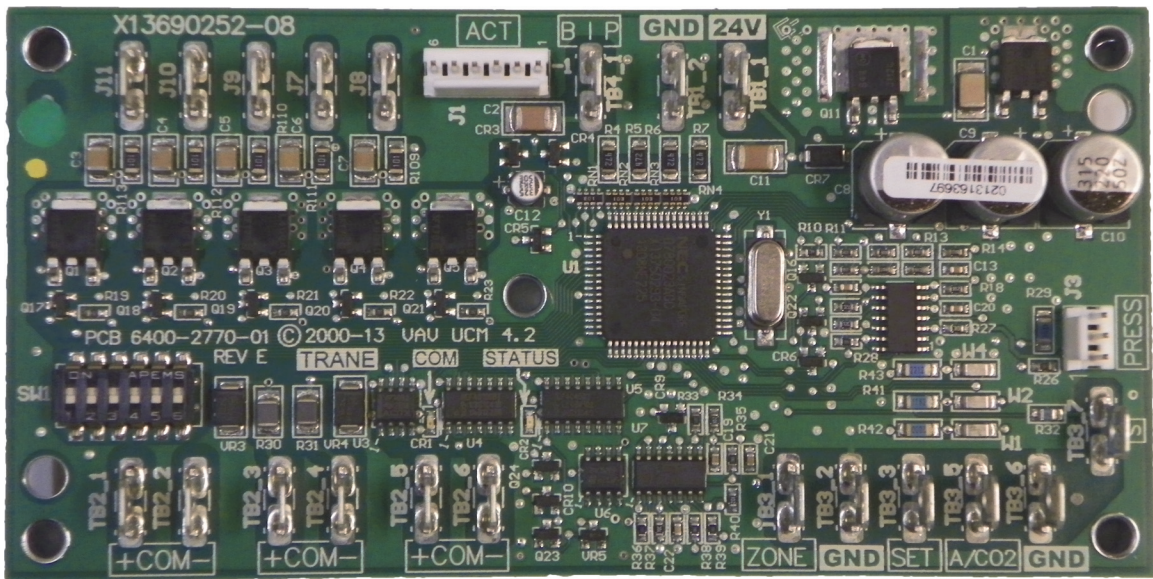




# Installation, Operation, and Maintenance

## VAV-UCM 4.2



### ⚠ 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.



# Introduction

Read this manual thoroughly before operating or servicing this unit.

## Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

**⚠ 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.

## Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

## Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

### ⚠ WARNING

#### Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury. All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

### ⚠ WARNING

#### Personal Protective Equipment (PPE) Required!

Installing/servicing this unit could result in exposure to electrical, mechanical and chemical hazards.

- Before installing/servicing this unit, technicians **MUST** put on all PPE required for the work being undertaken (Examples; cut resistant gloves/sleeves, butyl gloves, safety glasses, hard hat/bump cap, fall protection, electrical PPE and arc flash clothing). **ALWAYS** refer to appropriate Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS) and OSHA guidelines for proper PPE.
- When working with or around hazardous chemicals, **ALWAYS** refer to the appropriate MSDS/SDS and OSHA/GHS (Global Harmonized System of Classification and Labelling of Chemicals) guidelines for information on allowable personal exposure levels, proper respiratory protection and handling instructions.
- If there is a risk of energized electrical contact, arc, or flash, technicians **MUST** put on all PPE in accordance with OSHA, NFPA 70E, or other country-specific requirements for arc flash protection, **PRIOR** to servicing the unit. **NEVER PERFORM ANY SWITCHING, DISCONNECTING, OR VOLTAGE TESTING WITHOUT PROPER ELECTRICAL PPE AND ARC FLASH CLOTHING. ENSURE ELECTRICAL METERS AND EQUIPMENT ARE PROPERLY RATED FOR INTENDED VOLTAGE.**

Failure to follow instructions could result in death or serious injury.

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## **Revision History**

### **VAV-SVX01D-EN**

Updated board photo and part number (BRD04939 replaced BRD02806).



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# General Information

## Overview of Manual

**Note:** One copy of the document is shipped with VAV units that have UCM 4.2 DDC controllers and is customer property. It must be retained by the unit's maintenance personnel.

This booklet describes proper installation, operation, and maintenance procedures for delivered air systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

## Chapter Overview

This chapter contains information about the following:

- Unit Control Module 4.2 (UCM 4.2)
- Specifications
- UCM 4.2 Enhancements
- UCM 4.2 Features
- Shipping
- Storage

## Unit Control Module 4.2 (UCM 4.2)

The UCM 4.2 is a microprocessor-based, Direct Digital Controller (DDC) for the (Variable Air Volume) VAV terminal unit. It contains the control logic to modulate the flow of supply air through the VAV terminal in response to the load requirements within the VAV zone.

The function of the UCM is to control the VAV terminal unit to vary the volumetric airflow rate to the zone. Units have been made with either pneumatic, analog electronic, or microprocessor controls (DDC VAV). This manual discusses only terminal units with Comm4 DDC/VAV controls. Factory installed DDC/VAV controls are available with all single duct terminal units, dual duct units, as well as parallel fan-powered and series fan-powered units. Two UCMs are required for dual duct units (one for the heating duct and one for the cooling duct).

The UCM modulates a VAV's damper blade based on a zone temperature, measured airflow, and airflow set points to continuously control conditioned air delivery to the space. The volume of incoming air is monitored and the damper adjusts to provide accurate control independent of the duct pressure. The damper modulates between operator airflow set points depending on space conditions. Additionally, fan and heat outputs may be energized depending on the application. Available inputs

include a twisted/shielded communication link, zone sensor, auxiliary temperature sensor (optional), CO<sub>2</sub> Sensor (optional), and Occupy/Unoccupy Sensor (optional), and 24 VAC power.

## Specifications

### Power Requirements

The UCM 4.2 requires 24VAC, 50/60 Hz NEC Class 2 power. The UCM itself consumes 8 VA. Our factory installed devices draw from 3 to 12 VA. Typical values are 4 VA for a damper actuator, 10 to 12 VA for an electric heat contractor, and 6 VA for a fan relay. The NEC Class 2 transformer should be sized to handle the total VA of all devices. The binary outputs are rated at steady-state 12 VA max.

### Operating Environments - UCM 4.2

32° to 140°F (0° to 60°C), 10% to 90% relative humidity, non-condensing

### Storage Environments - UCM 4.2

-40° to 150°F (-40° to 65.6°C), 10% to 90% relative humidity, non-condensing

### Mounting

Typically, the UCM 4.2 is factory installed. However, UCM 4.2 is available with retrofit kits, in which case it must be field installed.

### Tracer Summit and UCM 4.2 Communications Link Wiring

Communications Link wiring must be 18 AWG twisted shielded pair wire. Each conductor must be stranded tinned copper. The maximum total wire length is 5,000 feet (1,524 m). See "UCM 4.2 Installation and Wiring," p. 11 for further information about wire selection.

