SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.
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Warnings, Cautions, and Notices

Warnings, cautions, and notices are provided in appropriate places throughout this document:

⚠️ WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠️ CAUTION: Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.

NOTICE: Indicates a situation that could result in equipment or property-damage-only accidents.
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Overview

The Tracer™ UC400 Programmable Controller is a multi-purpose, programmable controller. Programming is done through the Tracer Graphical Programming (TGP2) Editor (see “Other Resources,” p. 59). This field-installed device is designed to control the following types of equipment:

- Single- and dual-duct variable-air-volume (VAV) units
- Fan coils
- Unit ventilators
- Blower coils
- Water-source heat pumps (WSHP)
- Small air handlers

This guide provides information on installing, operating, and maintaining the controller.

Specifications

Table 1. UC400 controller specifications

<table>
<thead>
<tr>
<th>Storage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-48°F to 203°F (-44°C to 95°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Between 5% to 95% (non condensing)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-40°F to 158°F (-40°C to 70°C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>Between 5% to 95% (nonconducting)</td>
</tr>
<tr>
<td>Power</td>
<td>20.4–27.6 Vac (24 Vac, ±15% nominal) 50–60 Hz 24 VA (24 VA plus binary output loads for a maximum of 12 VA for each binary output)</td>
</tr>
<tr>
<td>Mounting weight of controller</td>
<td>Mounting surface must support 0.80 lb. (0.364 kg)</td>
</tr>
<tr>
<td>Environmental rating (enclosure)</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>Altitude</td>
<td>Maximum 9842 ft. (3000 m)</td>
</tr>
<tr>
<td>Installation</td>
<td>UL 840: Category 3</td>
</tr>
<tr>
<td>Pollution</td>
<td>UL 840: Degree 2</td>
</tr>
</tbody>
</table>

Sensors

The UC400 controller supports the following sensor types:

- Zone temperature sensors (resistive and thermistor)
- Linear 0–20 mA, such as humidity sensors
- Linear 0–10 Vdc, such as indoor air-quality sensors
- 3-wire pressure transducer inputs
Table 2 provides information about the different types of device connections:

<table>
<thead>
<tr>
<th>Connection</th>
<th>Quantity</th>
<th>Types</th>
<th>Range</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input (AI1 to AI5)</td>
<td>5</td>
<td>Temperature</td>
<td>10 kΩ thermistor</td>
<td>A11 to A14 can be configured for timed override capability.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setpoint</td>
<td>189 Ω to 889 Ω</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resistive</td>
<td>100 Ω to 100 kΩ</td>
<td>Typically used for fan speed switch.</td>
</tr>
<tr>
<td>Universal input (UI1 and UI2)</td>
<td>2</td>
<td>Linear</td>
<td>0–20 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linear</td>
<td>0–10 Vdc</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature</td>
<td>10 kΩ thermistor</td>
<td>These inputs may be configured to be thermistor or resistive inputs, 0–10 Vdc inputs, or 0–20 mA inputs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setpoint</td>
<td>189 Ω to 889 Ω</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resistive</td>
<td>100 Ω to 100 kΩ</td>
<td></td>
</tr>
<tr>
<td>Universal input (UI1 and UI2)</td>
<td>2</td>
<td>Binary</td>
<td>Open collector/dry contact</td>
<td>Low impedance relay contacts recommended.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pulse</td>
<td>Solid state open collector</td>
<td>Minimum dwell time is 25 ms On and 25 ms Off.</td>
</tr>
<tr>
<td>Binary input (BI1 to BI3)</td>
<td>3</td>
<td>24 Vac detect</td>
<td></td>
<td>The UC400 controller provides the 24 Vac that is required to drive the binary inputs when using the recommended connections.</td>
</tr>
<tr>
<td>Binary output (BO1 to BO3)</td>
<td>3</td>
<td>Relay</td>
<td>2.88 A @24 Vac pilot duty</td>
<td>Power needs to be wired to the binary output. All outputs are isolated from each other and from ground or power. <strong>Ranges given are per contact.</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>General purpose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pilot duty</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resistive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Binary output (BO4 to BO9)</td>
<td>6</td>
<td>TRIAC</td>
<td>0.5 A max @24-277 Vac, resistive and pilot duty</td>
<td>Use for modulating TRIAC. User determines whether closing high side (providing voltage to the grounded load) or low side (providing ground to the power load). <strong>Ranges given are per contact and power comes from TRIAC SUPPLY circuit.</strong></td>
</tr>
<tr>
<td>Analog output/binary input</td>
<td>2</td>
<td>Linear output</td>
<td>0–20 mA</td>
<td>Each termination must be configured as either an analog output or binary input.</td>
</tr>
<tr>
<td>(AO1/BI4 and AO2/BI5)</td>
<td></td>
<td>Linear output</td>
<td>0–10 Vdc</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Binary input</td>
<td>Dry contact</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>PWM output</td>
<td>80 Hz signal @ 15 Vdc</td>
<td></td>
</tr>
<tr>
<td>Pressure inputs (P11 and P12)</td>
<td>2</td>
<td>3-wire</td>
<td>0–5 in H₂O</td>
<td>Pressure inputs supplied with 5 volts of power. Designed for Kavlico™ pressure transducers.</td>
</tr>
</tbody>
</table>

**CAUTION**

**Electrical Shock Hazard!**

Do not mix Class 1 and Class 2 voltage wiring in an enclosure or on a controller without an approved barrier between the wiring.
Expansion Modules

If you need additional points, you can add up to eight XM30 expansion modules. Two of the expansion modules can be powered directly by the UC400 power supply, but they must not exceed the 200 mA current limit of the IMC connector. Calculate the power requirements before attempting to power the expansion modules with the UC400 power supply. If the calculated load exceeds 200 mA or if you need more than two XM30 expansion modules, install separate DC power supplies. See “XM30 Expansion Modules,” p. 12.

Agency Listings and Compliance

This section lists compliance with Conformity European (CE) and Underwriters Laboratories (UL) standards for the UC400 controller:

- UL916 PAZX- Open Energy Management Equipment
- UL94-5V Flammability
- CE Marked
- FCC Part 15, Subpart B, Class B Limit
- AS/NZS CISPR 22:2006
- VCCI V-3/2008.04
- ICES-003, Issue 4:2004

Packaged Contents

Visually inspect all parts for obvious defects or damage. All components are thoroughly inspected before leaving the factory. Any claims for damage incurred in shipping should be filed immediately with the carrier.

UC400 Controller

The following items are included in the UC400 package:

- UC400 controller
- DIN rail and DIN rail mounting screws
- Terminal connectors
- Installation guide

*Note:* For factory-mount controllers, the terminal connectors are part of the harness connector (see “Other Resources,” p. 59). For field-mounted controllers, the quantities will vary depending on user requirements.
Overview

Accessories

Two accessory options are available for the UC400:

- Enclosure for remote mounting, p/n X13651534, which includes:
  - Pre-mounted DIN rail
  - Transformer (line voltage to 24 Vac)
  - Transformer to unit controller cable/harness
  - Convenience power outlet (available only on 115 V version)
  - Four #10 (5 mm) wall anchors and four #10 x 1.5 inch (5 x 40 mm) screws

- XM30 expansion module, which includes:
  - IMC cable
  - Pluggable terminal connectors (not installed)
  - Installation sheet

Required Tools

You will need the following tools to install and initially test the UC400 controller:

- Drill and appropriate bits for DIN rail mounting
- A #2 Phillips-head screwdriver
- A 1/8 inch (3.2 mm) wide, flat-bladed screwdriver
- Digital multimeter
Installation: Mounting

This chapter provides instructions for physical installation of a UC400 controller and an XM30 expansion module.

UC400 Controller

This section shows dimensions and provides installation instructions for mounting, removal, or repositioning the UC400 controller on a DIN rail.

Dimensions and Clearances

Figure 1. Controller dimensions

*DIN Standard 43 880, Built-in Equipment for Electrical Installations, Overall Dimensions and Related Mounting Dimensions
Mounting, Removing, or Repositioning the Controller on a DIN Rail

**Notice:**
Avoid Equipment Damage!
Do not use excessive force to install or remove the controller from the DIN rail. Excessive force could result in damage to the plastic enclosure.

**Important:** Always install devices on a horizontally oriented DIN rail to allow proper ventilation.

**Mounting the controller**
1. Hook the controller over the top of the DIN rail.
2. Gently push on lower half of device in the direction of the arrow until the release clip locks into place.
Removing or repositioning the controller

1. Disconnect all connectors.
2. Insert a screwdriver blade into the slotted release clip shown in Figure 4 and gently pry upward to disengage the clip.
3. While holding tension on the clip, lift the controller upward to free it from the DIN rail.
4. Reposition the controller by sliding it sideways or by removing it completely and reattaching it.
5. Gently push on lower half of device in the direction of the arrow until the release clip locks into place.

Figure 3. Mounting a UC400 on the DIN rail

Figure 4. Slotted release clip on the back of the UC400
**XM30 Expansion Modules**

The UC400 controller has 23 built-in points and supports up to eight XM30 expansion modules. Each expansion module adds up to four additional points. However, the controller can only supply up to 200 mA of electrical current, which is enough to power only two expansion modules. The third and all subsequent expansion modules must be powered by a (recommended) Trane PM014 power module or third-party equivalent.

**Example 1: UC400 With Two Expansion Modules**

Expansion and power modules can be installed on the DIN rail along with the UC400 controller and interconnected using the provided IMC bus connectors. Figure 5 shows a UC400 controller and two XM30 expansion modules installed next to each other on a DIN rail. They are interconnected with the IMC bus connectors.

*Important:* Set the addresses of the expansion modules before connecting the power supply and applying power.

**Figure 5. UC400 controller with two XM30 expansion modules**

**Example 2: UC400 With Four Expansion Modules**

Figure 6 shows a UC400 controller, four XM30 expansion modules, and a PM014 power module, which is required to power at least two of the expansion modules. To use the IMC bus connectors for all the devices, remove the power supply wire as shown to prevent the 24VDC power supplied by the controller from entering the power supply module.
**Important:** Set the addresses of the expansion modules before connecting the power supply and applying power.

Figure 6. UC400 controller with four XM30 expansion modules and a PM014 power module.

Locating Expansion Modules Remotely from the Controller

You can locate the expansion and power modules remotely from the controller. Note the following:

- Use the screw terminals instead of the IMC bus connectors to interconnect them.
- If the communication cable travels outside of an enclosure, it must be shielded to prevent interference.
- The maximum power supply wire length between the UC400 controller and XM30 expansion module is 656 ft (200 m).
- If two XM30 expansion modules are mounted remotely, the sum of the power supply wiring lengths must not exceed 500 ft (152 m).
- The maximum wire length for IMC communications is 656 ft (200 m).
- See BAS-SVX33 for PM014 power module wire length limits.

