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

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

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

WARNING – Bodily injury/ equipment damage. Although there may be alternate methods of installation and commissioning of the RMC, it is recommended that technicians perform the procedures in the presented order: plan, install, wire before applying power, apply power, verify power-on sequence, and configure.

WARNING – Bodily injury. The RMC-100 startup guide does not address any requirements for the installation of product(s) in hazardous (classified) locations. Refer to the installation instructions and local and national electrical codes for installation requirements in hazardous (classified) locations.
Read and consider the contents of this startup guide prior to beginning installation of the equipment. For any questions that are not answered in this guide or in the documentation listed in the Additional information section, call the ABB main office number listed on the back page of this guide.

**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, user drawings, and software for the Remote Modular Controller 100 are available for download at [www.abb.com/totalflow](http://www.abb.com/totalflow). The following is a short list of related documents and drawings for quick reference.

<table>
<thead>
<tr>
<th>Document name</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMC-100 user manual</td>
<td>2105552</td>
</tr>
<tr>
<td>RMC-100 data sheet</td>
<td>2101126</td>
</tr>
<tr>
<td>TFIO module user manual</td>
<td>2101226</td>
</tr>
<tr>
<td>RMC-100 AI to ABB 2600 T pressure transmitter</td>
<td>2105593</td>
</tr>
<tr>
<td>RMC-100 COMM (RS485) to ABB XMV(267/269CS/266J) W/RTD</td>
<td>2105579</td>
</tr>
<tr>
<td>RMC-100 to ABB FCB Coriolis meter</td>
<td>2105592</td>
</tr>
</tbody>
</table>

**Assumptions**

— The software PCCU32 version 7.55 or newer is installed and operational on the PC used to communicate with the RMC equipment for configurations. Previous versions of PCCU32 are not compatible.

— Installation and maintenance will only be conducted by personnel authorized to work on electrical installations.

— Installation and maintenance will be conducted in accordance with relevant national and local codes.
1 Health and safety

1.1 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 electrical hazard. Failure to observe this safety information will result in death or severe injury. The text may state the hazard, what to do or not do to avoid the hazard, and what the result would be if not followed.

WARNING – Bodily injury / property damage / equipment damage. 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 – Property damage / minor injury. 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. The symbol may also be used for property damage warnings. The text may state the hazard, how to avoid the hazard, and what the result would be if not followed.

NOTICE – Property damage / data loss. This symbol indicates a potential situation where data could be corrupted, gas samples could be contaminated, or normal operation could be effected if recommendations are not followed. The text may state the condition, how to avoid undesirable results, and what the result would be if not followed.

IMPORTANT NOTE: This symbol indicates useful information, important information, or information to clarify a concept. The signal words "IMPORTANT NOTE" do not indicate a dangerous or harmful situation.

1.2 Potential safety hazards

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

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

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

2.1 Enclosure requirements

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

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

2.2 Battery and charger requirements

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

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

- Battery charger specifications:
  - Solar panel must be nominal 12 Vdc, 30W or less, or
  - NEC Class 2 power source: 14.5 Vdc to 15.5 Vdc, 1.65 A
2.3 External power supply requirements
When powering the controller with external power (EXT PWR mode), comply with the following specifications:

- Power supply must be rated as a NEC Class 2 power source. EXT PWR mode operation is +9 Vdc to 30 Vdc, 5A maximum.
- RMC rating for ambient temperature without battery is \( Ta = -40 \, ^\circ C \) to +70 \( ^\circ C \) (-40 \( ^\circ F \) to 158 \( ^\circ F \)).

**WARNING – Equipment damage.** A battery can not be used when the controller is in the EXT PWR mode.

2.4 Location specifications and design
Decide on the location to install the controller. The RMC mounts on a DIN rail. Mount the DIN rail in an enclosure or on an interior wall that meets the environmental ratings for the location (see details in section 2.1, *Enclosure requirements*).

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

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

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

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

**WARNING – Equipment damage.** Field installation cable and conductors must be rated greater than 70 \( ^\circ C \) when installed in an ambient temperature greater than 60 \( ^\circ C \).

3 Unpacking and inspecting

**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. For any missing, incorrect, and damaged parts or noticeable defects, call the ABB main office number listed on the back page of this guide.

4 Basic hardware installation

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

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**WARNING – Equipment damage.** It is recommended that technicians perform all of the procedures in the order presented in this section before powering the RMC.

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**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. Use properly insulated tools and wear a grounding strap to eliminate static electricity when connecting or disconnecting wires.

