Installation Instructions

Tracer™ UC400 Programmable Controller

Order Number: BMUC400AAA0100011 (PN: X13651492)

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The Tracer UC400 controller is a multi-purpose, programmable, wireless-compatible device. This field- or factory-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 (WSHPs)
- Small air handlers

Packaged Contents

- One UC400 programmable controller
- One bag of terminal connectors
- DIN rail

Important: *Visually inspect contents for obvious defects or damage. All components have been thoroughly inspected before leaving the factory. Any claims for damage incurred during shipment should be filed immediately with the carrier.*

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Required Tools for Mounting and Wiring

A 1/8 inch, flat-bladed screwdriver is required to perform functions such as setting rotary addressing switches, tightening or loosening screw terminals, and removing or repositioning the controller on DIN rail.

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 may also be used to alert against unsafe practices.
***NOTICE*:** Indicates a situation that could result in equipment or property-damage only accidents.

Storage and Operating Specifications

Storage	
Temperature:	-48°F to 203°F (-44°C to 95°C)
Relative humidity:	Between 5% to 95% (noncondensing)
Operating	
Temperature:	-40°F to 158°F (-40°C to 70°C)
Humidity:	Between 5% to 95% (noncondensing)
Power:	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)
Mounting weight of controller:	Mounting surface must support 0.80 lb. (0.364 kg)
Environmental rating (enclosure):	NEMA 1
Altitude:	9,842 ft (3,000 m)
Installation:	UL 840:Category 3
Pollution:	UL 840:Degree 2

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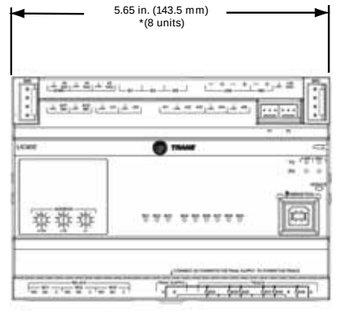
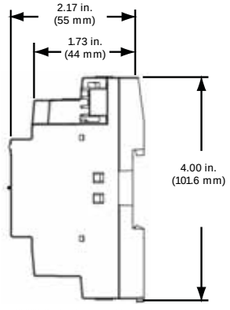
Dimensions and Mounting/Removing the UC400 Controller

Front View



End View



*DIN Standard 43 880, Built-in Equipment for Electrical Installations, Overall Dimensions, and Related Mounting Dimensions

Notice:

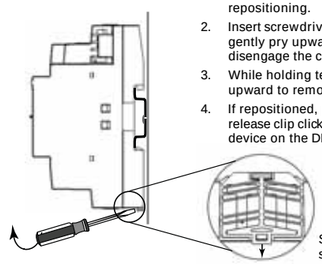
Avoid Equipment Damage: Do not use excessive force to install the controller on the DIN rail. Excessive force could result in damage to the plastic enclosure. If using another manufacturer's DIN rail, follow their recommendations for installation.

To mount device:

1. Hook device over top of DIN rail.
2. Gently push on lower half of device in the direction of arrow until the release clip clicks into place.

To remove/reposition device:

1. Disconnect all connectors before removing or repositioning.
2. Insert screwdriver into slotted release clip and gently pry upward with the screwdriver to disengage the clip.
3. While holding tension on the clip, lift device upward to remove or reposition.
4. If repositioned, push on the device until the release clip clicks back into place to secure the device on the DIN rail.



Before wiring, ensure that all wiring complies with the National Electrical Code (NEC)™ and local electrical codes.

⚠ 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. Expected result: Vac ≤4.0 V.

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Wiring Requirements

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

- The UC400 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 copper wire is recommended for the circuit between the transformer and the UC400.

Transformer Recommendations

The UC400 can be powered with 24 Vac. Use of a 24 Vac power supply is recommended in order to use the spare 24 Vac outputs for powering 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 UC400 controller (12 VA) and outputs (maximum 12 VA per binary output).
- CE-compliant installations: The transformer must be CE marked and SELV compliant per IEC standards.