Discovering and Configuring Expansion Modules

After they are connected and addressed, XM30 expansion modules must be “discovered” by the UC400 controller. Connect Tracer TU to the UC400 controller with a USB cable or by using an IP connection passing through a Tracer SC system controller.

**Note:** Due to an IMC communications conflict, you cannot use the Tracer TU Communication Adapter to discover expansion modules.

Use the Tracer TU service tool to configure each expansion module point as either an analog input, binary input, or analog output.
Installation: Wiring

This chapter provides instructions for all of the wiring on a new UC400 controller.

Overview

Figure 7. Wiring Overview Outline
General Instructions

Conformance to Regulatory Standards

All wiring must comply with the National Electrical Code (NEC™) and local electrical codes.

Connecting Wires to Terminals

Use the following procedure when connecting wires to the UC400 controller or the XM30 expansion module:

1. Strip the wires to expose 0.28 inch (7 mm) of bare wire.
2. Insert the wire into a terminal connector.
3. Tighten the terminal screw to 0.5 to 0.6 N-m (71 to 85 ozf-in or 4.4 to 5.3 lbf-in.)
4. Tug on the wires after tightening the screws to ensure all wires are secure.

Figure 8. Checking wire connections

BACnet MS/TP Link

Setting the Address

Note: To set rotary dials for the XM30 expansion module, see Tracer XM30 Expansion Module Installation Sheet (X39641148-01).

The rotary address dials on the UC400 serve one or two purposes depending upon the network: they are always used for the MAC Address, which is sometimes all or part of the BACnet Device ID.
MAC Address

The MAC Address is required by the RS-485 communication protocol on which BACnet operates. A UC400 controller can use a MAC Address from 001 to 120.

**Important:** Each device on the link must have a unique MAC Address/Device ID. A duplicate address or a 000 address setting will interrupt communications and cause the Tracer SC device installation process to fail.

BACnet Device ID

The BACnet Device ID is required by the BACnet network. Each device must have a unique number from 001 to 4094302.

**BACnet networks without a Tracer SC system controller.** On BACnet networks without a Tracer SC system controller, the Device ID can be assigned one of two ways:

- It can be the same number as the MAC Address, determined by the rotary address dials on the UC400 controller. For example, if the rotary address dials are set to 042, both the MAC Address and the BACnet Device ID are 042.
- It can be soft set using Tracer TU service tool. If the BACnet Device ID is set using Tracer TU service tool, the rotary address dials only affect the MAC Address, they do not affect the BACnet Device ID. See “Appendix: Protocol Implementation Conformance Statement (PICS)” p. 60 for information about the UC400 BACnet protocol implementation conformance statement (PICS).
**BACnet networks with a Tracer SC system controller.** On BACnet networks with a Tracer SC system controller, the Device ID for the UC400 controller is always soft set by the system controller using the following scheme (illustrated in Figure 10).

- The first three digits are determined by the address rotary dials on the Tracer SC system controller.
- The fourth digit is determined by the link number to which the UC400 controller is attached.
- The last three digits are determined by the rotary address dials on the UC400 controller.

*Note:* The BACnet Device ID is displayed as the Software Device ID on the Tracer TU Controller Settings Page in the Protocol group.

**Figure 10. UC400 Controller BACnet Device ID assignment by Tracer SC system controller**

---

**Connection Wiring**

BACnet MS/TP link wiring must be field-supplied and installed in compliance with the National Electrical Code and local codes. The wire must be low-capacitance, 18-gauge, stranded, tinned-copper, shielded, twisted-pair. **Figure 11, p. 18** shows an example of BACnet link wiring with multiple UC400 controllers.

*Note:* For more details on this topic, see the Tracer SC Unit Controller Wiring Guide listed under “Other Resources,” p. 59.
Figure 11. BACnet MS/TP link wiring.

Power Supply

⚠️ WARNING
Hazardous Voltage!

Disconnect all electric power, including remote disconnects, before servicing. Follow proper lockout and/or tagout procedures to ensure the power cannot be inadvertently energized. Failure to disconnect power before servicing could result in serious injury or death.


⚠️ CAUTION
Personal Injury and Equipment Damage!

After installation, make sure to check that the 24 Vac transformer is grounded through the controller. Failure to check could result in personal injury and/or damage to equipment. Measure the voltage between chassis ground and any ground terminal on the UC400 controller. Expected result: Vac ≤ 4.0 V.

Notice:
Avoid Equipment Damage!

Sharing 24 Vac power between controllers could cause equipment damage.

A separate transformer is recommended for each UC400 controller. The line input to the transformer must be equipped with a circuit breaker sized to handle the maximum transformer line current.

If a single transformer is shared by multiple UC400 controllers:

- The transformer must have sufficient capacity.
- Polarity must be maintained for every UC400 controller powered by the transformer.

Important: If the polarity is inadvertently reversed between two controllers powered by the same transformer, a difference of 24 Vac will occur between the grounds of each controller, which can result in:
- Partial or full loss of communication on the entire BACnet MS/TP link
- Improper function of UC400 outputs
- Damage to the transformer or a blown transformer fuse

Transformer Recommendations

The UC400 controller can be powered with 24 Vac or 24 Vdc. You must use a 24 Vac power supply for proper operation of the binary inputs, which require 24 Vac detection, and also to use the spare 24 Vac outputs to power relays and TRIACS.

- AC transformer requirements: UL listed, Class 2 power transformer, 24 Vac ±15%, device max load 24 VA, BCI application 6 VA. The transformer must be sized to provide adequate power to the controller (12 VA) and outputs (maximum 12 VA per binary output).
- DC power supply requirements: UL listed, Class 2 power supply, 24 Vdc ±15%, device max load 420 mA, BCI application 90 mA.
- CE-compliant installations: The transformer must be CE marked and SELV compliant per IEC standards.

Wiring Requirements

To ensure proper operation of the UC400 controller, install the power supply circuit in accordance with the following guidelines:

- The controller must receive AC power from a dedicated power circuit; failure to comply may cause the controller to malfunction.
- A dedicated power circuit disconnect switch must be near the controller, easily accessible by the operator, and marked as the disconnecting device for the controller.
- DO NOT run AC power wires in the same wire bundle with input/output wires; failure to comply may cause the controller to malfunction due to electrical noise.
- 18 AWG (0.823 mm²) copper wire is recommended for the circuit between the transformer and the controller.
Installation: Wiring

Connect the Wires

1. Disconnect power to the transformer.
2. Connect the 24 Vac secondary wires from the transformer to the 24 VAC and \( \lambda \) terminals on the UC400 controller.
3. Do one of the following to make sure the controller is adequately grounded:
   - Connect a grounding pigtail at some point along the secondary wire that runs between the controller \( \lambda \) terminal and the transformer.
   - Ground one of the \( \lambda \) terminals on the controller to the enclosure (if the enclosure is adequately grounded) or to an alternate earth ground.

Figure 12. Connecting 24 Vac transformer and ground.

Power on Check

1. Verify that the 24 Vac connector and the chassis ground are properly wired.
2. Remove the lockout/tagout from the line voltage power to the electrical cabinet.
3. Energize the transformer to apply power to the UC400 controller.
4. Observe the UC400 controller when power is applied to verify the power check sequence:
   a. The power LED lights red for 1 second.
   b. The power LED lights green.
      • If the sequence completes as described, the controller is properly booted and ready for the application code. See “Checking and Transferring Application Code Firmware,” p. 40.
      • If the power LED flashes red, a fault condition exists. See “LED Descriptions and Activities with Troubleshooting Tips,” p. 35. If there are other problems after powering, see “Commissioning and Troubleshooting in Powered State,” p. 49.

Inputs and Outputs

This section describes how to wire the inputs and outputs to the UC400 controller.

Device Pre-Power Checks

Before you connect any inputs or outputs to the UC400 controller, perform these pre-power checks.

Basic checks

For devices with input/output types listed below, verify their basic functionality:

• Binary inputs: check that they are opening and closing. Also check for 24 Vac if they provide their own power. With a Trane-provided 24 Vac, check to make sure it is dry contact and working.
• Thermistors: check for 10K using a digital multimeter (DMM).
• Thumb wheels: verify mechanical operation.
• Binary outputs: check for any dead shorts.
• Analog outputs: check that no A/C voltage is present and that the load has no 24 Vac across it or 120 Vac.

Point check diagrams

This section shows diagrams and describes methods to check device input/output points before the connection to the UC400 controller has been made and power has been applied. The step numbers in each illustration correspond to the information in each table. (See Table 2, p. 6 for a list of device connections.)

Note: The UC400 controller should not be connected to the input and output devices during the pre-power checks, so the controller is not shown in the diagrams. Similar illustrations in the section, “Commissioning and Troubleshooting in Powered State,” p. 49 show the location of the UC400 controller.
Resistive inputs

Checkout Procedure | Measurement | Expected Value
--- | --- | ---
Step 1 | Measure AC voltage across the resistive termination. | \( V_{ac} \approx 0.0 \text{ V} \) AC voltage will affect further measurement.
Step 2 | Measure DC voltage across the resistive termination. | \( V_{dc} \approx 0.0 \text{ V} \) DC voltage will affect further measurement.
Step 3 | Measure the resistance across the resistive termination. | Compare the measured resistance with the expected value based on the manufacturer’s specification and current conditions.

Voltage inputs

Checkout Procedure | Measurement | Expected Value
--- | --- | ---
Step 1 | Measure AC voltage across the voltage input. | \( V_{ac} \approx 0.0 \text{ V} \) AC voltage will affect further measurement.
Step 2 | Measure DC voltage across the voltage termination. | Compare the measured voltage with the expected value based on the manufacturer’s specification and current conditions.
Current inputs

<table>
<thead>
<tr>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Measure AC voltage across the current input.</td>
<td>$\text{Vac} \approx 0.0 \text{ V}$&lt;br&gt;AC voltage will affect further measurement.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Measure DC voltage across the current input.</td>
<td>$\text{Vdc} \approx 0.0 \text{ V}$</td>
</tr>
<tr>
<td>Step 3</td>
<td>Measure the DC current across the current input.</td>
<td>Compare the measured current with the expected value based on the manufacturer’s specification and current conditions.</td>
</tr>
</tbody>
</table>

Binary inputs, 24 Vac detect

<table>
<thead>
<tr>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Measure AC voltage across the resistive termination.</td>
<td>$\text{Vac} = 0.0 \text{ V}$&lt;br&gt;AC voltage will affect further measurement.</td>
</tr>
<tr>
<td>Step 2</td>
<td>Measure DC voltage across the resistive termination.</td>
<td>$\text{Vdc} = 0.0 \text{ V}$&lt;br&gt;DC voltage will affect further measurements.</td>
</tr>
<tr>
<td>Step 3</td>
<td>Measure the resistance across the resistive termination.</td>
<td></td>
</tr>
</tbody>
</table>
Binary inputs based on analog output connection

![Diagram of binary inputs based on analog output connection]

### Wiring Requirements

**Notice:**

**Avoid Equipment Damage!**

Remove power to the UC400 controller before making input/output connections. Failure to do so may cause damage to the controller, power transformer, or input/output devices due to inadvertent connections to power circuits.