4.1 Grounding the controller

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

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

To ground the DIN rail:
1. Screw the DIN rail onto the mounting surface.
2. Attach a grounding wire to the DIN rail.
3. Attach the other end of the grounding wire to an electrical ground.
4.2 Mounting the RMC
To mount the controller on the DIN rail:
1. Position the RMC on the DIN rail.
2. Push the RMC onto the DIN rail until it snaps into place (Figure 1).

![Figure 1: Mounting the RMC](image)

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

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

Table 1 provides the specifications for the serial communication ports.

<table>
<thead>
<tr>
<th>Type</th>
<th>Maximum Length</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232</td>
<td>50 feet (15 meters)</td>
<td>Terminal connector (9 POS), screw termination and pluggable COMM module</td>
</tr>
<tr>
<td>RS-485 or RS-422</td>
<td>4000 feet (1220 meters)</td>
<td>Active when communication module is inserted</td>
</tr>
</tbody>
</table>
Table 2 identifies RS-232, RS-422, and RS-485 communication pinouts for COMM 1 and COMM 2.

Table 2: COMM 1 and COMM 2 serial communication pinouts

<table>
<thead>
<tr>
<th>PIN</th>
<th>RS-232</th>
<th>RS-422</th>
<th>RS-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Voltage Out (VOUT)</td>
<td>Voltage Out (VOUT)</td>
<td>Voltage Out (VOUT)</td>
</tr>
<tr>
<td>2</td>
<td>Ground (GND)</td>
<td>Ground (GND)</td>
<td>Ground (GND)</td>
</tr>
<tr>
<td>3</td>
<td>Switched voltage (Sw VOUT)</td>
<td>Switched voltage (Sw VOUT)</td>
<td>Switched voltage (Sw VOUT)</td>
</tr>
<tr>
<td>4</td>
<td>Operate (OPER)</td>
<td>Operate (OPER)</td>
<td>Operate (OPER)</td>
</tr>
<tr>
<td>5</td>
<td>Remote request to send (RRTS)</td>
<td>Remote request to send (RRTS)</td>
<td>Remote request to send (RRTS)</td>
</tr>
<tr>
<td>6</td>
<td>Request to send (RTS)</td>
<td>Transmit bus+ (TBUS+)</td>
<td>Transmit/Receive (BUS+)</td>
</tr>
<tr>
<td>7</td>
<td>Transmit data (TX)</td>
<td>Transmit bus- (TBUS-)</td>
<td>Transmit/Receive (BUS-)</td>
</tr>
<tr>
<td>8</td>
<td>Receive data (RX)</td>
<td>Receive bus+ (RBUS+)</td>
<td>Not Used</td>
</tr>
<tr>
<td>9</td>
<td>Clear to send (CTS)</td>
<td>Receive bus- (RBUS-)</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

To wire the serial communication port:

1. **IMPORTANT NOTE:** Refer to the RMC user drawings for COMM wiring details for specific external devices. See the Additional information section.

2. **CAUTION – Equipment damage.** An external device can be powered from pin 1 (VOUT) or pin 3 (Sw VOUT) on both COMM1 and COMM2. The output voltage at these pins is dependent upon the external power supply connected to the CHARGER/EXT PWR port. Before connecting to these pins, ensure that the device is compatible with the input voltage at the CHARGER/EXT PWR port. Connecting an incompatible device may result in damage to the device.

3. Use a slotted screwdriver to pry the terminal connector off the electronic board.
4. Trim the wire covering back ¼ inch on each wire.
5. Loosen the terminal connector screws for the correct pin according to Table 2.
6. Insert the wires in the required pins. If powering the device from the COMM port:
   a. Use pin 1 (VOUT) and pin 2 (GND) to provide constant voltage.
   b. Use pin 3 (Sw VOUT) and pin 2 (GND) to provide switched voltage.
7. Tighten the terminal connector screws.

8. **CAUTION – Equipment damage.** Do not overtighten the terminal connector screws as this may damage the wire.

9. Insert the terminal connector back onto the COMM port if it was removed.
7. Insert the communication module in the appropriate slot (Figure 2). The communication module pushes the port cover downward when inserted.

![Image of COMM terminals and modules](image)

Figure 2: COMM terminals and modules

4.4 Wiring I/O ports

Wire the RMC I/O ports to monitor, control and power external devices. Wiring for power is required if there is no external supply powering the device.

To wire the I/O port:

1. **IMPORTANT NOTE:** Refer to the RMC user drawings for I/O wiring details for specific external devices. See the *Additional information* section.

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

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

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

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

6. Insert the terminal connector back on the I/O port if it was removed.
4.4.1 Analog input pinouts
Table 3 and Figure 3 identify the AI pinouts.