Notice:

Avoid Equipment Damage!

Sharing 24 Vac power between controllers could cause equipment damage.

A separate transformer is recommended for each UC400. 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 UC400s:

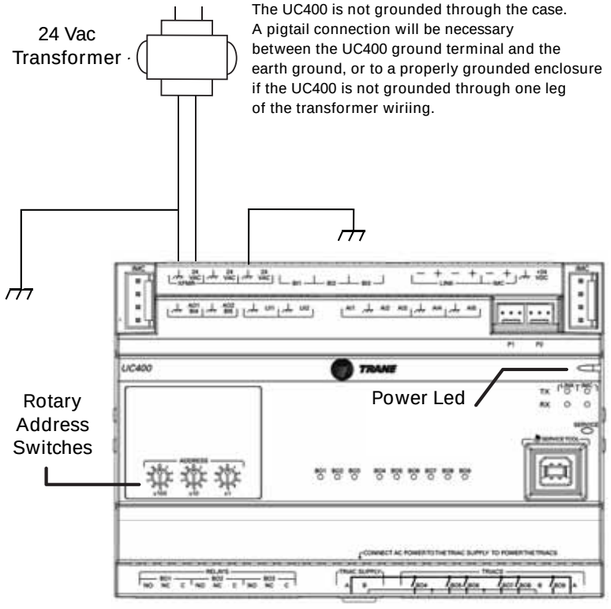
- The transformer must have sufficient capacity
- Polarity must be maintained for every UC400 powered by the transformer

Important: *If a technician inadvertently reverses polarity between controllers powered by the same transformer, a difference of 24 Vac will occur between the grounds of each controller. The following symptoms could result:*

- *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*

Wiring AC Power to the 24 Vac Transformer

1. Connect one secondary wire from the 24 Vac transformer to the chassis terminal and earth ground or enclosure.
2. Connect the other secondary wire to the 24 Vac terminal.



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UC400 Startup and Power Check

1. Verify that the 24 Vac connector and the chassis ground are properly wired.
2. Each device must have a unique and valid address. The address is set either by using the rotary address switches or, for Tracer SC applications, by using the Software Set Device ID function in the Tracer TU service tool. Valid addresses are **001** through **127** for Tracer SC applications.
   Important: *A duplicate address or a 000 address will cause communication problems in a BACnet link: The Tracer SC will not discover all devices on the link and the installation process will fail after discovery.*
3. Remove the lockout/tagout from the line voltage power to the electrical cabinet.
4. Apply power to the UC400 and observe the power check sequence that follows:
   The power LED lights red for 1 second. Then it changes to green, indicating that the unit is properly booted and ready for application code. Flashing red indicates that a fault conditions exists. The Tracer TU service tool can be used to check for fault conditions after application code and TGP2 programming have been loaded.

Input/Output Wiring

Notice:

Avoid Equipment Damage!

Remove power to the UC400 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.

Pre-power checks of input/output devices should be performed according to the *Tracer UC400 IOM* (BAS-SVX20). Maximum wire lengths are as follows:

Maximum Wire Lengths		
Type	**Inputs**	**Outputs**
Binary	1,000 ft (300 m)	1,000 ft (300 m)
0–20 mA	1,000 ft (300 m)	1,000 ft (300 m)
0–10 Vdc	300 ft (100 m)	300 ft (100 m)
Thermistor/Resistive	300 ft (100 m)	Not Applicable

- 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.
- Analog and 24 Vdc output wiring distances are dependent on the receiving unit specifications. Use shielding for analog and 24 Vdc outputs.
- DO NOT run input/output wires or communication wires in the same wire bundle with AC power wires.