### Maximum wire lengths

<table>
<thead>
<tr>
<th>Type</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary</td>
<td>1,000 ft (300 m)</td>
<td>1,000 ft (300 m)</td>
</tr>
<tr>
<td>0–20 mA</td>
<td>1,000 ft (300 m)</td>
<td>1,000 ft (300 m)</td>
</tr>
<tr>
<td>0–10 Vdc</td>
<td>300 ft (100 m)</td>
<td>300 ft (100 m)</td>
</tr>
<tr>
<td>Thermistor/Resistive</td>
<td>300 ft (100 m)</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

- All wiring must be in accordance with the NEC and local codes.
- Use only 18–22 AWG (1.02 mm to 0.65 mm diameter), stranded, tinned-copper, shielded, twisted-pair wire. Shielding is optional for binary inputs and analog 0 - 20mA inputs.
- 24 Vdc output wiring distances are dependent on the receiving unit specifications. Output wiring must comply with the receiving unit’s wiring specifications.
- **DO NOT** run input/output wires or communication wires in the same wire bundle with AC power wires.

### Providing Low-voltage Power for Inputs/Outputs

The UC400 controller can provide low-voltage power to the inputs/outputs. More than one input or output can receive power from a given screw terminal as long as the total amount of power consumed does not exceed the terminal’s limit.

The UC400 controller requires 24 Vac, UL-listed, Class 2 power transformer. This section provides information about checking power budget consumption for the UC400 in an *un-powered* state.
Calculating power consumption

Apply these rules when calculating the necessary power consumption:

- Total available power is determined by the transformer rating.
- Reserve 12 VA to power XM30 expansion modules.
- The total of the 24 Vac output and inputs should not exceed the remaining power.

Use the following table as a guideline for the UC400 controller power consumption.

Table 3. UC400 Power Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Sub (a)</th>
<th>VA Draw Per I/O (24 VAC)</th>
<th>Maximum Total VA Draw (24 Vac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UC400 Board</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UC400 controller</td>
<td></td>
<td>8 VA</td>
<td>8 VA</td>
</tr>
<tr>
<td>5 x AI</td>
<td>0.2 VA per AI</td>
<td>1 VA</td>
<td>1 VA</td>
</tr>
<tr>
<td>2 x UI</td>
<td>0.13 VA per UI</td>
<td>0.25 VA</td>
<td>0.25 VA</td>
</tr>
<tr>
<td>2 x PI</td>
<td>0.13 VA per PI</td>
<td>0.25 VA</td>
<td>0.25 VA</td>
</tr>
<tr>
<td>3 x BI</td>
<td>0.17 VA per BI</td>
<td>0.5 VA</td>
<td>0.5 VA</td>
</tr>
<tr>
<td>2 x AO</td>
<td>1 VA per AO</td>
<td>2 VA</td>
<td>2 VA</td>
</tr>
<tr>
<td>3 x BO (relay)</td>
<td>1 VA per relay (no load)</td>
<td>3 VA</td>
<td>3 VA</td>
</tr>
<tr>
<td>6 x BO (TRIAC)</td>
<td>0.34 VA per TRIAC (no load)</td>
<td>1 VA</td>
<td>1 VA</td>
</tr>
<tr>
<td>Subtotal for controller</td>
<td></td>
<td></td>
<td>16 VA</td>
</tr>
<tr>
<td>24 Vdc Supply</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 mA(b)</td>
<td>1 VA per 25mA DC</td>
<td>8 VA</td>
<td>8 VA</td>
</tr>
<tr>
<td>Total for controller</td>
<td></td>
<td></td>
<td>24 VA</td>
</tr>
</tbody>
</table>

Binary Outputs: Relay and TRIAC

<table>
<thead>
<tr>
<th>BO1 to BO3</th>
<th>Relay</th>
<th>See Table 2, p. 6, Device Connections</th>
<th>See Table 2, p. 6, Device Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO4 to BO9</td>
<td>TRIAC</td>
<td>0.5 A - 12 VA@ 24 Vac</td>
<td>12 VA Maximum</td>
</tr>
</tbody>
</table>

Notice:

Avoid Equipment Damage!

Remove power to the UC400 controller before making input/output connections. Failure to do so may cause damage to the controller, power transformer, or input/output devices due to inadvertent connections to power circuits.

(b) Expansion Modules: If all analog outputs are configured for current and the devices are powered at the maximum current draw, then the XM30 maximum current draw is 115 mA. Do not exceed the UC400 controller 200 mA output limit.
Pressure Transducer Inputs

The pressure inputs P1 and P2 (shown in Figure 13) are designed for 3-wire pressure sensor transducers, specifically Kavlico brand, which require 5 Vdc input.

**Important:** If you are using a different brand of pressure sensor transducer, contact Trane for help ensuring proper operation.

- P1 is typically used alone in single-duct applications when only one pressure measurement is needed.
- P1 and P2 are typically used together in dual-duct applications when two pressure measurements are needed. Examples include dual-duct VAV control and duct pressure measurement.
Binary Inputs

Connect to the binary inputs to monitor statuses such as fan on/off or alarm resets.

1. Connect the common wire to a common terminal as shown below.

   **Note:** Because the common terminals are in parallel, wiring can be made to any common terminal.

2. Connect the shield wire (if present) to a common terminal at the termination board and tape it back at the input device.
3. Connect the signal wire to an available input terminal.
4. Use the Tracer™ TU service tool to configure the input for binary operation.

**Figure 14. Typical wiring, binary inputs to UI or BI terminals**

If using a universal input terminals configured as a binary input (shown using 2-wire with shielding)

If using binary input terminals (shown using 2-wire without shielding)

0–10 Vdc Analog Inputs

The two universal inputs can be used to receive a 0–10 Vdc analog signal from sensors such as indoor air quality sensors and pressure sensors. To wire a 0–10 Vdc analog input:

1. Connect the shield wire (as common connection) to a common terminal as shown in Figure 15.
2. Connect the signal wire to an available input terminal.
3. Connect the supply wire to a 24 Vdc or 24 Vac terminal as required.
4. Use the Tracer TU service tool to configure the universal input for analog operation.
Figure 15. Typical wiring, 0–10 Vdc

24 Vdc

0–10 Vdc out

Common

300 ft (100 m) max.

24 VAC

BI1

AO1

BI5

AO2

UI1

UI2

BI3

BI4

BI6

BI7

BI8

BI9

+24 VDC

TX

RX

LINK IMC

SERVICE

SERVICE TOOL

CONNECT AC POWER TO THE TRIAC SUPPLY TO POWER THE TRIACS

BO1

BO2

BO3

BO4

BO5

BO6

BO7

BO8

BO9

1

2

3

4

5

6

7

8

9

0

x10

VAC 24 VAC

24 Vdc 0–10 Vdc out Common

Common

300 ft (100 m) max.
0–20 mA Analog Inputs

The universal inputs can be used to receive a 0–20 mA analog signal from sensors such as humidity sensors and pressure sensors.

To wire a 0–20 mA analog input:

1. Connect the shield to a common terminal at the terminal board and tape it back at the input device.

   **Important:** Do not use the shield as the common connection. For 3-wire applications, use a 3-conductor cable with shield and for 2-wire applications, use a 2-conductor cable with separate shield.

2. Connect the signal wire to an available universal input terminal.
3. Connect the supply wire to a 24 Vdc or 24 Vac terminal as required.
4. Use the Tracer TU service tool to configure the universal input for analog operation.

**Figure 16.** Typical wiring, 0–20 mA

---

Variable Resistance Analog Inputs

Variable resistance analog inputs include 10K thermistors, resistive, and setpoint thumb wheels on zone sensors.

1. Connect the shield to a common terminal at the terminal board and tape it back at the input device.
**Installation: Wiring**

**Note:** Do Not use the shield as the common connection. For 3-wire applications, use a 3-conductor cable with shield and for 2-wire applications, use a 2-conductor cable with separate shield.

2. Connect the signal wire to an available input terminal.
3. Use the Tracer TU service tool to configure the input for analog operation.

**Figure 17. Typical wiring, variable resistance**

<table>
<thead>
<tr>
<th>Zone Sensor Output</th>
<th>UC400 Termination</th>
<th>Type</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone Temp</td>
<td>AI1</td>
<td>Thermist</td>
<td>10k Ω</td>
</tr>
<tr>
<td>Zone Temp Setpoint</td>
<td>AI2</td>
<td>Setpoint</td>
<td>189 Ω–889 Ω</td>
</tr>
<tr>
<td>Fan Mode</td>
<td>AI3</td>
<td>Resistive</td>
<td>100 Ω–100k Ω</td>
</tr>
<tr>
<td>Comm+ (a)</td>
<td>IMC+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comm-</td>
<td>IMC-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) For Comm+/− wiring, use 18 AWG, shielded, twisted-pair wire.

**Analog Outputs**

The UC400 has two analog outputs. These outputs can be used for 0–10 Vdc outputs or 0–20 mA outputs, which can control actuators or secondary controllers.

**Note:** Output wiring specifications must comply with the receiving device wiring requirements.

1. Connect the shield to a common terminal at the terminal board and tape it back at the input device.

**Important:** Do Not use the shield as the common connection. For 2-wire applications, use a 2-conductor cable with separate shield.
2. Connect the signal wire to an available output terminal.
3. Connect the supply wire to a 24 Vdc or 24 Vac terminal as required.
4. Use the Tracer TU service tool to configure the input for analog operation.

Figure 18. Typical wiring, analog outputs

Relays (Dry Contact/Binary Outputs)

The UC400 has three relay binary outputs used as powered outputs. All outputs are isolated from one another and from the ground and power.

**Note:** Output wiring specifications must comply with the receiving device wiring requirements.

**Notice:**

Controlling coil-based loads: Inrush current (the initial surge of a current into a load before it attains normal operating condition) can be three times greater, or more, than the operating current.

**Important:** Use pilot relays for dry contact outputs for load currents greater than 0.5 amperes and use powered outputs for load currents less than 0.5 amperes.

To wire relay binary outputs:

1. Connect the shield to a common terminal at the terminal board and tape it back at the output device.
2. Connect the signal wire to an available output terminal.
3. Use the Tracer TU service tool to configure the input for analog operation.
Figure 19. Typical wiring, relays (binary outputs)

TRIAC (low/high side switching, binary outputs)

The UC400 has six TRIAC binary outputs. To wire TRIAC binary outputs (low/high), see the illustration below.
Figure 20. Typical wiring, TRIAC binary outputs

Low Side Switching

Note: The benefit of using low side switching is to minimize the risk of burning up binary outputs due to inadvertent shorts to the ground.