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

Table 3: Analog input pinouts

<table>
<thead>
<tr>
<th>Input</th>
<th>Pin</th>
<th>Description</th>
<th>Input</th>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>PWR - Power</td>
<td>3</td>
<td>2</td>
<td>AI - Input signal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>AI - Input signal</td>
<td></td>
<td>3</td>
<td>GND - Input ground</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>GND - Input ground</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>PWR - Power</td>
<td>4</td>
<td>2</td>
<td>AI - Input signal</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>AI - Input signal</td>
<td></td>
<td>3</td>
<td>GND - Input ground</td>
</tr>
</tbody>
</table>

Figure 3: Analog input pinouts

4.4.2 Analog output pinouts
Table 4 and Figure 4 identify the AO pinouts.

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

Table 4: Analog output pinouts

<table>
<thead>
<tr>
<th>Output</th>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>PWR - Loop power input</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>SNK - Current sink input</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>SRC - Current source output</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>GND - Ground</td>
</tr>
</tbody>
</table>

Figure 4: Analog output pinouts
4.4.3 Pulse input pinouts

Table 5 and Figure 5 identify the PI pinouts.

<table>
<thead>
<tr>
<th>Input</th>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>INP - Pulse input 1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>GND - Ground</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>INP - Pulse input 2</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>GND - Ground</td>
</tr>
</tbody>
</table>

Figure 5: Pulse input pinouts

4.4.4 Digital input and output pinouts

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

<table>
<thead>
<tr>
<th>DI/DO</th>
<th>PIN</th>
<th>Description</th>
<th>DI/DO</th>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>SIG–Signal DI/DO 1</td>
<td>4</td>
<td>1</td>
<td>SIG–Signal DI/DO 4</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>GND–ground</td>
<td></td>
<td>2</td>
<td>GND–ground</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>SIG–Signal DI/DO 2</td>
<td>5</td>
<td>1</td>
<td>SIG–Signal DI/DO 5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>GND–ground</td>
<td></td>
<td>2</td>
<td>GND–ground</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>SIG–Signal DI/DO 3</td>
<td>6</td>
<td>1</td>
<td>SIG–Signal DI/DO 6</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>GND–ground</td>
<td></td>
<td>2</td>
<td>GND–ground</td>
</tr>
</tbody>
</table>

Figure 6: Digital I/O pinouts

4.5 Connecting TFIO modules

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

CAUTION – Equipment damage. When the TFIO interface is disabled, the module(s) remain powered. Remove the power from the RMC before connecting or disconnecting additional TFIO module(s) or TFIO cable. Failure to power down the RMC may result in damage to the module(s).
Table 7 identifies the different module types available that support 9 to 30 V operation. RMC does not support the TFIO CIM module, part number 2100421.

<table>
<thead>
<tr>
<th>TFIO module</th>
<th>Part number</th>
<th>TFIO software version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve Control Combo I/O (M2)</td>
<td>2100412</td>
<td>2100576-007</td>
</tr>
<tr>
<td>4–20 mA Analog Output (M2)</td>
<td>2100415</td>
<td>2100715-006</td>
</tr>
<tr>
<td>Type II Analog Input (M2)</td>
<td>2100418</td>
<td>2100575-006</td>
</tr>
<tr>
<td>Combo Digital (M2)</td>
<td>2100543</td>
<td>2100563-009</td>
</tr>
<tr>
<td>Thermocouple (M2)</td>
<td>2100869</td>
<td>2101024-001</td>
</tr>
<tr>
<td>RTD (M2)</td>
<td>2101018</td>
<td>2101027-001</td>
</tr>
</tbody>
</table>

**CAUTION – Equipment 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 the TFIO B port.
8. Attach the 9-pin connector of the TFIO interface cable to the TFIO B port.
9. Loosen the terminal connector screws for the correct pin according to Table 8.
10. Insert the wires in the required TFIO pins.
11. Tighten the terminal connector screws.

**NOTICE – Property damage.** Do not overtighten the terminal connector screws as this may damage the wire.
Figure 7 shows the side view of a TFIO module and its pinouts.

![TFIO Module Side View](image)

**Figure 7: TFIO module**

Table 8 to 13 identify the wiring pins for the TFIO M2 modules used with the RMC. The wiring pins are the same for legacy TFIO modules.