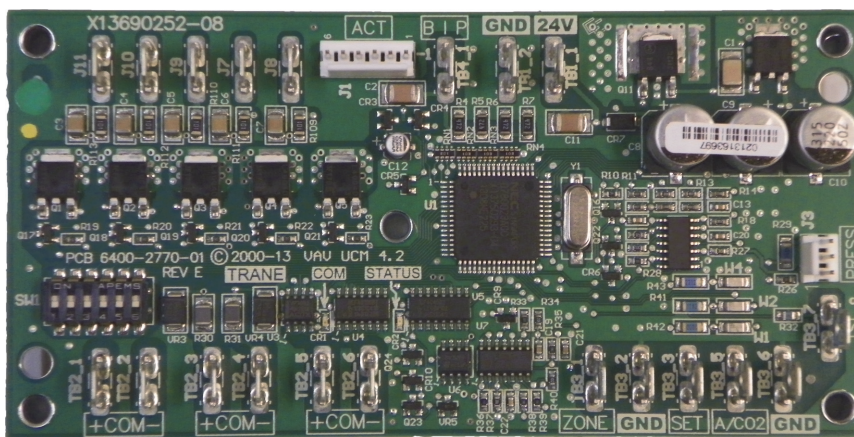
### UCM 4.2 Enhancements

- The enhanced VAV UCM is backward compatible with VariTrane® D VAV boxes (VXXD and VXXE) VariTrac® dampers, and VariTrac II dampers.
- UCM 4.2 adds support for operation with VariTrane Series F valves (¼-turn blade dampers) via 90-second drive time.
- UCM 4.2 adds a second, CO<sub>2</sub> interfacing, mode of operation to the auxiliary analog input (TB3-5). This is a 1 to 10 volt DC input with a mapping of input voltage to CO<sub>2</sub> output data value of 200 parts per million (PPM) of CO<sub>2</sub> per volt. The use of this new auxiliary analog input as an interface to a CO<sub>2</sub> detector is mutually exclusive with the use of the input as auxiliary temperature input. Therefore, the use of the CO<sub>2</sub> interfacing mode of operation is not recommended for stand-alone applications requiring auto-changeover.

- UCM 4.2 adds a binary 24VAC, dry contact input. It can be configured either as a generic input or as an occupancy detector input.
- UCM 4.2 adds a VariTrac Bypass Damper mode of operation. In this mode, supply air temperature and supply air pressure is made available on the Comm4 link. The damper position is a Comm4-control parameter. A Comm4 configurable failsafe position was added. The supply air temperature uses a new "S" input (TB3-7). The use of this new input is mutually exclusive with the zone temp input (TB3-1).
- UCM 4.2 now assumes the hot water valve is closed after reset. This prevents a reset during hot water override from causing the valve to stop moving. This also changes the behavior after reset, when there is a reheat demand, the hot water valve now opens (from assumed closed position) to the desired reheat position.
- In a wireless system, the hard-wired sensor can now be configured as not present. The hard-wired sensor failures will not be reported as long as at least one wireless zone sensor is reporting valid temperature values.

**Note:** This is an older wireless system that has been obsoleted and not the one discussed in the wireless zone sensor section.

Figure 1. UCM 4.2 board layout



### Zone Sensor, Auxiliary Sensor, and Thumbwheel Set Point Calibration

If there is a discrepancy between a measured temperature and what the UCM reports, a calibration offset value can be edited in the UCM setup screen to correct the displayed value.

### Flow Sensor Calibration

If there is a discrepancy between a measured flow and what the UCM reports, the measured value can be entered, which automatically calculates a calibration multiplier to correct the displayed value.

- For standalone units, series or parallel fan operation will use the unoccupied fan control when the local unoccupied request (\*\* function) is received. In UCM 3.3 and prior, the fan would operate as if occupied during local unoccupied request.
- UCM 4.2 adds a local minimum heating flow set point. The use of and value of this set point is configurable.

### UCM 4.2 Backward Compatibility

UCM 4.2 can be used to replace UCM I, UCM II, and UCM III with no compatibility issues. However, if the communicating device (i.e. Command Unit I or Comfort Manager™ I) is a COM 3 device (1992 or earlier), then you will need an upgrade chip. The Comfort Manager chip upgrade is Kit 1511 and the Command Unit chip upgrade is Kit 1512.

### UCM 4.2 Features

#### UCM Outputs

UCM Triac outputs for controlling a fan or reheat are rated at 12 VA each.

#### Wiring Diagram

Figure 3, p. 14 shows a typical wiring diagram for the redesigned UCM hardware. The new service part number is BRD04939.

### Water Valve Override

Each UCM that has proportional or staged hot water heat outputs can be edited to override the water valve to its maximum position.

### Ventilation Set Points and Ratio Calculation

Set point values needed for a space to satisfy indoor air quality requirements are provided. A resultant ventilation ratio can be used to calculate an air handler's outside air damper minimum position or other control strategies.



## General Information

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### Water Heat Output Configuration

UCMs that have hot water heat outputs can be configured for normally open or normally closed.

### Zone Sensor Functions

Zone sensor functions now include: air valve drive to maximum, use unoccupied set points, timed override, and cancel timed override.

### Slaving of Zone Sensors

Up to three (3) UCM 4.2 may be connected to a single zone sensor.

### Generic UCM Capability

UCM 4.2 can be configured to control non-Trane VAV boxes.

### Shipping

Each VAV product and its service literature are shipped in the same package. When unpacking, make sure that the literature is not lost or discarded with the packing material. Visually inspect the individual components for obvious defects or damage. All components are thoroughly inspected before leaving the factory. Any claims for damage incurred during shipment must be filed with the carrier.

### Storage

When any component of the VAV system and/or field installed accessories must be stored for a period of time prior to being installed, they must be protected from the elements. The storage location temperature should be between -40° to 150°F (-40° to 65.6°C) and the relative humidity should be 10% to 90%, non-condensing.

The warranty will not cover damage to the VAV system or controls due to negligence during storage. A controlled indoor environment must be used for storage.



# VAV Start Up/Check Out Procedure

## Chapter Overview

This chapter contains information about the following:

- Unit 4.2 Pre-Power Check-Out
- Light Emitting Diode (LED) Operations
- Zone Sensor Check-Out

## UCM 4.2 Pre-Power Check-Out

<b>⚠ WARNING</b>
<p><b>Live Electrical Components!</b></p> <p><b>During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.</b></p>

- Check the supply voltage at TB1. Proper polarity must be maintained. TB1-1 is the hot side (+) and TB1-2 is the ground side (-) of the 24VAC input. The UCM cannot be powered from a common 24 VAC transformer that is supplying power to a device containing a full-wave rectifier bridge in its power supply. The acceptable voltage is 20 to 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in increased system instability.
- Verify that communications wiring has properly been terminated at TB2-1 (+) and TB2-2 (-). Polarity is very important on the communications link.
- Verify that the zone sensor connections are correct as detailed in the UCM wiring chapter.
- Verify that the proper unit DIP switch settings have been set on each UCM.
- Verify that the tubing is properly connected to the transducer.

## Light Emitting Diode (LED) Operations

The UCM has one green LED located near TB3 and one yellow LED located near TB2 on the UCM circuit board. These LED's are used to help diagnose communication (yellow) or circuit board problems (green).

The green LED (red on older boards) is a power indicator. It is steady on when the power is on and the software is functioning correctly. If it blinks with a 1 second on 1 second off cycle when power is applied, then the board is not functioning and must be replaced.

