
Tel: +1 713 587 8000

Texas Office – Odessa
8007 East Business 20
Odessa, TX 79765
Ph: +1 432 272 1173

Texas Office – Pleasanton
150 Eagle Ford Road
Pleasanton, TX 78064
Ph: +1 830 569 8062

Kansas Office - Liberal
2705 Centennial Blvd
Liberal, KS 67901
Ph: +1 620 626 4350

California Office - Bakersfield
4300 Stine Road
Suite 405-407
Bakersfield, CA 93313
Ph: +1 661 833 2030