High Side Switching
Operation

This section describes how to verify and interpret the UC400 LEDs and how to safely operate the UC400. LEDs are used to provide serviceability of controllers and XM30 expansion modules. The UC400 and XM30 expansion module have the following LEDs located on the front (see the illustration in Figure 21):

- Marquee LED
- Communication Status LEDs and IMC Status LEDs
- Service Button LED
- Binary Output Relay (3)/TRIAC (9) Status LEDs (only the UC400)

For detailed information about wiring communication links, see Tracer SC Unit Controller Wiring Guide (BAS-SVNO3) listed in the section, “Other Resources,” p. 59.

Figure 21. Controller LEDs
LED Descriptions and Activities with Troubleshooting Tips

There are 15 LEDs on the front of the UC400 unit. The following table provides a description of LED activity, an indication or troubleshooting tip for each, and any relative notes. See Figure 21, p. 34, for locations of these LEDs and to “Addressing and Discovering XM Expansion Modules,” p. 43 for a description of the XM30 LED activities.

Table 4. LED Activities and Troubleshooting Tips

<table>
<thead>
<tr>
<th>LED Name</th>
<th>Activities</th>
<th>Indication and Troubleshooting Tips</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marquee LED</td>
<td>Shows solid green when the unit is powered and no alarm exists</td>
<td>Indicates normal operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shows blinking green during a device reset or firmware download</td>
<td>Indicates normal operation</td>
<td></td>
</tr>
</tbody>
</table>
|                   | Shows solid red when the unit is powered, but represents low power or a malfunction | • If low power: could be under voltage or the microprocessor has malfunction. Follow the troubleshoot procedure “24 Vac Measurement,” p. 52 to measure for the expected value range. In addition, see Table 3, p. 25, for a list of 24 Vac draws.  
|                   |                                                                           | • If malfunction: un-power and then re-power unit to bring the unit back up to normal operation.   | When powering the UC400 and expansion module, the Marquee LED will blink RED, blink GREEN (indicating activated and controller/expansion module are communicating), and then stay GREEN CONTINUOUSLY (indicating normal power operation). |
|                   | Shows blinking red when an alarm or fault exists                           | An alarm or fault condition will occur if the value for a given point is invalid or outside the configured limits for the point. Alarm and fault conditions vary, and they can be configured by the programmer. |                                                                       |
|                   | LED not lit                                                               | Indicates power is OFF or there is a malfunction                                                   |                                                                       |
|                   |                                                                            | • OFF or malfunction: cycle the power and see Table 3, p. 25.                                     |                                                                       |
| Link and IMC      | TX blinks green                                                            | Blinks at the data transfer rate when the unit transfers data to other devices on the link         | TX LED: Regardless of connectivity or not, this LED will constantly blink as it continually looks for devices to communicate to. |
|                   | RX blinks yellow                                                           | Blinks at the data transfer rate when the unit receives data from other devices on the link       | LED not lit: Determine if, for example, a Tracer SC or BACnet device is trying to talk to the controller or if it is capable of talking to the controller. Also determine if the communication status shows down all of the time. In addition, check polarity and baud rate. |
|                   | LED is not lit                                                             | Indicates that the controller is not detecting communication                                       | See "Ground Measurements," p. 58 for a check-out procedure.           |
|                   |                                                                            | • Not lit: cycle the power to reestablish communication                                            |                                                                       |
| Service           | Shows solid green when the LED has been pressed                             |                                                                                                      | When the UC400 is placed into boot mode, the system will not run any applications such as trending, scheduling, and TGP2 runtime. The controller will be placed into boot mode if the service pin is held in when power is applied. In boot mode, the controller is non-operational and is waiting for a new main application to be downloaded. |
|                   | LED not lit                                                               | Indicates controller is operating normally                                                          |                                                                       |
### Table 4. LED Activities and Troubleshooting Tips (continued)

<table>
<thead>
<tr>
<th>LED Name</th>
<th>Activities</th>
<th>Indication and Troubleshooting Tips</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binary B01 through B09</td>
<td>Shows solid yellow</td>
<td>Indicates a corresponding binary output has been <strong>commanded ON</strong></td>
<td>If the user is currently powering the UC400 from a USB port, the Led lights will turn <strong>ON</strong>. However, the binary outputs <strong>will not</strong> be activated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Relay coil</strong>; indicates that a command has been made to energize</td>
<td><strong>Commanded ON</strong>: As an example of commanded ON, a command could be a manual command such as an override or a command could be from TGP2 based on a list of conditions that are met telling these outputs to turn ON.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>TRIAC</strong>; indicates that a command has been made to turn <strong>ON</strong></td>
<td>LED not lit: Did the user command it to be <strong>ON</strong>? If yes, see the Marquee LED at the top of this table. In addition, see “24 Vac Measurement,” p. 52 and “Ground Measurements,” p. 58 for check-out procedures.</td>
</tr>
<tr>
<td></td>
<td>LED not lit</td>
<td>Indicates that a relay output is de-energized or no power to the board</td>
<td><strong>Not lit</strong>: cycle power to reestablish communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Not lit</strong>; cycle power to reestablish communication</td>
<td></td>
</tr>
</tbody>
</table>
Maintenance

Maintaining the UC400 is done by means of the Tracer TU service tool. TU is a set of tools that allows you to create and edit objects, configure equipment, chart data, customize TGP2 programs, and create and edit custom graphics. These functions are performed using the Device Navigation Tree and the TU Utility tab. For more detailed information about any of these functions and the TU service tool, see “Other Resources,” p. 59.

Important: Because the UC400 is a self-serviceable unit, this device is not intended to be disassembled by the user for maintenance.

This section will describe the basics of:
- Starting a session of TU and direct connection
- Connecting using Ethernet or LAN
- Checking and Transferring Application Code Firmware
- Configuring the UC400 and addressing and discovering the XM30
- Creating and editing points for the UC400
- Monitoring and viewing the status of the UC400
- Backup and restore

Starting a Session of TU and Direct Connection

If the TU service tool is not installed, see the Tracer TU Service Tool Getting Started Guide (TTU-SVN01). This document will provide information about features, capabilities, and requirements of TU.

To start a TU session:
1. Connect the USB cable directly from the laptop to the UC400 or to a panel USB port connected to the controller.

Important: If using a PC with multiple USB ports, it is conceivable to connect using the same process outlined below for the same piece of equipment. This is normal operation. Observe existing USB standards for cable length. (For more information go to informational Web sites, such as http://www.USB.org.)

When connecting to the controller for the first time, the Found New Hardware Wizard appears.

Figure 22. Found New Hardware Wizard screen
2. Select **No, not this time** when asked to connect to Windows Update and then click **Next**.
   Verify that UC400 appears on the next dialog box.

3. If the UC400 appears, select **Install the software automatically (Recommended)** and then click **Next**.
   If the UC400 does not appear, repeat the Tracer TU installation.

4. Click **Continue Anyway** if a warning message dialog box appears stating that the software has not passed Windows Logo testing.

5. Click **Finish** on the final dialog box to complete the installation.

   **Note:** If encountering an error condition or message during this installation procedure or during the subsequent connection steps, see “Tracer TU Installation and Connection Error Conditions,” p. 40 below for corrective actions.

6. Click either the **Tracer TU** desktop icon or the **Tracer TU** program item in the Tracer TU group on the **Start** menu.
   The Tracer TU splash screen appears briefly followed by the **Connect** dialog box.

7. Select the **Direct Connection (Via USB cable)** radio button if it is not already selected.

8. Click the **Connect** button and the **Unit Summary** page will appear after successful connection.

**Connecting Using Ethernet or LAN**

The following instructions describe a direct connection using an Ethernet cable (Tracer SC only) or an indirect connection using an IP address over a local area network (LAN) on which the Tracer SC resides. (See **Tracer SC System Controller Installation and Setup** [BAS-SVX31])

Using an Ethernet cable or a LAN connection requires creating a **facility** using the **Add/Edit Facility Connection Details** dialog box that is accessed from the **Connect** dialog box. To create a facility, you must know the IP address assigned to the Tracer SC or the parent Tracer SC of the UC400.

To connect to a controller using an Ethernet cable or LAN connection:

1. Click either the **Tracer TU** desktop icon or the **Tracer TU** program item in the Tracer TU group on the **Start** menu. The Tracer TU splash screen appears briefly followed by the **Connect** dialog box.
2. Click **Facility Setup** and the **Add/Edit Facility Connection Information** dialog box appears.

3. Click **Add** and the **Add/Edit Facility Connection Details** dialog box appears.

4. Enter the name and IP address of the Tracer SC to access and then click **Save**. Each created facility is saved and can then be selected from the **Connect To** drop-down list.

5. Select the **Connect To** option on the Connect dialog box and then select the new entry on the **Connect To** drop-down list.

**Figure 24. Add/Edit Facility Connection Details dialog box**

**Figure 25. Connect dialog box**
6. Click **Connect** and the **Unit Summary** screen appears.

**Figure 26. The Unit Summary screen**

### Tracer TU Installation and Connection Error Conditions

During installation or initial connection to a UC400, you may encounter an error message or error condition. The messages with corrective actions are listed in the following table.

**Table 5.**

<table>
<thead>
<tr>
<th>Error Message/Condition</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does not recognize USB hardware</td>
<td>Respond as follows:</td>
</tr>
<tr>
<td></td>
<td>Install correct USB drivers using <strong>Tracer TU Setup.exe</strong>.</td>
</tr>
<tr>
<td></td>
<td>If you receive this message and have the correct USB drivers installed, wait for the UC400 to completely boot before attaching the USB cable.</td>
</tr>
<tr>
<td>Tracer TU does not respond, or the screen is blank</td>
<td>The phrase <strong>Connected Local USB</strong> should appear in the lower left hand corner of the Tracer TU screen. If it does not, the connection has been lost. Restart Tracer TU by clicking the Connection icon in the upper left of the Tracer TU window.</td>
</tr>
<tr>
<td>Found New Hardware (Popup message)</td>
<td>Open the <strong>Found New Hardware Wizard</strong> and verify that UC400 is displayed after &quot;This wizard helps you to install software for“. Respond as follows: If this text is displayed, then select, <strong>Install the software automatically (Recommended)</strong>. If this text does not appear, run the Tracer TU installation file, <strong>Tracer TU Setup.exe</strong>.</td>
</tr>
<tr>
<td>No application code present</td>
<td>Open the File Transfer Utility in the Tracer TU service tool to transfer the UC400 firmware. (See &quot;Checking and Transferring Application Code Firmware,&quot; p. 40.)</td>
</tr>
</tbody>
</table>

### Checking and Transferring Application Code Firmware

All UC400 controllers ship without application code. Before configuring the UC400, check for the controller application code using the Tracer™ TU service tool, as follows:

1. Start the Tracer TU service tool to establish a connection with the UC400. If no application code is present, the following message appears. Click **OK**.
2. Open the Transfer Files Wizard by clicking located at the top left side of the screen.