**Table 1. Green LED power function indication**

LED State	Indication
"On"	Board functioning correctly
Blinking	Board malfunction (Replace Board)
"Off"	Board does not have power

The yellow LED functions as the communication indicator. The indication from the yellow LED is as follows:

**Table 2. Yellow LED communication indicator function**

LED State	Indication
"On"	Incorrect (reversed) communication polarity, no connection, or shorted lines.
Blinking slowly approx. 1 blink/sec.	Communication is occurring on the link but not for that particular UCM.
Blinking quickly (multiple blinks/sec.)	Communication is occurring on the link, specifically with that UCM.
"Off"	Polarity is correct and no communication is occurring on the link



## VAV Start Up/Check Out Procedure

### Zone Sensor Check-out

If an erroneous temperature is being reported to the UCM, use the “Zone sensor temperature-resistance table,” p. 10 to verify the integrity of the adjustable set point potentiometer or sensor. The resistance should be measured across the terminals to which the device is connected.

**Note:** Disconnect the zone sensor from the UCM when making the checks listed in the table below.

**Table 3. Zone sensor temperature-resistance table**

Temp (°F)	Thermostat Thumbwheel Resistance (Ohms)	Sensor Resistance (k Ohms)
55	792	17.0
56	772	16.5
57	753	16.1
58	733	15.7
59	714	15.4
60	694	15.0
61	675	14.6
62	656	14.3
63	636	14.0
64	617	13.6
65	597	13.3
66	578	13.0
67	558	12.6
68	539	12.3
69	519	12.1
70	500	11.8
71	481	11.5
72	461	11.2
73	442	11.0
74	422	10.7
75	403	10.4
76	383	10.2
77	364	10.0
78	344	9.7
79	325	9.5
80	306	9.3
81	286	9.0
82	267	8.8
83	247	8.6
84	228	8.4
85	208	8.2

**Note:** Thumbwheel resistance checks are made at TB3-2 and TB3-3 on the zone sensor. Temperature sensor resistance is measured at TB3-1 and TB3-2 of the zone sensor.

# UCM 4.2 Installation and Wiring

## ⚠ WARNING

### Hazardous Voltage!

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

## ⚠ WARNING

### Proper Field Wiring and Grounding Required!

All field wiring **MUST** be performed by qualified personnel. Improperly installed and grounded field wiring poses **FIRE** and **ELECTROCUTION** hazards. To avoid these hazards, you **MUST** follow requirements for field wiring installation and grounding as described in **NEC** and your local/state electrical codes. Failure to follow code could result in death or serious injury.

## Chapter Overview

This chapter contains information about the following:

- UCM 4.2 Power Wiring
- Zone Sensor Wiring
- Communication Wiring
- DIP Switch Settings Selection

## UCM 4.2 Power Wiring

### Power Requirements

#### NOTICE:

### Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors could result in equipment damage.

Use at least 16 AWG for power wiring and connect to terminal TB1-1 (+) and TB1-2 (-). 24 VAC is required to power the UCM control and has an acceptable voltage tolerance of 20 to 28 VAC. Replace the UCM control box cover after field wiring to prevent any electromagnetic interference.

**Note:** A dedicated 24 VAC, 50VA NEC class 2 transformer is recommended to power the UCM. When powering multiple UCM's from one transformer, polarity must be maintained. Terminal TB1-1 is designated positive (+) and terminal TB1-2 is negative (-) to the unit casing ground.

The power consumption for cooling only Series F Models (VariTrac and VariTrane) is 12 VA (4 VA for the air valve/actuator and 8 VA for the board). To determine the total

UCM power requirement, add the power consumption per stage to the circuit board power requirement. For example, a Series F unit containing magnetic contactors with three stages of reheat would consume 42 VA.

**Table 4. VA rating for components**

Style	Volt Amps
F - Style Actuator	4 VA
Air Valve Actuator C through E Style	12 VA
VariTrac Actuator	3 VA
Fan Power Fan Output	6 VA
Hot Water Proportional	4 VA
Hot Water 2 Position	6.5 VA
Electric Heater Magnetic Contactor	10 VA
Electric Heater Mercury Contactor	12 VA

**Note:** VariTrane™ and VariTrac™ cooling only Series D and E models consume 20 VA (12 VA for the actuator and 8 VA for the UCM). The heating output ratings remain the same.

See [Figure 1, p. 7](#) for UCM terminal locations and [Figure 2, p. 13](#) through [Figure 5, p. 16](#) for wiring of output devices.

## Zone Sensor Wiring

### Location and Mounting

A zone sensor in each control zone should be located in the most critical area of the zone. Sensors should not be mounted in direct sunlight or in the area's supply air stream. Subdivision of the zone may be necessary for adequate control and comfort.

Avoid mounting zone sensors in areas subject to the following:

- Drafts or "dead spots" behind doors or corners
- Hot or cold air ducts
- Radiant heat from the sun or appliances
- Concealed pipes or chimneys
- Unheated or uncooled surfaces behind the sensor such as outside walls
- Air flows from adjacent zones or other units

### Wiring

Each unit must be controlled by a zone sensor that is designated specifically for use with the UCM control. Field wiring for the zone sensors must meet the following requirements:

- Must be 14 to 18 AWG
- Refer to the sensor instructions for terminal connections.
- If local codes require enclosed conductors, the zone sensor wires should be installed in conduit. Do not



## UCM 4.2 Installation and Wiring

route zone sensor wires in conduit with 24VAC or other high power conducting wires.

### Multiple UCM's Per Zone Sensor

Up to three (3) UCM's may be connected to a single zone sensor and thumbwheel set point.

- Connect terminal connections TB3-1, TB3-2, and TB3-3 in parallel (i.e. daisy chain) from the master UCM to the slaved UCM(s).

**Note:** Proper polarity must be maintained.

- Cut jumper wires W1 and W2 on the slaved UCM's (never cut jumper wires W1 and W2 on master UCM).

### Multiple UCM's per Auxiliary Duct Temperature Sensor

Up to three (3) UCMs may be connected to a single auxiliary duct temperature sensor.

- Connect terminal connections TB3-5 and TB3-6 in parallel (i.e. daisy chain) from the master UCM to the slaved UCM(s).

**Note:** Proper polarity must be maintained.

- Cut jumper wire W4 on the slaved UCMs (never cut jumper wire W4 on the master UCM).

### Zone Sensor Hardwired Option

Depending on the zone sensor options used, a maximum of five wires may be required to run from the UCM to the zone sensor. The zone sensor options are:

- Zone sensor only (2 wires) - Part Number X13511528010
- Sensor with night set back - Part Number X13511530010
- Zone sensor with external adjustable - Part Number X13511529010
- Zone sensor with external adjustable night set back, timed override (TOV) on/cancel button - Part Number X13511527010
- Digital zone sensor - Part Number X13790866010
- Communications jack - Part Number X13651467020 (for one box of 12)

**Note:** All wiring from the zone sensor to the Communication link must be twisted shielded pair wiring.

### Zone Sensor Wireless Option

#### Wireless Zone Sensor

Receiver is used to receive a signal from the wireless zone sensor and can be factory installed- Part Number X13790855010.