---

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

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

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

---

<table>
<thead>
<tr>
<th>Table 8: TFIO valve control interface module (M2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J1</strong></td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 9: TFIO analog output (4-20 mA) module (M2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J1</strong></td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>
Table 10: TFIO analog input module (M2)

<table>
<thead>
<tr>
<th>J1</th>
<th>J2</th>
<th>J3</th>
<th>J4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AI1 (+)</td>
<td>AI3 (+)</td>
<td>AI5 (+)</td>
</tr>
<tr>
<td>2</td>
<td>AI1 (GND)</td>
<td>AI3 (GND)</td>
<td>AI5 (GND)</td>
</tr>
<tr>
<td>3</td>
<td>AI2 (+)</td>
<td>AI4 (+)</td>
<td>AI6 (+)</td>
</tr>
<tr>
<td>4</td>
<td>AI2 (GND)</td>
<td>AI4 (GND)</td>
<td>AI6 (GND)</td>
</tr>
</tbody>
</table>

Table 11: TFIO combo digital module and extended (M2)

<table>
<thead>
<tr>
<th>J1</th>
<th>J2</th>
<th>J3</th>
<th>J4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>POINT 1 SIG</td>
<td>POINT 3 SIG</td>
<td>POINT 5 SIG</td>
</tr>
<tr>
<td>2</td>
<td>POINT 1 GND</td>
<td>POINT 3 GND</td>
<td>POINT 5 GND</td>
</tr>
<tr>
<td>3</td>
<td>POINT 2 SIG</td>
<td>POINT 4 SIG</td>
<td>POINT 6 SIG</td>
</tr>
<tr>
<td>4</td>
<td>POINT 2 GND</td>
<td>POINT 4 GND</td>
<td>POINT 6 GND</td>
</tr>
</tbody>
</table>

Table 12: TFIO thermocouple module (M2)

<table>
<thead>
<tr>
<th>J1</th>
<th>J2</th>
<th>J3</th>
<th>J4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shield</td>
<td>Shield</td>
<td>Shield</td>
</tr>
<tr>
<td>2</td>
<td>TC1 (J-Wht/K-Yel)</td>
<td>TC2 (J-Wht/K-Yel)</td>
<td>TC3 (J-Wht/K-Yel)</td>
</tr>
<tr>
<td>3</td>
<td>TC1 Red (-)</td>
<td>TC2 Red (-)</td>
<td>TC3 Red (-)</td>
</tr>
<tr>
<td>4</td>
<td>Shield</td>
<td>Shield</td>
<td>Shield</td>
</tr>
</tbody>
</table>

Table 13: TFIO RTD module (M2)

<table>
<thead>
<tr>
<th>J1</th>
<th>J2</th>
<th>J3</th>
<th>J4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OUT</td>
<td>OUT</td>
<td>OUT</td>
</tr>
<tr>
<td>2</td>
<td>(+)</td>
<td>(+)</td>
<td>(+)</td>
</tr>
<tr>
<td>3</td>
<td>(-)</td>
<td>(-)</td>
<td>(-)</td>
</tr>
<tr>
<td>4</td>
<td>IN</td>
<td>IN</td>
<td>IN</td>
</tr>
</tbody>
</table>

See section 9, Configuring TFIO interfaces to configure the TFIO interfaces.

5 Powering the RMC

This section describes two modes for powering the controller:

— Battery mode: power is supplied by a 12 volt battery with a charger (see section 5.2, Powering with battery and charger.)
— External power mode: power is supplied by an external power source (see section 5.3, Powering with external power.)

Review section 5.1, Power on sequence, follow the instructions for the appropriate power mode and continue to section 5.4, Lithium battery.
5.1 Power on sequence

The RMC power on sequence is initiated as soon as power is connected. The following information may be displayed on the LCD as the controller completes its startup:

- ABB TOTALFLOW RMC-100 – identifies the controller name and model
- BOOT 2105412-XXX – indicates the version of the boot software
- OS 2105411-XXX – indicates the version of the operating system
- Super CAP Charged – indicates if the super capacitor is charged (see section 5.1.1, Super capacitor.)
- APP 2105457-XXX – indicates the version of the flash

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

5.1.1 Super capacitor

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

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

5.2 Powering with battery and charger

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

**IMPORTANT NOTE:** Make sure the battery and charger meet the specifications in section 2.2, Battery and charger requirements.

5.2.1 Connecting the battery (dc power)

The hardware required for a battery installation is a 12 volt sealed lead acid (SLA) battery and the battery cable. Before installation, inspect the battery cable and connectors for breakage where they terminate on the battery. To install and connect the battery:

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

2. Connect the battery to the terminals (Figure 8). The power terminal block is green. Observe the polarity (+ and -).

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

Connect the battery before connecting the charger cable.

![Battery port](image)

**Figure 8: Battery port**

3. Confirm that the battery is supplying power to the RMC by observing the power on sequence information scrolling on the LCD (see details in section 5.1, *Power on sequence*). When the DATE/TIME display, the sequence is complete.