3. Click Next. Verify that the selected device name is “UC400 Hardware.” Click Next.

4. Click the Browse button. Select and open the Firmware folder. Select and open the UC400 folder. Select the most current application code file. Click Open to select the file for transfer.
5. Verify that the correct application code file appears in the File column. Click **Start Transfer**.

When the transfer is complete, the following screen appears.

**Configuring the UC400 and Creating or Editing Points**

**Configuring the UC400**

Configuring the UC400 is performed by means of the TU Controller Settings Utility. Use this utility to configure date and time, units of measure, and protocol. To configure the UC400:

1. Select the **Controller Settings Utility** tab from the vertical tab set located on the right side of the TU window.

   **Note:** The content of this screen is based on the type of controller that is connected and the system protocol used to communicate with the controller.

2. Click **Date and Time** to set the preferred date and time formats and then click **Send to Device**.

   **Note:** The actual dates and times are not saved during power loss.

3. Click **Protocol** to display the baud rate and device ID setting.

4. Specify the **Baud Rate** (default is 76800 for Trane BACnet devices), then click **Send to Device** for the changes to take effect.

   **Note:** The baud rate must be the same for all devices on an MS/TP link. Set the baud rate to match the slowest device on the link.

5. Click **Protocol** again to display its contents.
To change an existing Software Device ID:

a. Select **Software Device ID**
b. Enter a new ID.
c. Click **Send to Device**.

If a Software Device ID is present and it needs to be returned to the rotary dial:

a. Set Device ID.
b. Delete the Software Device ID.
c. Uncheck **Use Software Device ID**.
d. Click **Send to Device**.

6. Click **Expansion Modules** to see the address and type of expansion modules connected to the UC400.

   **Note:** Default settings are shown in gray, and they do not indicate that a module has been installed. See “Addressing and Discovering XM Expansion Modules,” p. 43.

7. Click **Controller Units** and set the preferred units of measure to **SI**, **IP**, or **Custom**, and then click **Send to Device**.

   **Note:** The controller units must be consistent for all devices on a BACnet MS/TP link.

   If you select Custom, the scrolling list to the right becomes active. You can select preferred options for the various units of measurement (Temperature, Pressure Gaseous, and so on).

### Addressing and Discovering XM Expansion Modules

The following steps explain how to connect and discover expansion modules with the UC400 controller using the Tracer TU service tool:

1. Disconnect the power from the UC400.
2. Set the two rotary dials on the front of the expansion module to 01 through 08 as shown in Figure 28, depending on the number of installed expansion modules.

   **Figure 28. Setting rotary dials**

   Use a 1/8 inch flathead screwdriver to set rotary dials. Dial rotates either direction.

   **Note:** Valid addresses are 01 to 99.

3. Connect the expansion modules and the UC400 using either the provided IMC cable harness or by running wire to the IMC/24 Vdc screw terminal connectors. If remotely connecting the expansion modules, the power supply must be locally grounded.

4. Power up the UC400 and the expansion modules. The transmitting (TX) and receiving (RX) LEDs blink when communication occurs between the devices. Note the following LED behaviors on the front of the expansion modules:

   - **Marquee LED:**
     - **Green:** if powered, application running, no faults or alarms.
     - **Solid red:** low power or malfunction or no application, processor not running.
     - **Sequencing when powered:** red and then to green.
   
   - **Service LED:**
• **Green:** when pressed and remains on.
• **Not lit:** normal operation.
• **Sequence when powered:** one short green blink on power up during memory test and will stay green if memory test fails. When service is selected, a module will continue using its normal node number for communication. However, it will communicate as node 0 if given the chance, but this does not affect operation.

• **Immediately following discovery by the UC400:** off.

5. Connect to the UC400 using the Tracer TU service tool.

6. On the right-hand side of the TU screen, click on the **Controller Settings Utility** and then select the **Controller Settings** tab.

7. Open the **Expansion Modules** group box and check the boxes corresponding to each expansion module that will be installed.

8. Select the expansion module type.

9. In the **Address** field, type in the rotary address for each expansion module to match the rotary dials set in Step #2.

10. Click the **Discover Modules** button. This action will reset the XM30 and its transmitting/receiving (TX/RX) LEDs will blink when communication occurs between the devices. Tracer TU displays **Device Discovery Complete** when the discovery process is complete. The additional expansion module points are now available for configuration with Tracer TU.

   **Note:** Expansion module points can be made available for programming, prior to installing the devices by following Step 7 through Step 10 above. When the actual expansion modules are connected to the UC400, the power must be cycled in order for the UC400 to read the rotary address settings of the expansion modules.

### Creating or Editing Points

You create, edit, and delete points in Tracer TU using the Controller Settings Utility.

**Figure 29. Analog points list and the Analog Input Properties dialog box**

You can access the Point Configuration Properties dialog boxes from the Controller Settings Utilities point list screens.

**Important:** When configuring points for the UC400, it is important to note that points are not pre-configured on the controller board. Instead, the board has a certain amount of...
memory set aside as you create a point. See Table 6, p. 45 below for the maximum point creation.

To create a point
1. Select the Controller Settings Utility tab from the vertical tab set located on the right side of the TU window.
2. Select either the Analog, Binary, or Multistate screen tab.
3. Click the Create New button in the Input, Output, or Value expanding boxes, depending on the type of point you wish to create.
4. On the Point Configuration tab, enter a meaningful name in the Name field.
5. Click the Reference Selection icon on the drop-down list in the Reference group box to display the Reference Selection dialog box. Select the appropriate hardware reference for the point.
   
   Note: If the hardware reference has already been used, a message will appear, indicating that the reference is not available.

   If an expansion module has been added, the additional points will be available on the selection tree.
6. Make the selections required to define the point, such as type update interval, dimensionality and minimum/maximum values.
7. Continue to enter required or optional settings on the Alarm Configuration tab and on the Datalog tab.
   (Click the Help button for more information about the controls on these two tabs, the Reference Selection dialog box, and referencing concepts.)
8. Click OK when you are finished.
9. Click Save to File to save the new point configuration to your hard drive or click Send to Device to send the new point configuration to the controller.

To edit a point
1. Go the Controller Settings Utility tab and select either the Analog, Binary, or Multistate tab screen.
2. Select an existing point from the Input, Output, or Multistate group boxes.
3. Choose an action to perform from the Actions drop-down list, which calls up the appropriate Point Configuration Properties dialog box.
4. Enter your changes on the Point Configuration Properties dialog box.
   (Click the Help button if you need guidance.)
5. Click Save to File or Save to Device to save the change.
   
   Note: See Table 6 to see the maximum number of points for each type that can exist in a UC400 configuration.

Table 6. Maximum Number of Points by Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog Input</td>
<td>16</td>
</tr>
<tr>
<td>Analog Output</td>
<td>8</td>
</tr>
<tr>
<td>Analog Values</td>
<td>104</td>
</tr>
<tr>
<td>Binary Inputs</td>
<td>16</td>
</tr>
<tr>
<td>Binary Output</td>
<td>16</td>
</tr>
<tr>
<td>Binary Value</td>
<td>48</td>
</tr>
</tbody>
</table>
You can also create points using the Points Summary feature in the TGP2 Editor, which you can access by clicking the TGP2 Editor icon in Tracer TU software. The TGP2 Editor permits you to create and modify TGP2 programs that run on the UC400. For more information about TGP2 programming or the TGP2 editor, see the electronic help within the TGP2 Editor and the TGP2 Applications Guide (BAS-APG008-EN).

**Monitoring and Viewing Point, Alarm, and Controller Status**

Use the Status Utility tab to monitor and view the details of UC400 points, alarms, and controller status.

To monitor and view details:

1. Select the **Status Utility** tab from the vertical tab set located on the right side of the Tracer TU window. Member tabs appear across the top of the Tracer TU screen for the inputs, outputs, and multistates.

2. Select the **Analog**, **Binary**, or **Multistate** member tab to view its lists of input, output, and value points.

---

**Table 6. Maximum Number of Points by Type**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multistate Inputs</td>
<td>8</td>
</tr>
<tr>
<td>Multistate Output</td>
<td>8</td>
</tr>
<tr>
<td>Multistate Values</td>
<td>16</td>
</tr>
</tbody>
</table>
3. Select the Alarm tab screen to view up to 100 alarms. Alarms automatically reset when their condition returns to normal. However, some alarms may need to be acknowledged at the parent Tracer SC level if indicated in the Acknowledgement column of the table.

Out-of-Service

Inputs/Outputs

The out-of-service mode disconnects the point from its reference. With inputs, the point no longer gets the value from its reference, but you can write to an input. With outputs, the point no longer pushes its value to its reference. In addition, you can change the value of the point without affecting the value of reference. However, this still requires the use of the priority table.

Values

Value objects will not accept a written value from on-box applications, such as TGP2 or an area when out of service. An off-box application, such as Tracer TU or Tracer SC, allows you to write to a value object. However, this still requires the use of the priority table.

Existing points can be placed in or out of service by clicking the Control icon corresponding to the point on the Analog, Binary, or Multistate tab screens on Status Utility.

Figure 30. Placing a point out of service

Overrides

You can override Output and Value points by clicking on the control icon on the Analog, Binary, and Multistate tab screens in the Status Utility. For example, to override a point:

1. Click the Status Utility tab ( ). A row of member tabs appears.
2. Click the Analog, Binary, or Multistate tab.
3. Click the icon in the row of the point you want to override. The Override Request dialog box appears.
4. Select Override. The Control Settings are activated.
5. Select a new value and priority level.
6. Select Duration Limit and specify a duration in hh:mm:ss format.
7. Click Save.
Backup

The files that are stored after a backup is complete are the TGP2 files, application code, the point configuration (.xml) file, setup files, and BACnet identification files. In addition, the data log configuration is stored in the backup file, but data is not. The user must chart and save the data to the hard drive.

To back up files from the controller:

1. Click the **Backup Wizard** icon in the upper left-hand corner of the Tracer TU window. The **Welcome to the Backup Wizard** appears.
2. Click **Next** and the **Choose From Available Devices** dialog box appears. Select the controller for the files that are to be backed up.
3. Click **Next** and the **Backup File Name and Destination** dialog box appears.
4. Click the **Browse** button and navigate to the directory where the backup file will be saved.
5. Click **Start Backup** and a dialog box with a progress meter appears. When the backup process is complete, a message appears stating, *The backup is now complete. 0 errors were found.*
6. Click **Close** and the click **Yes**.

Restore

You can restore backup files to a controller if the controller becomes corrupt or must be replaced.

To restore files to a controller:

1. Click the **File Transfer Utility** icon in the upper left-hand corner of the Tracer TU window. The **Welcome to the Transfer Files Wizard** appears.
2. Click **Next** and the **Choose From Available Devices** dialog box appears. Select the controller for the file that is to be restored.
3. Click **Next** and click **Browse** button and navigate to the directory to locate the file to restore.
4. Select the last backup file on the **Choose the Files Affected** dialog box. The **Start Transfer** button becomes active.
5. Click **Start Transfer** to download the backup file to the controller.