The wiring harness connects the receiver to the UCM 4.2 - Part Number X19051692010.

### Zone Sensor

The wireless zone sensor with night setback timed override (TOV) on/cancel button. Also can be ordered for Celsius and Fahrenheit setpoint adjustment - Part Number X13790492010 (F), X13790494010 (C). Digital Wireless Part Number: X13790822010.

## Communication Wiring

### Communication Link Wiring

The "Communication Link" is the communication wiring between Tracer Summit® and all VAV box Unit Control Modules (UCM). Tracer Summit can be connected to the UCM communication link in a "daisy chain" configuration.

**Note:** It is not necessary for each UCM to be connected to the line in sequential order by address. Also, multiple communication links may be run and terminated at Tracer Summit. However, a consistent, documented wiring path will help troubleshoot communication problems after installation.

Field wiring for the communication link must meet the following requirements:

1. Communication link wiring must be at least 18 AWG twisted shielded pair wire. Shields must be grounded at Tracer Summit or Central Control Panel (CCP) only. More than one ground reference will cause communications failures. Shields must be daisy chained. Tape the shield at the last VAV UCM to prevent any connection between the shield and ground. Wire specifications are as follows:

#### Plenum Cable

Stranded, tinned copper insulated with extruded FEP. Conductors cabled and shielded with overall aluminum/Mylar tape and stranded, tinned copper drawn wire. Extruded jacket, 300 volt, 150°C NEC 725-2 (b) class 2, type CL2P, 25 pF/ft.

#### Non-Plenum Cable

Stranded tinned copper insulated with polyethylene. Conductors cabled and shielded with overall aluminum/polyester tape and stranded, tinned copper drain wire. Chrome gray PVC jacket, 300V, 60°C NEC type CM, 24 pF/ft.

**Table 5. Wire capacitance**

Max. Communication Link Wiring Length	Max. Wire Capacitance
1,000 feet (304.8m)	Up to 60 pF/ft. (196.9 pF/m)
2,000 feet (609.6 m)	Up to 50 pF/ft. (164.0 pF/m)
3,000 feet (914.4m)	Up to 40 pF/ft. (131.2 pF/m)
4,000 feet (1,219.2 m)	Up to 30 pF/ft. (98.4 pF/m)
5,000 feet (1,524 m)	Up to 25 pF/ft. (82.0 pF/m)

**Note:** Wire capacitance must comply with this table.

- The maximum wire length should not exceed 5,000 feet (1,524 m).
- Communication link wiring cannot pass between buildings.
- A maximum of 63 UCMs can be connected to each COM Link. Daisy chaining is a typical configuration. "STAR" chaining is also acceptable.

**Note:** Polarity is extremely important and must be observed on communication link connections.

- At the VAV box, communication link wires must be connected to TB2-1, 3 (+) and TB2-2, 4 (-) terminals on the UCM.
- Verify that the UCM address is properly set (DIP switch SW1). See Table 6, p. 13 for proper DIP switch settings.

### DIP Switch Settings

DIP Switch SW1 contains six switches for addressing the UCM. These switches allow a user to set a unique communication address for each UCM. Each UCM on a given communication link must have a unique address in order for Tracer Summit or the CCP to communicate to it. Refer to Table 6, p. 13 for UCM 4.2 DIP switch settings.

**Note:** When using Rover™ service tool to communicate to the UCM, you must add 64 to the DIP switch address. For example, a UCM with the DIP switch address set to 1 would be UCM Number 65 in Rover.

Figure 2. Rover screen/application

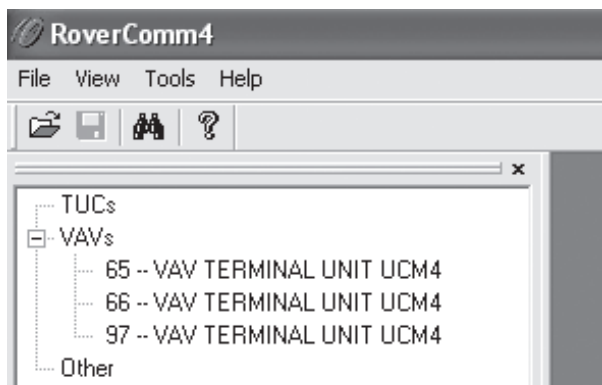


Table 6. DIP switch settings for UCM 4.2

UCM Unit #	Address	Dip					
		1	2	3	4	5	6
1	65	OFF	ON	ON	ON	ON	ON
2	66	ON	OFF	ON	ON	ON	ON
3	67	OFF	OFF	ON	ON	ON	ON
4	68	ON	ON	OFF	ON	ON	ON
5	69	OFF	ON	OFF	ON	ON	ON
6	70	ON	OFF	OFF	ON	ON	ON
7	71	OFF	OFF	OFF	ON	ON	ON
8	72	ON	ON	ON	OFF	ON	ON

Table 6. DIP switch settings for UCM 4.2 (continued)

UCM Unit #	Address	Dip					
		1	2	3	4	5	6
9	73	OFF	ON	ON	OFF	ON	ON
10	74	ON	OFF	ON	OFF	ON	ON
11	75	OFF	OFF	ON	OFF	ON	ON
12	76	ON	ON	OFF	OFF	ON	ON
13	77	OFF	ON	OFF	OFF	ON	ON
14	78	ON	OFF	OFF	OFF	ON	ON
15	79	OFF	OFF	OFF	OFF	ON	ON
16	80	ON	ON	ON	ON	OFF	ON
17	81	OFF	ON	ON	ON	OFF	ON
18	82	ON	OFF	ON	ON	OFF	ON
19	83	OFF	OFF	ON	ON	OFF	ON
20	84	ON	ON	OFF	ON	OFF	ON
21	85	OFF	ON	OFF	ON	OFF	ON
22	86	ON	OFF	OFF	ON	OFF	ON
23	87	OFF	OFF	OFF	ON	OFF	ON
24	88	ON	ON	ON	OFF	OFF	ON
25	89	OFF	ON	ON	OFF	OFF	ON
26	90	ON	OFF	ON	OFF	OFF	ON
27	91	OFF	OFF	ON	OFF	OFF	ON
28	92	ON	ON	OFF	OFF	OFF	ON
29	93	OFF	ON	OFF	OFF	OFF	ON
30	94	ON	OFF	OFF	OFF	OFF	ON
31	95	OFF	OFF	OFF	OFF	OFF	ON
32	96	ON	ON	ON	ON	ON	OFF
33	97	OFF	ON	ON	ON	ON	OFF
34	98	ON	OFF	ON	ON	ON	OFF
35	99	OFF	OFF	ON	ON	ON	OFF
36	100	ON	ON	OFF	ON	ON	OFF
37	101	OFF	ON	OFF	ON	ON	OFF
38	102	ON	OFF	OFF	ON	ON	OFF
39	103	OFF	OFF	OFF	ON	ON	OFF
40	104	ON	ON	ON	OFF	ON	OFF
41	105	OFF	ON	ON	OFF	ON	OFF
42	106	ON	OFF	ON	OFF	ON	OFF
43	107	OFF	OFF	ON	OFF	ON	OFF
44	108	ON	ON	OFF	OFF	ON	OFF
45	109	OFF	ON	OFF	OFF	ON	OFF
46	110	ON	OFF	OFF	OFF	ON	OFF
47	111	OFF	OFF	OFF	OFF	ON	OFF
48	112	ON	ON	ON	ON	OFF	OFF
49	113	OFF	ON	ON	ON	OFF	OFF
50	114	ON	OFF	ON	ON	OFF	OFF
51	115	OFF	OFF	ON	ON	OFF	OFF
52	116	ON	ON	OFF	ON	OFF	OFF
53	117	OFF	ON	OFF	ON	OFF	OFF
54	118	ON	OFF	OFF	ON	OFF	OFF
55	119	OFF	OFF	OFF	ON	OFF	OFF
56	120	ON	ON	ON	OFF	OFF	OFF
57	121	OFF	ON	ON	OFF	OFF	OFF
58	122	ON	OFF	ON	OFF	OFF	OFF
59	123	OFF	OFF	ON	OFF	OFF	OFF