4. If the power on sequence fails to initiate or complete, press the reset button shown in Figure 11.

**5.2.2 Connecting the charger**

The RMC may use a 10, 20, or 30 watt solar panel with Nominal 12 Vdc output voltage. The solar panel may be mounted on a 2 inch pipe or the top or side of a meter house.

**WARNINGS – Equipment damage.** Alternate installations could use a NEC Class 2 rated power source instead of a solar panel charger. When using a NEC Class 2 rated power source, the output must be 14.5 Vdc to 15.5 Vdc maximum as described in section 2.2, *Battery and charger requirements*.

Failure to use chargers that meet the required voltage specifications may cause equipment damage.
**IMPORTANT NOTES:** Call the ABB main office number listed on the back page of this guide for questions about mounting the solar panel on the top or side of a meter house.

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 – Equipment damage.** Never connect the solar panel or alternate charger cable to the RMC before the battery is connected to the BAT port (Figure 8, **Battery port**).

To connect the solar panel charger (adapt instructions if connecting to a NEC Class 2 rated power source as a charger):

1. Verify that the solar panel is operating properly before installation:
   a. Check the solar panel using a digital voltmeter to verify polarity and output voltage. Voltage varies depending on the amount of sun, angle to sun, etc.
   b. If the measured output voltage is within the manufacturer’s specification as defined by the specification sheet supplied with the panel, continue with the installation.
   c. If the measured voltage is out of specification, call the ABB main office number listed on the back page of this guide for a replacement panel.

2. Connect the solar panel cable to the CHARGER/EXT PWR terminals as shown in Figure 9. Observe the polarity (+ and -).

3. Continue to section 5.4, **Lithium battery**.

---

![Figure 9: Solar panel connection](image)

---

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5.3 Powering with external power

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

**IMPORTANT NOTE:** Make sure that the external power supply meets the specifications in section 2.3, *External power supply requirements.*

---

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

To wire an external power supply to the controller:

1. Follow the manufacturer’s instruction supplied with the external power supply to install and connect it to a power source.

2. Connect the external power supply cable to the CHARGER/EXT PWR terminals as shown in Figure 10. Observe the polarity (+ and -).

![Figure 10: External power supply connection](image)

3. Apply power to the external power supply.

4. Confirm that the RMC is receiving power by observing the power on sequence information scrolling on the LCD (see details in section 5.1, *Power on sequence*). When the DATE/TIME display the sequence is complete.

5. If the power on sequence fails to initiate or complete, press the reset button shown in Figure 11.

5.4 Lithium battery

The lithium battery serves to retain operation of the real time clock with the lithium battery backup switch. The switch is located between the TFIO ports and accessed by a slot in the housing. Lift the cover over the TFIO ports to view the switch settings. The two settings are:

- Enable - The switch is on. The lithium battery backs up the real time clock. If power is lost or disconnected, the real time clock continues to operate until the lithium battery is depleted.
Disable - The switch is off. The lithium battery does not back up the real time clock. To ensure the lithium battery is enabled, insert a small screwdriver in the slot and move the switch to the ENABLE position as shown in Figure 11.

![Figure 11: Lithium battery switch](image)

6 Configuring the RMC using PCCU32 software

**IMPORTANT NOTE:** PCCU32 version 7.57 software or newer is required to communicate with the RMC equipment for configuration. Previous versions of PCCU32 are not compatible. It is assumed that PCCU32 is already installed in the PC or laptop used to connect to the controller. To download the latest PCCU32 version, see the Additional Information section. For PCCU32 installation instructions, see the RMC100 User Manual.

6.1 Establishing local communication

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

The following instructions are for a USB port connection. For other ports, refer to the RMC user manual.

The required USB cable has a USB 2.0 Type B plug to a USB 2.0 Type A plug.

To set up local communication using the USB port:

1. Power on the RMC and laptop.
2. Connect the USB cable. An annunciator in the LCD displays a lower case “u” for local USB connection.
3. Start PCCU.
4. On the PCCU32 tool bar, click **Setup**. The System Setup window displays (Figure 12).

![System Setup](image1)

**Figure 12: System setup**

5. Under Communications in the Setup tab, click the Serial port radio button.

6. Select the PCCU Com. Port from the drop-down list (the computer USB port that the cable is connected to).

7. Click **Close**.

8. On the PCCU32 tool bar, click **Entry** to connect to the device. When the connection is successful, the PCCU32 Entry screen displays.

9. If the RMC calendar clock is different from the laptop’s date and time, a message box displays to synchronize the date and time (Figure 13).