Tug Test for Terminal Connectors

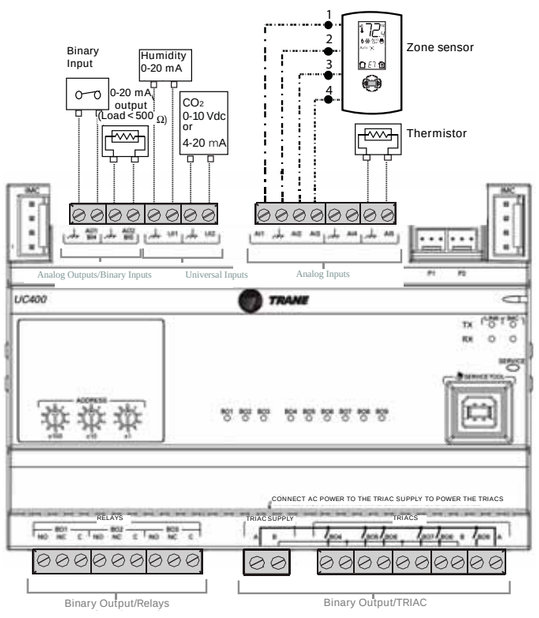
If using terminal connectors for wiring the UC400, strip the wires to expose 0.28 in (7 mm) of bare wire. Insert each wire into a terminal connector and tighten the terminal screws. A tug test is recommended after tightening terminal screws to ensure that all wires are secure. *Torque reference: Tighten screw terminals to 0.5–0.6 N·m (71–85 ozf/in or 4.4–5.3 lbf/in)*
Note: *N·m=Newton meter • ozf/in= ounce force per inch • lbf/in= pound force per inch*

BACnet MS/TP Link Wiring

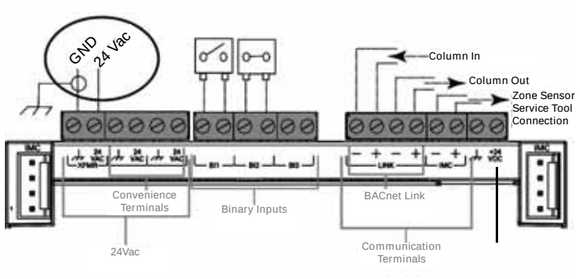
BACnet MS/TP link wiring must be field-supplied and installed in compliance with NEC and local codes. In addition, the wire must be the following type: low capacitance, 18 gauge, stranded, tinned copper, shielded, twisted pair. for more details, refer to the wiring guide for the *Unit Controller Wiring for Tracer SC™System Controller*, BAS-SVN03.
Important: *Polarity must be maintained between all devices on the link.*

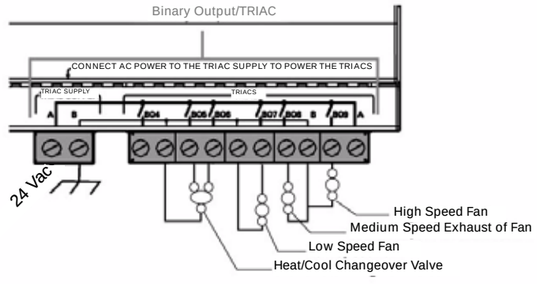
Examples of Wiring

Analog input/output wiring terminals are on the top tier.



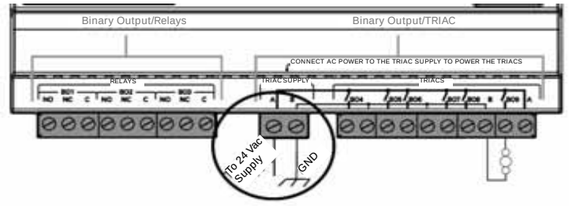
Binary input (wiring terminals are on the lower tier) and binary output.



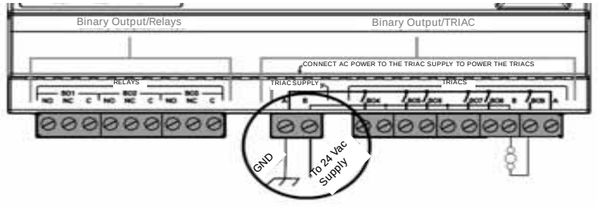


TRIAC Supply Wiring

High-side Switching; typical wiring method



Low-side Switching; minimizes the risk of burning up binary outputs due to inadvertent shorts to the ground.