# UCM 4.2 Installation and Wiring

**Table 6. DIP switch settings for UCM 4.2 (continued)**

UCM Unit #	Address	Dip					
		1	2	3	4	5	6
60	124	ON	ON	OFF	OFF	OFF	OFF
61	125	OFF	ON	OFF	OFF	OFF	OFF
62	126	ON	OFF	OFF	OFF	OFF	OFF
63	127	OFF	OFF	OFF	OFF	OFF	OFF

The following figures show wiring diagrams for typical applications of UCM 4.2

**Figure 3. Wiring diagram for single duct units with factory installed electric reheat**

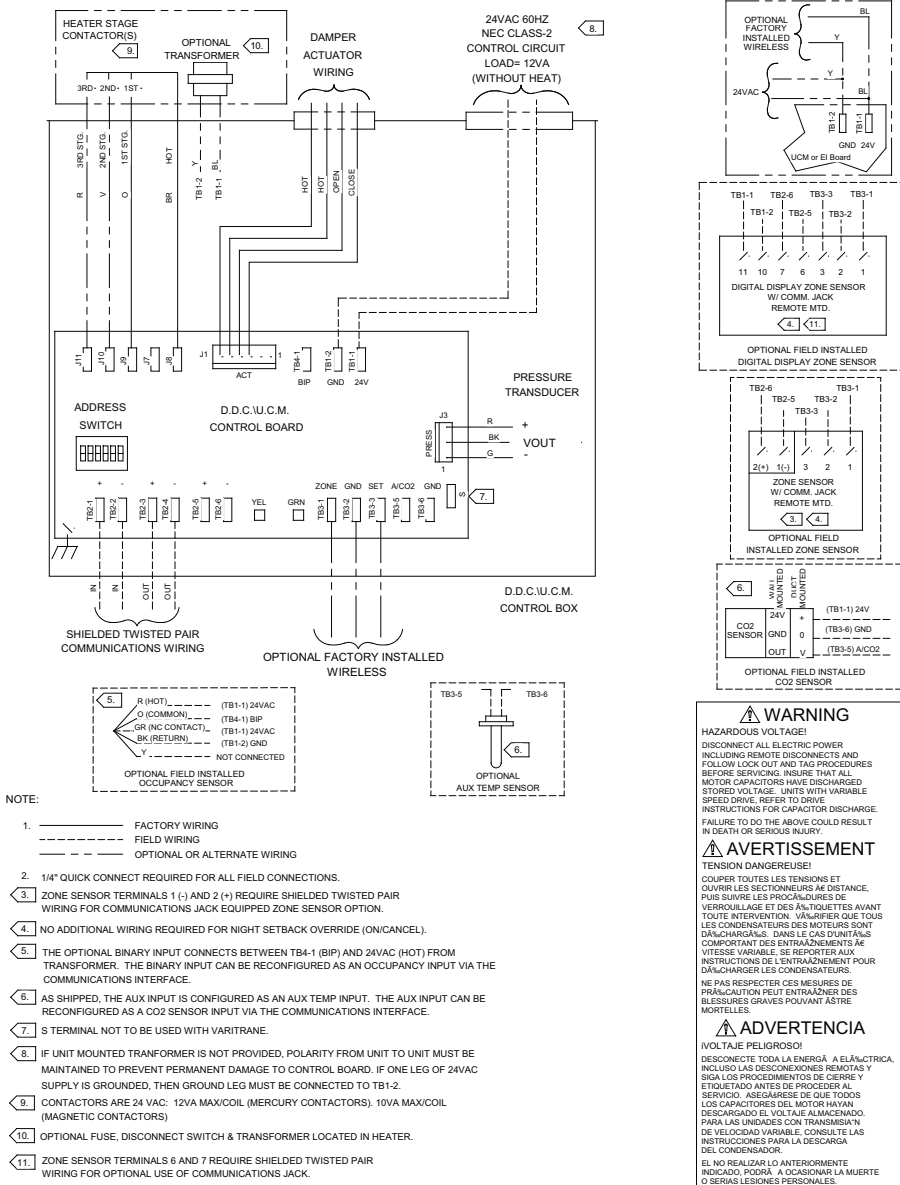
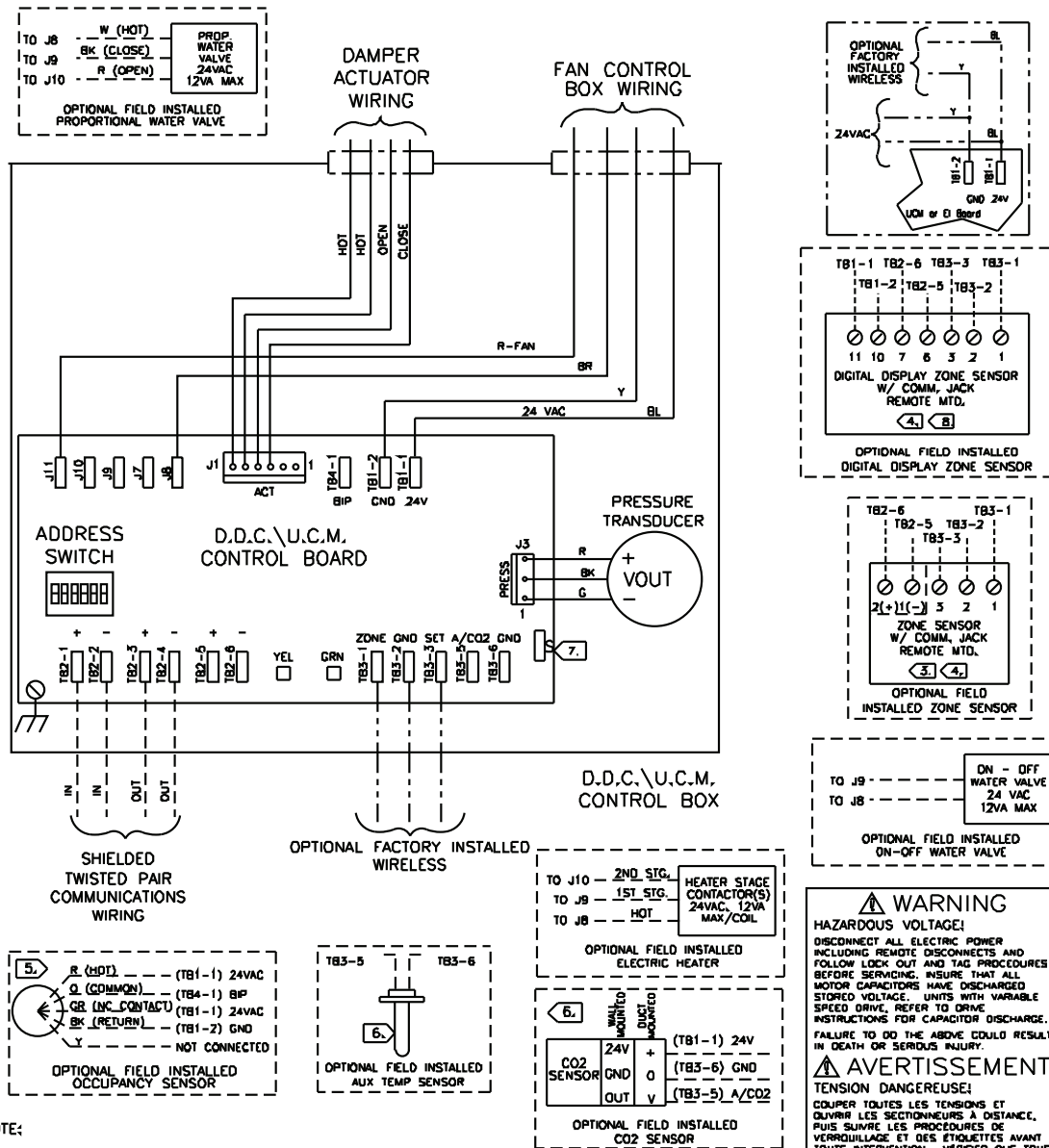