![Notice](image2)

**Figure 13: Synchronize date and time**

10. Click **Yes**. The RMC calendar clock is synchronized with the laptop date and time.
6.2 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 14.

   Table 14: Required Station setup

<table>
<thead>
<tr>
<th>Entry</th>
<th>Format</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station ID</td>
<td>10 digit alphanumeric</td>
<td>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.</td>
</tr>
<tr>
<td>Location</td>
<td>24 digit alphanumeric</td>
<td>The location identifier describes the location, such as the county name or a road number. Not mandatory.</td>
</tr>
<tr>
<td>Date/Time</td>
<td>MM/DD/YYYY HH:MM:SS (24 hour clock)</td>
<td>Date and time must be set correctly and should agree with the collection equipment if measurement tubes are instantiated.</td>
</tr>
</tbody>
</table>

3. Verify the Lithium Battery Status is OK in a green bar (Figure 14). If the status is Low Voltage or Not Connected, the field background color is red. Refer to Troubleshooting in the RMC100 User Manual to determine and resolve the problem before continuing with the startup instructions.

![Figure 14: Station Setup screen](image)

4. Change any other settings in the Station Setup tab as needed. Leave PCCU open on the Station Setup tab. For more information, refer to the RMC User Manual.
6.3 Configuring security (optional)

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

1. Ensure that the security switch is set to off. The switch is located between the TFIO A and TFIO B connectors on the RMC (Figure 15).

![Security switch diagram](image)

Figure 15: Security switch

2. Return to the PCCU32 Station Setup tab.
3. Verify the Security Switch Status field shows off (Figure 14, Station Setup screen). The security codes cannot be configured if the status is on.
4. Type a four digit security code for Security Code Level 1 (read only access).
5. Type a four digit security code for Security Code Level 2 (read and write access).

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

6. Click Send.
7. Set the RMC security switch to ON.
8. Click Re-read and check that the security switch status is on to begin enforcement of the security codes.

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

9. Call the ABB main office number listed on the back page of this guide if you need further assistance with security.
6.4 Changing the LCD display

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

1. On the **Station Setup** tab, scroll down to the LCD Display Date/Time Format section (Figure 16).

![Figure 16: LCD display date and time format](image)

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

7 Configuring communications

7.1 Configuring the COMM ports

The configuration is for COMM1 and COMM2 communication ports when connecting one or more serial devices. These ports are software configurable to support RS-232, RS-422, and RS-485. To configure the ports:

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 17).

![Figure 17: COMM port configuration](image)
3. Verify that the port is unused.
4. Select the appropriate port (COM1 or COM2).
5. Click **Add New Device/Application**. The Add/Modify Communication device and applications box displays (Figure 18).

![Add/Modify Communication devices and applications](image)

**Figure 18: Add communication**

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

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

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

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

8. Click **OK**. The port settings display.
9. Type a user-defined Port Description. Ensure the port description helps to uniquely identify the port.
10. Configure the Serial port settings to match the settings of the external device.

**IMPORTANT NOTES:** The Interface setting for a modem is RS-232 Modem.
If the protocol selected in the Add/Modify Communication device and application box is MODBUS®, select the appropriate register format.

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

The LED lights on the top of the communication module show that data is being sent (TXD) and received (RXD) when the external device begins communicating with the RMC. As long as the RMC is powered on, the PWR LED light should be on.
Figure 19 provides a communication configuration example to connect an ABB Totalflow product, such as a multivariable transmitter or XMV. The XMV Interface is chosen to support this type of connection.

![Figure 19: Serial port configuration to connect XMVs](image1)

Figure 20 provides a communication configuration example to connect equipment for remote communication such as a radio. The Generic Com App is chosen to support this type of connection.

![Figure 20: Serial port configuration for remote communication](image2)
7.2 Configuring Ethernet communication

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

To configure the network parameters:

1. Connect the Ethernet cable from the RMC to the network communication equipment (hub, switch, router, etc.).
2. Verify the Ethernet port LED is green (the network Ethernet link is on).
3. Configure the network parameters.
   a. Select **Communications** on the navigation tree. The **Communications Setup** tab displays.
   b. Select the **Network** tab (Figure 21).

   ![Figure 21: Ethernet remote communication setup](image)

   c. Verify that the Network Adaptor is set to Enable.
   d. If using DHCP for dynamic addressing, change the Enable DHCP field to **Yes**.
   e. If using static addresses, type each of the parameters: IP Address, Default Gateway, and Subnet Mask.
   f. Click **Send**. An Information box displays a message to warm-start or reset the device for the changes to take effect.
   g. Click **OK**.
4. Remember to press the reset button shown in Figure 11.
5. Verify that the Ethernet interface has been properly configured by pinging the device from the network. The RMC should reply to the ping from the network.
6. Reconnect PCCU32 to the controller after startup is complete.