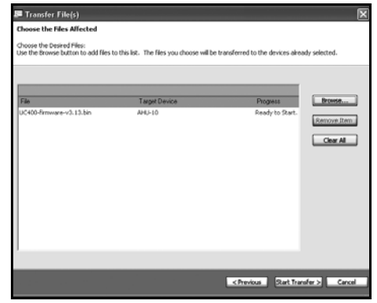


Checking and Transferring Application Code Firmware

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 (see the *Tracer UC400 IOM* [BAS-SVX20] for more details):

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* and then click Next.
4. Click Browse. 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 file transfer complete screen appears as shown below.



Input/Output Specifications

Input/Output type	Quantity	Types	Range	Notes
Analog input (AI1 to AI5)	5	Temperature	10 kΩ thermistor	AI1 to AI5 can be configured for timed override capability. Supports *, ** for Trane Zone Sensors.
		Setpoint	189 Ω to 889 Ω	
		Resistive	100 Ω to 100 kΩ	Typically used for fan speed switch.
Universal input (UI1 and UI2)	2	Linear	0–20 mA	These inputs may be configured to be thermistor or resistive inputs, 0–10 Vdc inputs, or 0–20 mA inputs.
		Linear	0–10 Vdc	
		Temperature	10 kΩ thermistor	
		Setpoint	189 Ω to 889 Ω	
		Resistive	100 Ω to 100 kΩ	
		Binary	Dry contact	Low impedance relay contact.
		Pulse	Solid state open collector	Minimum dwell time is 25 milliseconds **ON** and 25 milliseconds **OFF**.
Binary input (BI1 to BI3) ⚠	3		24 Vac detect	The UC400 controller provides the 24 Vac that is required to drive the binary inputs when using the recommended connections.
Binary output (BO1 to BO3) ⚠	3	Relay	2.88 A @24 Vac pilot duty	Power needs to be wired to the binary output. All outputs are isolated from each other and from ground or power. **Note:** Ranges given are per contact.
	Other ranges	• General purpose	• 10 A; up to 277 Vac	
		• Motor	• 1/3 hp @ 125 Vac or 1/2 hp @ 277 Vac	
		• Pilot duty	• 2 A; up to 125 Vac	
		• Resistive	• 8 A; up to 250 Vac or 10 A; up to 30 Vac or 10 A; up to 30 Vdc	
Binary output (BO4 to BO9) ⚠	6	TRIAC	0.5 A max @24–277 Vac, resistive and pilot duty	Use for modulating TRIACs. User determines whether closing high side (providing voltage to the grounded load) or low side (providing ground to the power load). **Note:** Ranges given are per contact and power comes from the TRIAC SUPPLY circuit.
Analog output/binary input (AO1/BI4 and AO2/BI5)	2	Linear output	0–20 mA	Each termination must be configured as either an analog output or binary input.
		Linear output	0–10 Vdc	
		Binary input	Dry contact	
		PWM output	80 Hz signal @ 15 Vdc	
Pressure inputs (PI1 and PI2)	2	3-wire	0–5 in H_2O	Pressure inputs supplied with 5 volts (designed for Kavlico™ pressure transducers).
Point total	**23**			

⚠ **Caution (*Pertains to the Binary Inputs/Outputs Listed in Table*)**

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 additional input/output points are needed, the XM30 expansion module is available. The UC400 will support up to eight XM30 expansion modules.

Note: See Tracer UC400 IOM (BAS-SVX20) and the XM30 Installation Instructions (X39641148) for application and installation information.

Agency Compliance

- 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
- Communications BACnet MS/TP, supports BACnet protocol ASHRAE 135-2004 and meets BACnet Testing Laboratory (BTL) as an Application Specific Controller (ASC) profile device

Declaration of Conformity

The EU Declaration of Conformity is available from your local Trane Sales Office.

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