Figure 4. Wiring diagram for fan-powered units with field installed reheat

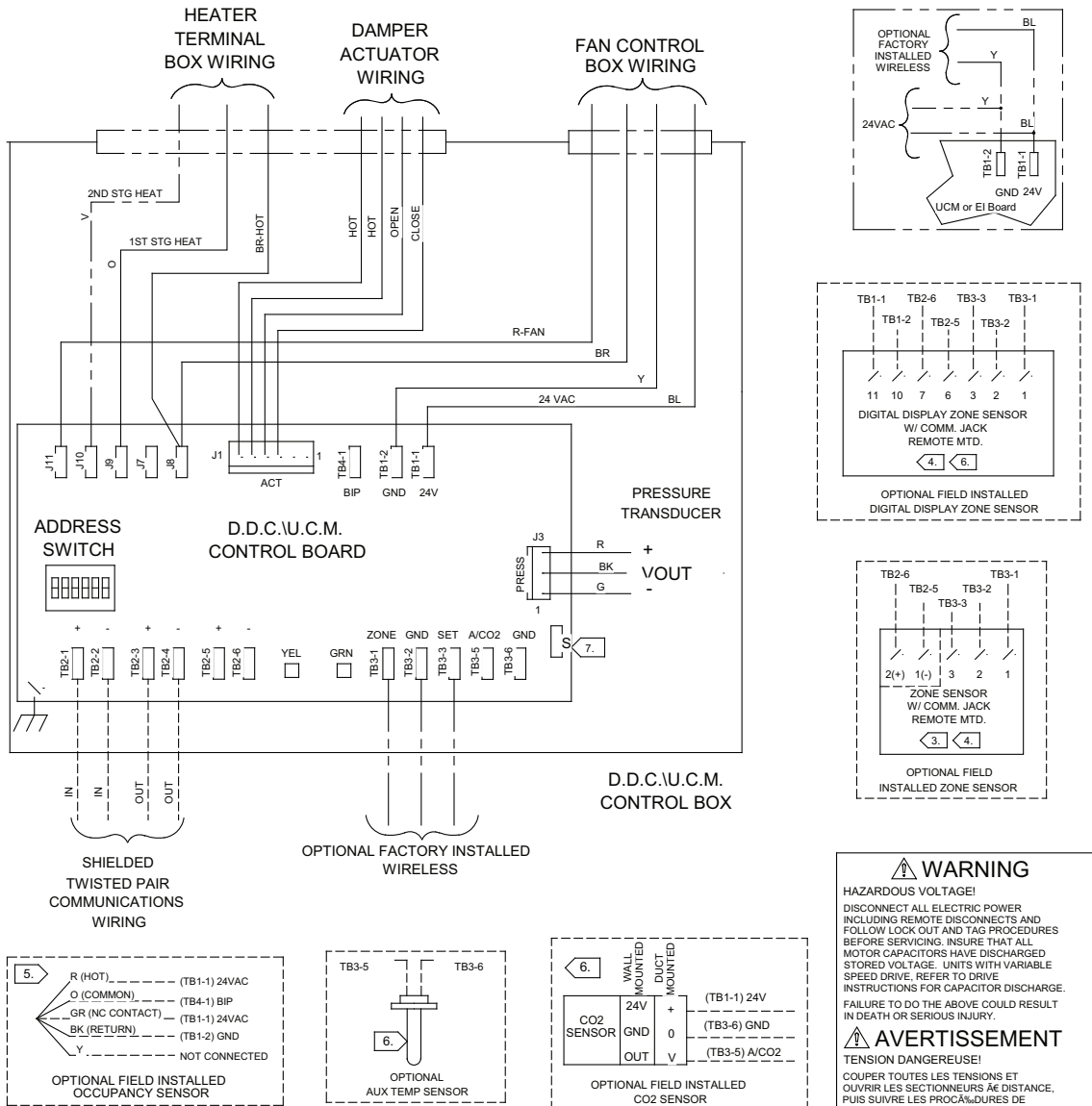


**NOTE:**

1. ————— FACTORY WIRING
  - FIELD WIRING
  - - - - - OPTIONAL OR ALTERNATE WIRING
2. 1/4" QUICK CONNECT REQUIRED FOR ALL FIELD CONNECTIONS.
  3. ZONE SENSOR TERMINALS 1 (-) AND 2 (+) REQUIRE SHIELDED TWISTED PAIR WIRING FOR COMMUNICATIONS JACK EQUIPPED ZONE SENSOR OPTION.
  4. NO ADDITIONAL WIRING REQUIRED FOR NIGHT SETBACK OVERRIDE (ON/CANCEL).
  5. THE OPTIONAL BINARY INPUT CONNECTS BETWEEN TB4-1 (BIP) AND 24VAC (HOT) FROM TRANSFORMER. THE BINARY INPUT CAN BE RECONFIGURED AS AN OCCUPANCY INPUT VIA THE COMMUNICATIONS INTERFACE.
  6. AS SHIPPED, THE AUX INPUT IS CONFIGURED AS AN AUX TEMP INPUT. THE AUX INPUT CAN BE RECONFIGURED AS A CO2 SENSOR INPUT VIA THE COMMUNICATIONS INTERFACE.
  7. S TERMINAL NOT TO BE USED WITH VARITRANE.
  8. ZONE SENSOR TERMINALS 6 AND 7 REQUIRE SHIELDED TWISTED PAIR WIRING FOR OPTIONAL USE OF COMMUNICATIONS JACK.