*Note:* You must verify that the device ID and baud rate are correct after restoring a controller using a backup file that was created with a different controller.

Configure the UC400 Controller as a VAV or Blower Coil Controller

You can configure the UC400 controller as a VAV or blower coil controller:

1. Go the **Configuration** tab and select **Equipment Selection**. If the controller is currently configured as a field programmable controller, the selection under equipment will be **Custom Programmed**.
2. Change the selection under Equipment to **VAV** or **Blower Coil**. The **Application Selection** and **Equipment Options** categories will appear below **Equipment Selection**.
3. Select the appropriate profile under **Application Selection**. If you change it from its previous selection, a **Revert** button appears, which permits you to undo your changes before you save them.
4. Select the appropriate settings under **Equipment Options**. The available choices varies depending upon your selection under **Application Selection**.
5. Click **Save** when finished.
Commissioning and Troubleshooting in Powered State

This section provides illustrations and methods of how to check the UC400 points after making connection and applying power (indicated in each illustration by the terminal connector and UC400 label). The step numbers or method numbers in each illustration correspond to the information in each table. (See Table 2, p. 6 for a list of device connections.)

To test inputs/outputs requires the following equipment:

- Digital multimeter (DMM)
- Small flat-tip screwdriver

**Note:** The Out of Service and Override features in Tracer TU can be used to simulate operation for testing the input/output interaction. By placing a point out of service or overriding at the priority required for control, the user can enter a value for the point sufficient to trigger a reaction at the output based on the TGP2 logic controlling the output.

Voltage Inputs

![Diagram of Voltage Inputs](image)

**Table 1.**

<table>
<thead>
<tr>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Measure AC voltage across the voltage termination</td>
<td>Vac = 0.0 V</td>
</tr>
<tr>
<td>Step 2</td>
<td>Measure DC voltage across the voltage termination</td>
<td>AC voltage will affect further measurement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Compare to input status in Tracer TU</td>
</tr>
</tbody>
</table>
### Resistive Inputs

#### Checkout Procedure

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Measure AC voltage across the resistive termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2</td>
<td>Measure DC voltage across the resistive termination</td>
</tr>
</tbody>
</table>

**Expected Value**

- AC voltage will affect further measurement
- See the charts below

---

**Measured Voltage Across a Thermistor Input**

**Measured Voltage Across a Thermistor Input**

**Measured Voltage Across a Resistive Input**

Charts showing measurements across thermistor input (Fahrenheit and Celsius) and resistive input.
Current Inputs- Methods 1 or 2

Table 2.

<table>
<thead>
<tr>
<th>General Information</th>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1 takes advantage of the very low input resistance of a DMM in current mode.</td>
<td>Step 1</td>
<td>Measure AC voltage across the current input</td>
<td>Vac = 0.0 V AC voltage will affect further measurement</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>Measure DC voltage across the current input</td>
<td>Vdc = 0.0 V</td>
</tr>
<tr>
<td></td>
<td>Step 3</td>
<td>Measure DC current across the current input</td>
<td>Compare to input status in Tracer TU</td>
</tr>
</tbody>
</table>

Table 3.

<table>
<thead>
<tr>
<th>General Information</th>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 2 interferes less in regards to the system. In voltage mode, the DMM affects the circuit less. Additional information is needed to translate the voltage measured to current flowing through the circuit.</td>
<td>Step 1</td>
<td>Measure AC voltage across the voltage input</td>
<td>Vac = 0.0 V AC voltage will affect further measurement</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>Measure DC voltage across the voltage termination</td>
<td>See the chart below</td>
</tr>
</tbody>
</table>
24 Vac Measurement

Checking the voltage that is powering the UC400 is often a necessary step when commissioning or troubleshooting. Operational issues and LED operation may result in a need to measure the input power.

When troubleshooting, it is faster to take measurements while the load is in place. If Step 1 indicates an out-of-specification voltage, disconnect the UC400 and measure the AC voltage across the transformer. These measurements can direct the technician towards the problem source.

Table 4.

<table>
<thead>
<tr>
<th>General Information</th>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checking the voltage that is powering the UC400 is often a necessary step when commissioning or troubleshooting. Operational issues and LED operation may result in a need to measure the input power. If Step 1 indicates an out-of-specification voltage, disconnect the UC400 and measure the AC voltage across the transformer. These measurements can direct the technician towards the problem source.</td>
<td>Step 1</td>
<td>Measure AC voltage with the UC400 connected. Perform this measurement while the unit is under load.</td>
<td>20.0 Vac ≤ V&lt;sub&gt;ac&lt;/sub&gt; ≤ 30.0 Vac</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>Measure AC voltage with the UC400 unconnected. Perform this measurement while the unit is not under load.</td>
<td>20.0 Vac ≤ V&lt;sub&gt;ac&lt;/sub&gt; ≤ 30.0 Vac</td>
</tr>
</tbody>
</table>
Binary Inputs, 24 Vac Detect- Methods 1 or 2

Table 5.

<table>
<thead>
<tr>
<th>General Information and Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Method 1:</em> Voltage across binary input measured without reference to chassis ground.</td>
<td>Measure AC voltage across the binary input</td>
<td>Vac ≈ 0.0 V (state = ON)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vac ≈ 24.0 V (state = OFF)</td>
</tr>
<tr>
<td><em>Method 2:</em> Voltage across binary input measured with reference to chassis ground. Any connection with chassis ground symbol can serve as a ground reference for this method.</td>
<td>Measure DC voltage across the binary input</td>
<td>Vac ≈ 0.0 V (state = OFF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vac ≈ 24.0 V (state = ON)</td>
</tr>
</tbody>
</table>

Binary Inputs- Based on Analog Output Connection

Table 6.

<table>
<thead>
<tr>
<th>General Information</th>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The UC400 analog output connections can be configured as binary inputs. This can be used only with dry contact or open collector-type sensors.</td>
<td>Step 1</td>
<td>Measure AC voltage across the binary input</td>
<td>Vac ≈ 0.0 V&lt;br&gt;AC voltage will affect further measurement</td>
</tr>
<tr>
<td></td>
<td>Step 2</td>
<td>Measure DC voltage across the binary input</td>
<td>Vdc ≤ 2.0 V (state = ON)&lt;br&gt;Vfc ≥ 2.0 V (state = OFF)</td>
</tr>
</tbody>
</table>
Open-collector Based Binary Sensors

Open-collector based binary sensors use a bipolar junction transistor (BJT; a three-terminal device in which emitter-to-collector current is controlled by base current) as the switching device in place of a relay. The term, open collector, refers to the collector connection on the transistor itself. Open-collector circuits are used for their low fatigue rate and quick response relative to relay-based outputs.

The circuit within the pulse meter is completed when adding a pull-up resistance and reference voltage. On the UC400, both universal input (UI) and analog output (AO) circuits add the necessary resistance and voltage without external parts.

**Note:** The reference voltage must always be DC.

The voltage across the pulse meter terminals will bounce between $V_{\text{sat}}$ (saturation voltage) of the transistor in the pulse meter and the $V_{\text{ref}}$ (reference voltage) provided by the UI or AO circuits of the UC400. Most bipolar transistors have a $V_{\text{sat}}$ of less than 0.2 Vdc.

The DMM sampling rate may be too slow to measure pulse meter output transitions.

**Note:** Check the specifications of the DMM being used. It may be necessary to use an oscilloscope to measure the transition voltages.

---

**Table 7.**

<table>
<thead>
<tr>
<th>Measurement Procedure</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure DC voltage across the binary input</td>
<td>$V_{\text{dc}} \leq 0.2$ V (BJT = ON)</td>
</tr>
<tr>
<td></td>
<td>UI: $V_{\text{dc}} \approx 3.3$ V (BJT = OFF)</td>
</tr>
<tr>
<td></td>
<td>AO: $V_{\text{dc}} \approx 22.0$ V (BJT = ON)</td>
</tr>
</tbody>
</table>
### Voltage Analog Output

**Table 8.**

<table>
<thead>
<tr>
<th>Measurement Procedure</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure DC voltage across the voltage termination</td>
<td>Compare to the expected value based on request from controller. This request may be based on an override of the output value.</td>
</tr>
</tbody>
</table>

### Current Analog Output- Methods 1 or 2

**Table 9.**

<table>
<thead>
<tr>
<th>General Information and Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1: Shorting the current output- this method leaves the circuit intact, however, it will cause the vast majority of the current to flow through the meter instead of the load (<strong>NOTE LOAD RESISTANCE</strong>).</td>
<td>Measure DC current across the current termination</td>
<td>Compare expected value based on request from controller. This request may be based on an override of the output value.</td>
</tr>
<tr>
<td>Method 2: Measuring current directly- this method is most the typical way to measure current and has the advantage of leaving the load in the loop. However, the circuit must be broken when using this method.</td>
<td>Measure DC current across the current termination</td>
<td>Compare expected value based on request from controller. This request may be based on an override of the output value.</td>
</tr>
</tbody>
</table>
 Commissioning and Troubleshooting in Powered State

Binary Output, TRIAC High Side Switching- Methods 1 or 2

Table 10.

<table>
<thead>
<tr>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1</td>
<td>Measure AC current across the binary output</td>
<td>Vac = 0.0 V (TRIAC = OFF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vac ≥ 24.0 V (TRIAC = ON)</td>
</tr>
<tr>
<td>Method 2</td>
<td>Measure AC current across the binary input</td>
<td>Vac = 0.0 V (TRIAC = On)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vac ≥ 24.0 V (TRIAC = Off)</td>
</tr>
</tbody>
</table>
Binary Output, TRIAC Low Side Switching- Methods 1 or 2

Table 11.

<table>
<thead>
<tr>
<th>Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method 1</td>
<td>Measure AC current across the binary output</td>
<td>V_ag = 0.0 V (TRIAC = OFF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_ag ≥ 24.0 V (TRIAC = ON)</td>
</tr>
<tr>
<td>Method 2</td>
<td>Measure AC current across the binary input</td>
<td>V_ag = 0.0 V (TRIAC = On)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_ag ≥ 24.0 V (TRIAC = Off)</td>
</tr>
</tbody>
</table>
Commissioning and Troubleshooting in Powered State

Ground Measurements

Table 12.