7.3 Configuring a third party serial-to-Ethernet module

Third party serial-to-Ethernet modules can be used to add serial communication ports for external devices such as XMVs and transmitters. The configuration instructions are provided from the manufacturer. Refer to the **RMC-100 User Manual** for the configuration of the RMC to support third party devices.
8 Configuring 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.

8.1 Change view option

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

1. On the top PCCU32 menu bar, select View.
2. Select the Expert option (Figure 22).
3. Click Yes at the warning and wait for the PCCU32 entry mode screen to refresh.

![Figure 22: Expert view selection](image)

8.2 Analog input configuration

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

To configure the analog input signal mode:

1. Select I/O System on the navigation tree. The Analog Inputs tab displays (Figure 23).

![Figure 23: Analog input configuration](image)

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

The analog output configuration 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 and its operating or measurement range.

When defining non-default engineering units for the first time, it is recommended that the AO is calibrated first. Engineering units can be defined after calibration is completed. Engineering units defined on the calibration screen are automatically reflected in the Analog Output tab (Figure 24). For AO calibration, refer to the RMC-100 User Manual.

If you need to change settings for the analog output after the first time calibration:
1. Select I/O System on the navigation tree.
2. Select the Analog Output tab (Figure 24).
3. Enter the AO percentage or the engineering units number.
4. Click Send.
5. Click Re-read.

8.4 Digital input/digital output configuration

The six (6) DI/DO ports support configurable input or output modes of operation. In input mode, the input thresholds are configurable for an input voltage range of 0 to 30 Vdc. This mode supports signals from external devices with:
— Active voltage outputs types (non-dry contact) – Digital Input (Voltage)
— Dry contact and open collector/drain output types – Digital Input (Dry-contact)

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

To configure each digital input or output:
1. Select I/O System in the navigation tree.
2. Select the Digital I/Os tab (Figure 25).
3. Select the Type from the drop-down list. Digital Input (Voltage) is the default.
4. Configure each Digital I/O port as appropriate:
   a. For digital input mode, select the low and high threshold voltage.
   b. For digital output mode, select the current value and the initial value.
5. Click Send.

8.5 Pulse input configuration

Each pulse input has a debounce filter. Without debounce, the PI operates at a frequency range of 0 to 20 kHz. With debounce, the frequency range is 0 to 100 Hz.

To configure the pulse input:
1. Select I/O System on the navigation tree.
2. Select the Pulse Inputs tab (Figure 26).

![Figure 26: Pulse input configuration](image)

3. Go to the Debounce area of the screen.
4. Select On if debounce is required. Set this for each PI port if debounce is needed.
5. Click Send.
9 Configuring TFIO interfaces

To scan and transmit data using the TFIO modules, the RMC TFIO interface must be enabled. Connected TFIO modules are detected only when the interfaces are enabled.

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

To verify or enable communication with TFIO modules:

1. On the navigation tree, under the I/O System:
   a. If modules were installed in TFIO-A, select TFIO A Modules (Figure 27). The TFIO Module List tab displays:
      i. Verify all TFIO modules connected and their type are listed.
   b. If modules were installed in TFIO-B, select TFIO-B Modules:
      i. Change TFIO-B Interface to Enabled.
      ii. Click Send.
      iii. Verify all TFIO modules connected and their type are listed.

Figure 27: TFIO A configuration
10 Troubleshooting

10.1 Visual alarm and status codes

After powering on, observe the LCD display. System alarms may display and indicate a condition to be resolved (Figure 28).