# UCM 4.2 Installation and Wiring

Figure 5. Wiring diagram for fan-powered units with factory installed electric reheat



**NOTE:**

1.  FACTORY WIRING  
 FIELD WIRING  
 OPTIONAL OR ALTERNATE WIRING
2. 1/4" QUICK CONNECT REQUIRED FOR ALL FIELD CONNECTIONS.
3. ZONE SENSOR TERMINALS 1 (-) AND 2 (+) REQUIRE SHIELDED TWISTED PAIR WIRING FOR COMMUNICATIONS JACK EQUIPPED ZONE SENSOR OPTION.
4. NO ADDITIONAL WIRING REQUIRED FOR NIGHT SETBACK OVERRIDE (ON/CANCEL).
5. THE OPTIONAL BINARY INPUT CONNECTS BETWEEN TB4-1 (BIP) AND 24VAC (HOT) FROM TRANSFORMER. THE BINARY INPUT CAN BE RECONFIGURED AS AN OCCUPANCY INPUT VIA THE COMMUNICATIONS INTERFACE.
6. AS SHIPPED, THE AUX INPUT IS CONFIGURED AS AN AUX TEMP INPUT. THE AUX INPUT CAN BE RECONFIGURED AS A CO2 SENSOR INPUT VIA THE COMMUNICATIONS INTERFACE.
7. S TERMINAL NOT TO BE USED WITH VARITRANE.
8. ZONE SENSOR TERMINALS 6 AND 7 REQUIRE SHIELDED TWISTED PAIR WIRING FOR COMMUNICATIONS JACK EQUIPPED ZONE SENSOR OPTION.

**⚠ WARNING**  
**HAZARDOUS VOLTAGE!**  
 DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE. FAILURE TO DO THE ABOVE COULD RESULT IN DEATH OR SERIOUS INJURY.

**⚠ AVERTISSEMENT**  
**TENSION DANGEREUSE!**  
 COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS À DISTANCE. PUIS SUIVRE LES PROCÉDURES DE VERROUILLAGE ET DES ÉTIQUETTES AVANT TOUTE INTERVENTION. VÉRIFIER QUE TOUTS LES CONDENSATEURS DES MOTEURS SONT DÉCHARGÉS. DANS LE CAS D'UNITÉS COMPORTANT DES ENTRAÎNEMENTS À VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR DÉCHARGER LES CONDENSATEURS. NE PAS RESPECTER CES MESURES DE PRÉCAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ÊTRE MORTELLES.

**⚠ ADVERTENCIA**  
**¡VOLTAJE PELIGROSO!**  
 DESCONECTE TODA LA ENERGÍA A ELÁCTRICA, INCLUSO LAS DESCONEXIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGÚRESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON TRANSMISIÓN DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRÁ OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.



# Wireless Zone Sensor

## Overview

The Trane Wireless Zone Sensor set includes a sensor and a receiver that work together to provide the same functions as the equivalent Trane wired sensor (#4190-1090), such as the standard 10 k temperature input (with the exception of the communication jack). No further software or hardware is necessary for site evaluation, installation, or maintenance.

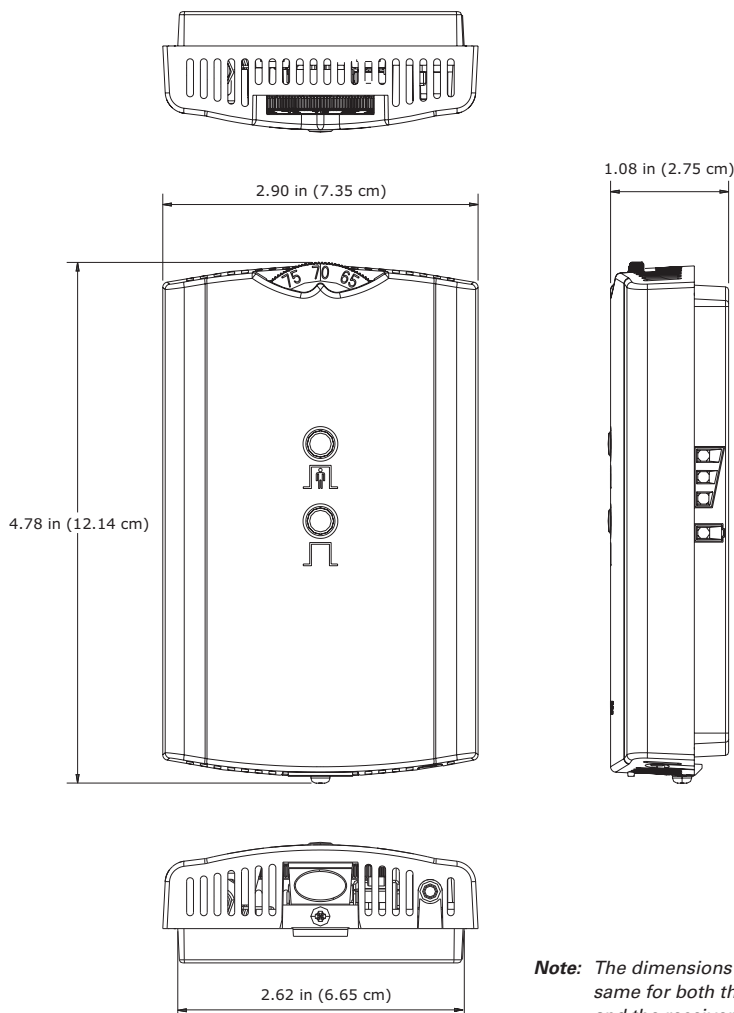
The sensor transmits the zone temperature, all zone temperature setpoint functions, timed override Occupied

(On) and timed override Unoccupied (Cancel) information to the receiver. The receiver electrically reproduces the zone temperature resistance, all zone temperature setpoint function resistances, and timed override On and timed override Cancel information as sent by the sensor.