<table>
<thead>
<tr>
<th>General Information and Checkout Procedure</th>
<th>Measurement</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method #1:</strong> AC voltage between shield conductors and device chassis ground- the voltage difference between BACnet MS/TP device chassis ground connections should be close to zero. If the voltage difference is greater than 4.0 Vac, there will be marginal communication or intermittent communication problems. If the voltage difference is greater than 7.0 Vac, some devices will no longer communicate.</td>
<td>Measure AC current across the current termination and confirm that only one end of the shield conductor is tied to the earth ground</td>
<td>Vac ≤ 2.0 V</td>
</tr>
<tr>
<td><strong>Method #2:</strong> AC voltage between earth ground and device chassis ground- the chassis ground of the UC400 needs to be connected to earth ground by some route.</td>
<td>Measure AC current across the current termination and confirm that only one end of the shield conductor is tied to the earth ground</td>
<td>Vac ≤ 4.0 V (Must comply with National Electric Code™ and local electrical code)</td>
</tr>
<tr>
<td><strong>Method #3:</strong> AC voltage between case (nominal chassis ground) and device chassis ground connector- in this illustration the connection appears as a short. However, it is possible that the chassis ground connection on the controller may actually be connected to the equipment metal some distance away. Use this measurement method if there are communication issues or input stability problems.</td>
<td>Measure AC voltage across the current termination. For this measurement, confirm that only one end of the shield conductor is tied to the earth ground.</td>
<td>Vac ≤ 4.0 V (Must comply with National Electric Code™ and local electrical code) Typically, this should be Vac ≤ 1.0 V</td>
</tr>
</tbody>
</table>
Other Resources

For more detailed information, see the following documentation:

- Tracer SC System Controller Installation and Setup (BAS-SVX31)
- Tracer SC Unit Controller Wiring Guide (BAS-SVN03)
- Tracer Graphics Editor Online Help
- Tracer Graphical Programming 2 (TGP2) Editor Online Help
- Tracer Graphical Programming (TGP2) Application Guide (BAS-APG008)
- Tracer TU Online Help
- Tracer TU Service Tool Getting Started Guide (TTU-SVN01)
- Tracer UC400 Enclosure Installation Sheet (X39641147-01)
- Tracer UC400 Programmable BACnet Controller (For Factory Installation on VAV) Installation, Operation, and Maintenance (VAV-SVX07)
- Tracer XM30 Expansion Module Installation Sheet (X39641148-01)
Appendix: Protocol Implementation Conformance Statement (PICS)

This section contains the Tracer UC400 BACnet Protocol Implementation Conformance Statement (PICS). The UC400 can be programmed with a variety of sequence of operations. All data used in the sequences are accessed through the BACnet protocol.

Standardized device profile (Annex L)

Table 12.

<table>
<thead>
<tr>
<th>Profile Description</th>
<th>Supported Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>BACnet Advanced Application Controller (B-AAC)</td>
<td>ü</td>
</tr>
<tr>
<td>BACnet Application Specific Controller (B-ASC)</td>
<td>ü</td>
</tr>
<tr>
<td>BACnet Building Controller (B-BC)</td>
<td>ü</td>
</tr>
<tr>
<td>BACnet Operator Workstation (B-OWS)</td>
<td>ü</td>
</tr>
<tr>
<td>BACnet Smart Actuator (B-SA)</td>
<td>ü</td>
</tr>
<tr>
<td>BACnet Smart Sensor (B-SS)</td>
<td>ü</td>
</tr>
</tbody>
</table>

Interoperability building blocks (Annex K)

Table 13.

<table>
<thead>
<tr>
<th>Data Sharing Description</th>
<th>Supported BIBB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Sharing-ReadProperty-A (DS-RP-A)</td>
<td>ü</td>
</tr>
<tr>
<td>Data Sharing-ReadProperty-B (DS-RP-B)</td>
<td>ü</td>
</tr>
<tr>
<td>Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)</td>
<td>ü</td>
</tr>
<tr>
<td>Data Sharing-WriteProperty-A (DS-WP-A)</td>
<td>ü</td>
</tr>
<tr>
<td>Data Sharing-WriteProperty-B (DS-WP-B)</td>
<td>ü</td>
</tr>
<tr>
<td>Data Sharing-WritePropertyMultiple-B (DS-WPM-B)</td>
<td>ü</td>
</tr>
</tbody>
</table>

Alarm and Event Management Description

| Alarm and Event-ACKI-B (AE-ACK-B)               | ü               |
| Alarm and Event-Alarm Summary-B (AE-ASUM-B)    | ü               |
| Alarm and Event-Enrollment Summary-B (AE-ESUM-B)| ü               |
| Alarm and Event-Information-B (AE-INFO-B)      | ü               |
| Alarm and Event-Notification Internal-B (AE-N-I-B)| ü             |

Trending Description

| Trending-Automated Trend Retrieval-B (T-ATR-B) | ü               |
| Trending-viewing and Modifying Trends Internal-B (T-VMT-I-B) | ü             |

Device Management Description

| Device Management-Backup and Restore-B (DM-BR-B)| ü               |
| Device Management-Device Communication Control-B (DM-DCC-B)| ü               |
| Device Management-Dynamic Device Binding-A (DM-DDB-A) | ü               |
| Device Management-Dynamic Device Binding-B (DM-DDB-B) | ü               |
| Device Management-Dynamic Object Binding-B (DM-DOB-B) | ü               |
| Device Management-List Manipulation-B (DM-LM-B) | ü               |
| Device Management-Object Creation and Deletion-B (DM-OCD-B) | ü               |
| Device Management-Private Transfer-A (DM-PT-A) | ü               |
### Table 13.

| Device Management-Private Transfer-B (DM-PT-B) | ü  |
| Device Management-Reinitialize Device-B (DM-RD-B) | ü  |
| Device Management-TimeSynchronization-B (DM-TS-B) | ü  |

### Segmentation capability

<table>
<thead>
<tr>
<th>Segmentation Description</th>
<th>Supported Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segmented Requests/ Window Size: 1</td>
<td>ü</td>
</tr>
<tr>
<td>Segmented Responses/ Window Size: 1</td>
<td>ü</td>
</tr>
</tbody>
</table>

### Object types

**Table 15. Descriptions and configurations**

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Required Properties Read</th>
<th>Properties Written(a)</th>
<th>Optional Properties Read</th>
<th>Ability to Create</th>
<th>Ability to Delete</th>
</tr>
</thead>
</table>
| Analog Input | • Object_Identifier  
• Object_Name  
• Object_Type  
• Present_Value  
• Status_Flags  
• Event_State  
• Out_Of_Service  
• Units | • Object_Name  
• Description  
• Out_Of_Service  
• Present_Value  
• Reliability  
• Min_Pres_Value  
• Max_Pres_Value  
• COV_Increment  
• Time_Delay  
• Notification_Class  
• High_Limit  
• Low_Limit  
• Deadband  
• Limit_Enable  
• Event_Enable  
• Notify_Type | • Description  
• Reliability  
• Min_Pres_Value  
• Max_Pres_Value  
• COV_Increment  
• Time_Delay  
• Notification_Class  
• High_Limit  
• Low_Limit  
• Deadband  
• Limit_Enable  
• Event_Enable  
• Acked_Transitions  
• Notify_Type  
• Event_Time_Stamps | Yes | Yes, only user created objects |

| Analog Output | • Object_Identifier  
• Object_Name  
• Object_Type  
• Present_Value  
• Status_Flags  
• Event_State  
• Out_Of_Service  
• Units  
• Priority_Array  
• Relinquish_Default | • Object_Name  
• Description  
• Out_Of_Service  
• Present_Value  
• Reliability  
• Min_Pres_Value  
• Max_Pres_Value  
• Relinquish_Default  
• COV_Increment  
• Time_Delay  
• Notification_Class  
• High_Limit  
• Low_Limit  
• Deadband  
• Limit_Enable  
• Event_Enable  
• Notify_Type | • Description  
• Reliability  
• Min_Pres_Value  
• Max_Pres_Value  
• COV_Increment  
• Time_Delay  
• Notification_Class  
• High_Limit  
• Low_Limit  
• Deadband  
• Limit_Enable  
• Event_Enable  
• Acked_Transitions  
• Notify_Type  
• Event_Time_Stamps | Yes | Yes, only user created objects |
### Table 15. Descriptions and configurations (continued)

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Required Properties Read</th>
<th>Properties Written(a)</th>
<th>Optional Properties Read</th>
<th>Ability to Create</th>
<th>Ability to Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog Value</strong></td>
<td>• Object_Identifier</td>
<td>• Object_Name</td>
<td>• Description</td>
<td>Yes</td>
<td>Yes, only user created objects</td>
</tr>
<tr>
<td></td>
<td>• Object_Name</td>
<td>• Description</td>
<td>• Priority_Array</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Object_Type</td>
<td>• Relinquish_Default</td>
<td>• Relinquish_Default</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Present_Value</td>
<td>• COV_Increment</td>
<td>• COV_Increment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Status_Flags</td>
<td>• Time_Delay</td>
<td>• Time_Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Event_State</td>
<td>• Notification_Class</td>
<td>• Notification_Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Out_Of_Service</td>
<td>• High_Limit</td>
<td>• High_Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Units</td>
<td>• Low_Limit</td>
<td>• Low_Limit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Deadband</td>
<td>• Deadband</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Limit_Enable</td>
<td>• Limit_Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Event_Enable</td>
<td>• Event_Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Notify_Type</td>
<td>• Notify_Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Binary Input</strong></td>
<td>• Object_Identifier</td>
<td>• Object_Name</td>
<td>• Change_Of_State_Time</td>
<td>Yes</td>
<td>Yes, only user created objects</td>
</tr>
<tr>
<td></td>
<td>• Object_Name</td>
<td>• Description</td>
<td>• Change_Of_State_Count</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Object_Type</td>
<td>• Inactive_Text</td>
<td>• Change_Of_State_Count</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Present_Value</td>
<td>• Active_Text</td>
<td>• Time_Of_State_Count_Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Status_Flags</td>
<td>• Present_Value</td>
<td>• Elapsed_Active_Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Event_State</td>
<td>• Reliability</td>
<td>• Time_Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Out_Of_Service</td>
<td>• Change_Of_State_Count</td>
<td>• Notification_Class</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Polarity</td>
<td>• Elapsed_Active_Time</td>
<td>• Alarm_Value</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Time_Delay</td>
<td>• Event_Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Notification_Class</td>
<td>• Aged_Transitions</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• High_Limit</td>
<td>• Notify_Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low_Limit</td>
<td>• Event_Time_Stamps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Deadband</td>
<td>• Relinquish_Default</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Limit_Enable</td>
<td>• Change_Of_State_Count</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Event_Enable</td>
<td>• Relinquish_Default</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Notify_Type</td>
<td>• COV_Increment</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Binary Output</strong></td>
<td>• Object_Identifier</td>
<td>• Object_Name</td>
<td>• Change_Of_State_Time</td>
<td>Yes</td>
<td>Yes, only user created objects</td>
</tr>
<tr>
<td></td>
<td>• Object_Name</td>
<td>• Description</td>
<td>• Change_Of_State_Count</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Object_Type</td>
<td>• Inactive_Text</td>
<td>• Change_Of_State_Count</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Present_Value</td>
<td>• Active_Text</td>
<td>• Time_Of_Count_Reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Status_Flags</td>
<td>• Present_Value</td>
<td>• Minimum_On_Time</td>
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<td></td>
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<tr>
<td></td>
<td>• Event_State</td>
<td>• Reliability</td>
<td>• Minimum_Off_Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Out_Of_Service</td>
<td>• Change_Of_State_Count</td>
<td>• Time_Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Polarity</td>
<td>• Elapsed_Active_Time</td>
<td>• Notification_Class</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>• Minimum_On_Time</td>
<td>• Feedback_Value</td>
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<td></td>
<td></td>
<td>• Time_Delay</td>
<td>• Event_Enable</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• notification_Class</td>
<td>• Aged_Transitions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High_Limit</td>
<td>• Notify_Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low_Limit</td>
<td>• Event_Time_Stamps</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Deadband</td>
<td>• Relinquish_Default</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Limit_Enable</td>
<td>• Change_Of_State_Count</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Event_Enable</td>
<td>• Relinquish_Default</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Notify_Type</td>
<td>• COV_Increment</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Event_Time_Stamps</td>
<td>• Feedback_Value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Table 15. Descriptions and configurations (continued)