Table 15 provides a description of the alarms and status codes. The alarms provide a brief summary of the action to resolve the condition.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description and action</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td></td>
</tr>
<tr>
<td>(Blank LCD)</td>
<td>No annunciators or nothing on the display. No power to the controller. Action: Check the cable connections and check the voltage. Make a local connection with RMC and PCCU.</td>
</tr>
<tr>
<td>LL</td>
<td>Low Lithium Battery Alarm. When LL (low lithium) displays, the lithium battery voltage is below 2.5 Vdc. If lithium battery voltage is above 2.5 Vdc, LL appears shaded. A new lithium battery measures approximately 3.6 Vdc. Action: Replace the lithium battery.</td>
</tr>
<tr>
<td>LC</td>
<td>Low Charger. Displayed if the battery charging voltage is (+) 0.4 Vdc or is less than or equal to battery voltage. If (+) 0.4 Vdc battery charging voltage is greater than battery voltage, LC is shaded. Action: Check the cable connections and check the power source.</td>
</tr>
<tr>
<td>Display application</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>A number represents the Display Group number currently displayed.</td>
</tr>
<tr>
<td>↑</td>
<td>The displayed item’s value is above the Data High Limit value specified on the Display Item Setup screen.</td>
</tr>
<tr>
<td>↓</td>
<td>The displayed item’s value is below the Data Low Limit value specified on the Display Item Setup screen.</td>
</tr>
<tr>
<td>Communication protocols</td>
<td></td>
</tr>
<tr>
<td>→</td>
<td>Transmitting data: sending a response</td>
</tr>
<tr>
<td>←</td>
<td>Receiving data: processing a response</td>
</tr>
<tr>
<td>!</td>
<td>Nak: Negative acknowledgement with packet list</td>
</tr>
<tr>
<td>+</td>
<td>Acknowledgement: positive acknowledge of receipt of request</td>
</tr>
<tr>
<td>☞</td>
<td>Waiting for Acknowledgement; waiting for response after transmission</td>
</tr>
<tr>
<td>?</td>
<td>Exception alarm processing</td>
</tr>
<tr>
<td>✈</td>
<td>ID Recognized: The ID has been recognized but is waiting for “Sync”</td>
</tr>
<tr>
<td>🎓</td>
<td>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.</td>
</tr>
<tr>
<td>Indicator</td>
<td>Description and action</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>R</strong></td>
<td>LevelMaster Protocol: LevelMaster protocol is selected for the port assigned to this annunciator</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>Displayed when connected to MMI port</td>
</tr>
<tr>
<td><strong>U</strong></td>
<td>Displayed when connected to USB port</td>
</tr>
<tr>
<td><strong>¥</strong></td>
<td>Packet Protocol: the Totalflow Packet Protocol selected on this port</td>
</tr>
<tr>
<td><strong>MODBUS®</strong></td>
<td>MODBUS® ASCII protocol is selected for the port assigned to this annunciator</td>
</tr>
<tr>
<td><strong>V</strong></td>
<td>Valve control</td>
</tr>
<tr>
<td><strong>+</strong></td>
<td>Displayed when the Valve Control option is on an Expanded I/O board (plug-in RTU). Other Valve Control symbols do not apply</td>
</tr>
<tr>
<td><strong>=</strong></td>
<td>Positive Acknowledge of receipt of request</td>
</tr>
<tr>
<td><strong>↑</strong></td>
<td>Displayed when the valve control option is installed. Process value (PV) is within the user-set dead band.</td>
</tr>
<tr>
<td><strong>↓</strong></td>
<td>Valve is in full open position.</td>
</tr>
<tr>
<td><strong>↓</strong></td>
<td>Valve is in full closed position.</td>
</tr>
<tr>
<td><strong>↑</strong></td>
<td>Valve is opening. (Open signal is being sent to the valve actuator.)</td>
</tr>
<tr>
<td><strong>↓</strong></td>
<td>Valve is closing. (Close signal is being sent to the valve actuator.)</td>
</tr>
<tr>
<td><strong>Ö</strong></td>
<td>Valve RMC override conditions met (DP/SP override set point or Low Battery)</td>
</tr>
<tr>
<td><strong>LL</strong></td>
<td>Local Lock-out is initiated.</td>
</tr>
<tr>
<td><strong>H</strong></td>
<td>Measurement application</td>
</tr>
<tr>
<td><strong>Z</strong></td>
<td>Hold: displayed when HOLD flag is active. HOLD displays when PCCU21 is being calibrated.</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Zero Flow Condition: visible only when Flow Rate is displayed.</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>Alarm Condition: need to view alarm. Compare application limits to current values to determine where the alarm condition is present</td>
</tr>
<tr>
<td><strong>AD</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>BF</strong></td>
<td>Back Flow Condition: visible only when DP variable is displayed</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>Other protocols</td>
</tr>
<tr>
<td><strong>T</strong></td>
<td>Local console protocol</td>
</tr>
<tr>
<td><strong>a</strong></td>
<td>Local terminal protocol or TESORO tank gauge</td>
</tr>
<tr>
<td><strong>b</strong></td>
<td>ADP protocol</td>
</tr>
<tr>
<td><strong>n</strong></td>
<td>Bluetooth listen</td>
</tr>
<tr>
<td><strong>s</strong></td>
<td>Network listen</td>
</tr>
<tr>
<td><strong>x</strong></td>
<td>ScaData protocol</td>
</tr>
<tr>
<td><strong>x</strong></td>
<td>X-Frame host annunciator</td>
</tr>
</tbody>
</table>

10.2 Additional assistance

For assistance, call the ABB main office number listed on the back page of this guide.
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