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Required Properties Read</th>
<th>Properties Written&lt;sup&gt;(a)&lt;/sup&gt;</th>
<th>Optional Properties Read</th>
<th>Ability to Create</th>
<th>Ability to Delete</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Binary Value</strong></td>
<td>• Object_Identifier • Object_Name • Object_Type • Present_Value • Status_Flags • Event_State • Out_Of_Service • Polarity</td>
<td>• Object_Name • Description • Out_Of_Service • Inactive_Text • Active_Text • Present_Value • Reliability • Change_Of_State_Count • Elapsed_Active_Time • Minimum_On_Time • Minimum_Off_Time • Relinquish_Default • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type</td>
<td>• Description • Inactive_Text • Active_Text • Change_Of_State_Time • Change_Of_State_Count • Time_Of_State_Count_Reset • Elapsed_Active_Time • Time_Of_Active_Time_Reset • Priority_Array • Relinquish_Default • Minimum_On_Time • Minimum_Off_Time • Time_Delay • Notification_Class • Alarm_Value • Event_Enable • Acked_Transitions • Notify_Type • Event_Time_Stamps • Reliability</td>
<td>Yes</td>
<td>Yes, only user created objects</td>
</tr>
<tr>
<td><strong>Device</strong></td>
<td>• Object_Identifier • Object_Name • Object_Type • System_Status • Vendor_Name • Vendor_Identifier • Model_Name • Firmware_Revision • Application_Software_Version • Protocol_Version • Protocol_Revision • Protocol_Services_Supported • Protocol_Object_Types_Supported • Object_List • Max_APDU_Length_Accepted • Segmentation_Supported • APDU_Timeout • Number_Of_APDU_Retries • Device_Address_Binding • Database_Revision</td>
<td>• Object_Name • Description • APDU_Segment_Timeout • APDU_Timeout • Number_Of_APDU_Retrieves • Backup_Failure_Timeout</td>
<td>• Location • Description • Max_Segments_Accepted • APDU_Segment_Timeout • Max_Master • Max_Info_Frames • Local_Time • Local_Date • Configuration_Files • Last_Restore_Time • Backup_Failure_Timeout • Active_COV_Subscriptions</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td><strong>Event Enrollment Object</strong></td>
<td>• Object_Identifier • Object_Name • Object_Type • Event_Type • Notify_Type • Event_Parameters • Object_Property_Reference • Event_State • Event_Enable • Acked_Transitions • Notification_Class • Event_Time_Stamps</td>
<td>• Object_Name • Notify_Type • Event_Parameters • Object_Property_Reference • Event_Enable • Notification_Class</td>
<td>• None</td>
<td>Yes</td>
<td>Yes, only user created objects</td>
</tr>
</tbody>
</table>
## Table 15. Descriptions and configurations (continued)

<table>
<thead>
<tr>
<th>Object Type</th>
<th>Required Properties Read</th>
<th>Properties Written&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Optional Properties Read</th>
<th>Ability to Create</th>
<th>Ability to Delete</th>
</tr>
</thead>
</table>
| Multistate Input     | • Object_Identifier  
• Object_Name    
• Object_Type  
• Present_Value  
• Status_Flags  
• Event_State  
• Out_Of_Service  
• Number_Of_States | • Object_Name  
• Description  
• State_Text  
• Out_Of_Service  
• Present_Value  
• Reliability  
• Time_Delay  
• Notification_Class  
• Alarm_Values  
• Fault_Values  
• Event_Enable  
• Notify_Type | • State_Text  
• Reliability  
• Time_Delay  
• Notification_Class  
• Alarm_Values  
• Fault_Values  
• Event_Enable  
• Acked_Transitions  
• Notify_Type  
• Event_Time_Stamps | Yes               | Yes, only user created objects                                                                |
| Multistate Output    | • Object_Identifier  
• Object_Name    
• Object_Type  
• Present_Value  
• Status_Flags  
• Event_State  
• Out_Of_Service  
• Number_Of_States | • Object_Name  
• Description  
• State_Text  
• Out_Of_Service  
• Present_Value  
• Reliability  
• Time_Delay  
• Notification_Class  
• Alarm_Values  
• Fault_Values  
• Event_Enable  
• Notify_Type | • State_Text  
• Reliability  
• Relinquish_Default  
• Time_Delay  
• Notification_Class  
• Feedback_Values  
• Event_Enable  
• Acked_Transitions  
• Notify_Type  
• Event_Time_Stamps | Yes               | Yes, only user created objects                                                                |
| Multistate Value      | • Object_Identifier  
• Object_Name    
• Object_Type  
• Present_Value  
• Status_Flags  
• Event_State  
• Out_Of_Service  
• Number_Of_States | • Object_Name  
• Description  
• State_Text  
• Out_Of_Service  
• Present_Value  
• Reliability  
• Priority_Array  
• Relinquish_Default  
• Time_Delay  
• Notification_Class  
• Alarm_Values  
• Fault_Values  
• Event_Enable  
• Notify_Type | • State_Text  
• Reliability  
• Relinquish_Default  
• Time_Delay  
• Notification_Class  
• Feedback_Values  
• Event_Enable  
• Acked_Transitions  
• Notify_Type  
• Event_Time_Stamps | Yes               | Yes, only user created objects                                                                |
| Notification Class    | • Object_Identifier  
• Object_Name    
• Object_Type  
• Notification_Class  
• Priority  
• Ack_Required  
• Recipient_List | • Object_Name  
• Priority  
• Ack_Required  
• Recipient_List | None                                                                 | Yes               | Yes, only user created objects                                                    |
| Trend                | • Object_Identifier  
• Object_Name    
• Object_Type  
• Log_Enable  
• Stop_When_Full  
• Buffer_Size  
• Log_Buffer  
• Record_Count  
• Total_Record_Count  
• Event_State | • Object_Name  
• Log_Enable  
• Start_Time  
• Stop_Time  
• Log_DeviceObjectProperty  
• Log_INTERVAL  
• Stop_When_Full  
• Buffer_Size  
• Log_Buffer  
• Record_Count  
• Notification_Threshold  
• Notification_Class  
• Event_Enable  
• Notify_Type | • Start_Time  
• Stop_Time  
• Log_DeviceObjectProperty  
• Log_INTERVAL  
• Stop_When_Full  
• Buffer_Size  
• Notification_Threshold  
• Records_Since_Notification  
• Last_Notify_Record  
• Notification_Class  
• Event_Enable  
• Acked_Transitions  
• Event_Time_Stamps | Yes               | Yes, only user created objects                                                                |

<sup>a</sup> Denotes the properties that are listed as required in the PICS.
Appendix: Protocol Implementation Conformance Statement (PICS)

(a) Properties written for Present_Value and Reliability only if Out_of_Service is TRUE.

**BACnet protocol**

**Data link layer options**

<table>
<thead>
<tr>
<th>Data Link Layer Description</th>
<th>Supported Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANSI/ATA 878.1, 2.5 Mb ARCNET (Clause 8)</td>
<td></td>
</tr>
<tr>
<td>ANSI/ATA 878.1, RS-485 ARCNET (Clause 8), Baud Rate(s)</td>
<td></td>
</tr>
<tr>
<td>BACnet IP, (Annex J)</td>
<td></td>
</tr>
<tr>
<td>BACnet IP, (Annex J), Foreign Device</td>
<td></td>
</tr>
<tr>
<td>ISO 8802-3, Ethernet (Clause 7)(10Base2, 10Base5, 10BaseT, Fiber)</td>
<td></td>
</tr>
<tr>
<td>LonTalk, (Clause 11), Medium</td>
<td></td>
</tr>
<tr>
<td>MS/TP Master (Clause 9), Baud Rate(s): 9600, 19200, 38400, 76800, and 115200 @1.5% Nominal Baud Rate</td>
<td>✔️</td>
</tr>
<tr>
<td>MS/TP Slave (Clause 9), Baud Rate(s)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Point-to-Point, EIA 232 (Clause 10), Baud Rate(s): 9600, 19200, 38400</td>
<td></td>
</tr>
<tr>
<td>Point-to-Point, Modem (Clause 10), Baud Rate(s): 9600, 19200, 38400</td>
<td></td>
</tr>
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**Device address binding**

<table>
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**Character sets**

Indicates support for multiple character sets, but does not imply that all character sets are supported simultaneously. Maximum supported string length is 64 bytes (any character set).

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Declaration of CE Conformity

Manufacturer name: Trane
Manufacturer address: 3600 Pammel Creek Road
LaCrosse, WI 54601
USA

The manufacturer hereby declares that the product:

Product name: Tracer™ UC400 Unit Controller
Model numbers: UC400

Conforms to the following standards or other normative documents:

Electromagnetic Emission:
- EN61326-1:2006
  - Class B Limit (30 MHz—1000 MHz, 1 GHz—2 GHz)
  - 150 kHz—30 MHz

Electromagnetic Immunity for Industrial:
- EN61326-1:2006
  - 8 kV air, 4 kV contact
  - 10 V/m, 80 MHz—1000 MHz
  - 3 V/m, 1.4 GHz—2.0 GHz
  - 1 V/m, 200 GHz—2.7 GHz
- EN61000-4-4: 2004 Fast Transients
  - AC input ports (L/L), differential mode, 1 kV
  - 3 V, 0.15 MHz—80 MHz
  - 30 A/m, 50 Hz
- EN61000-4-8: 1993+A1:2001 Power Frequency Magnetic Field
  - 0% Vnom, 1 cycle; 70% Vnom, 25 cycle; 40% Vnom, 10 cycle; 0% Vnom, 250 cycle
- EN61000-4-11: Second Edition: 2004 Voltage Dips and Interruptions

Where and When Issued:
- Electromagnetic Emission: 09/03/2008
- Electromagnetic Immunity: 02/19/2009

Mark of Compliance:

This document validates CE conformity of the Tracer UC400 Unit Controller.
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