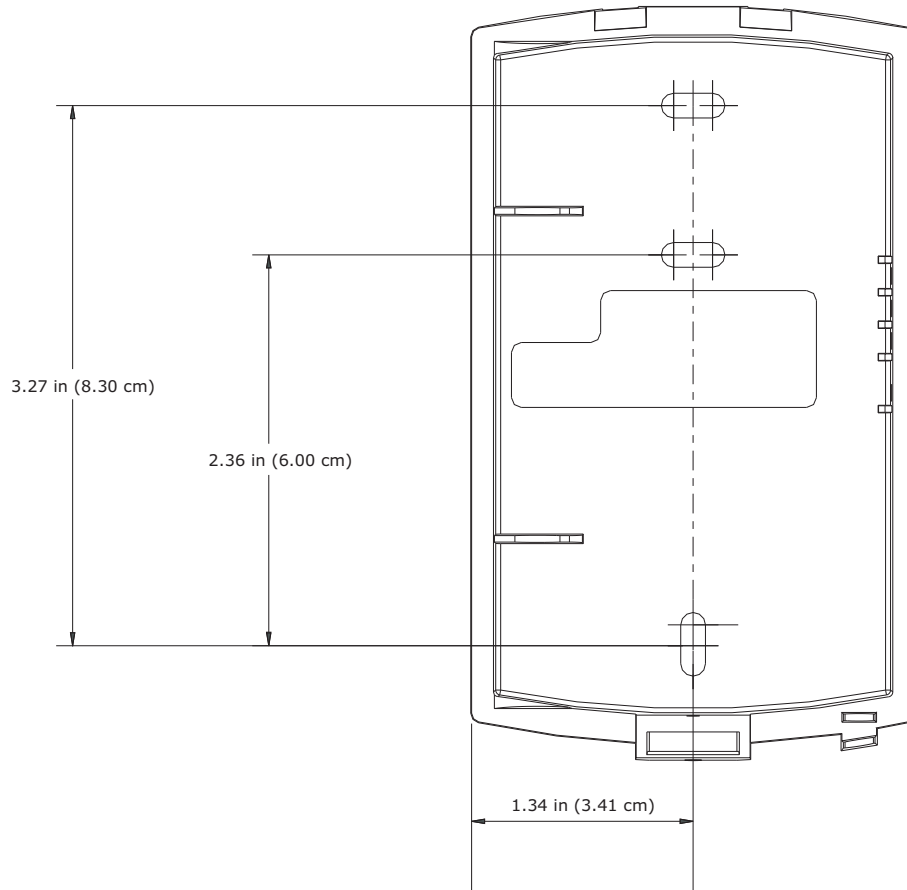
## Dimensional Diagrams

See [Figure 6, p. 17](#) and [Figure 7, p. 18](#) for dimensions of the Wireless Zone Sensor set. The dimensions are the same for both the sensor and the receiver.

**Figure 6. Outside dimensions for sensor**



**Note:** The dimensions are the same for both the sensor and the receiver.

**Figure 7. Mounting hole dimensions for sensor**


**Note:** The dimensions are the same for both the sensor and the receiver.

## Setting the Address, Mounting, Wiring, and Associating the Receiver and Sensor

The following procedure list shows the recommended order for installation:

- Choosing a location for mounting the sensor
- Setting the rotary address switches on the receiver and on the sensor
- Replacing and securing the receiver cover
- Powering the sensor and associating the sensor to the receiver
- Applying power to the receiver
- Testing signal and battery strength
- Disassociation

## Choosing a Location for Mounting the Sensor

Placement of the receiver and the sensor set is critical to proper operation. In most installations, distance is not the limiting factor for proper radio signal quality. It is more greatly affected by walls, barriers, and general clutter. For best radio transmission range and reliability, wherever possible, mount the receiver and sensor in line of sight. Try to minimize the number of barriers between the pair of devices. In general, sheetrock walls and ceiling tiles offer little restriction to the propagation of the radio signal throughout the building; concrete or metal barriers offer the most restriction. The transmission range for the sensor is as follows:

- Open range: 2,500 ft (762 m) (packet error rate = 2%)
- Usable range: 200 ft (61 m)
- Typical range: 75 ft (23 m)

## Ambient considerations

Avoid locations that are outside the operating temperature and humidity range (see [Table 14, p. 48](#)).

## Location Considerations for the Sensor

When selecting a location for the sensor, consider both thermal and radio transmission characteristics of the location.

## Thermal considerations

- Avoid areas of direct sunlight
- Avoid areas in the direct air stream of air diffusers
- Avoid exterior walls and other walls that have a temperature differential between their two sides
- Avoid areas close to sources of heat such as sunlight, appliances, or other equipment
- Avoid drafty areas
- Avoid dead spots behind doors, projection screens, or corners

## Radio transmission considerations

- Avoid metal barriers between the sensor and receiver, such as plastered walls with metal lath as they will decrease radio signal quality.

- Avoid placing the sensor inside metal enclosures
- Avoid radio transmissions through thick, solid concrete walls

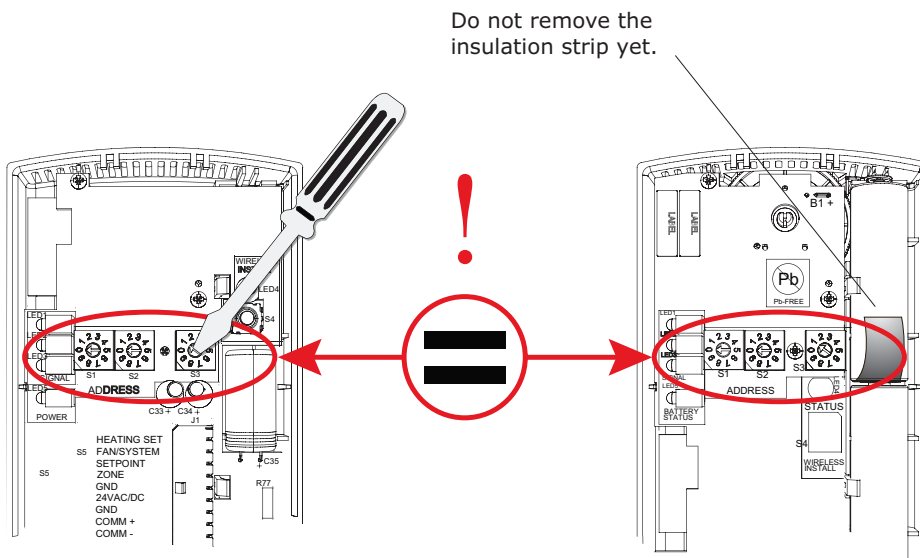
## Setting the Rotary Address Switches on the Receiver and the Sensor

**Note:** To expedite the installation and association process, set the addresses before applying power to the receiver.

The process of establishing communication between the receiver and sensor is referred to as association. The receiver and the sensor must have their rotary switches set to the same address in order to enable communication between the two devices (see [Figure 8, p. 19](#)). Important limitations are as follows:

- Only one associated receiver/sensor set can communicate within the reception range of the wireless system.
- It is not possible to associate more than one sensor to a receiver, nor is it possible to associate more than one receiver to a sensor.

**Figure 8. Setting the rotary address switches on the receiver and the sensor**



## Setting the Receiver Address

1. Using a small screwdriver, set the three rotary address switches (locations S1, S2, S3) on the receiver ([Figure 8, p. 19](#)) to an address between 001 and 999.

**Note:** Do not use 000 as an address for installation. If you set the receiver address to 000, it will:

- Return the receiver outputs to their factory defaults indefinitely (zone temperature and setpoint outputs: 72.5°F [22.5°C])
- Remove all association knowledge

- Make the receiver unable to associate with a sensor

- Read the switches from left to right in the order in which they are numbered (S1, S2, S3).
  - Zero is at the 9 o'clock position.
2. Make a notation of the address and location of the receiver.



## Wireless Zone Sensor

---

### Setting the Sensor Address

1. Using a small screwdriver, set the three rotary address switches (locations S1, S2, S3) on the sensor ([Figure 8, p. 19](#)) to the same address used for the receiver it is to be associated with.
2. Make a notation of the address and location where this sensor is to be mounted.

**Note:** Do not use 000 as an address for installation. If you set the address to 000, it will:

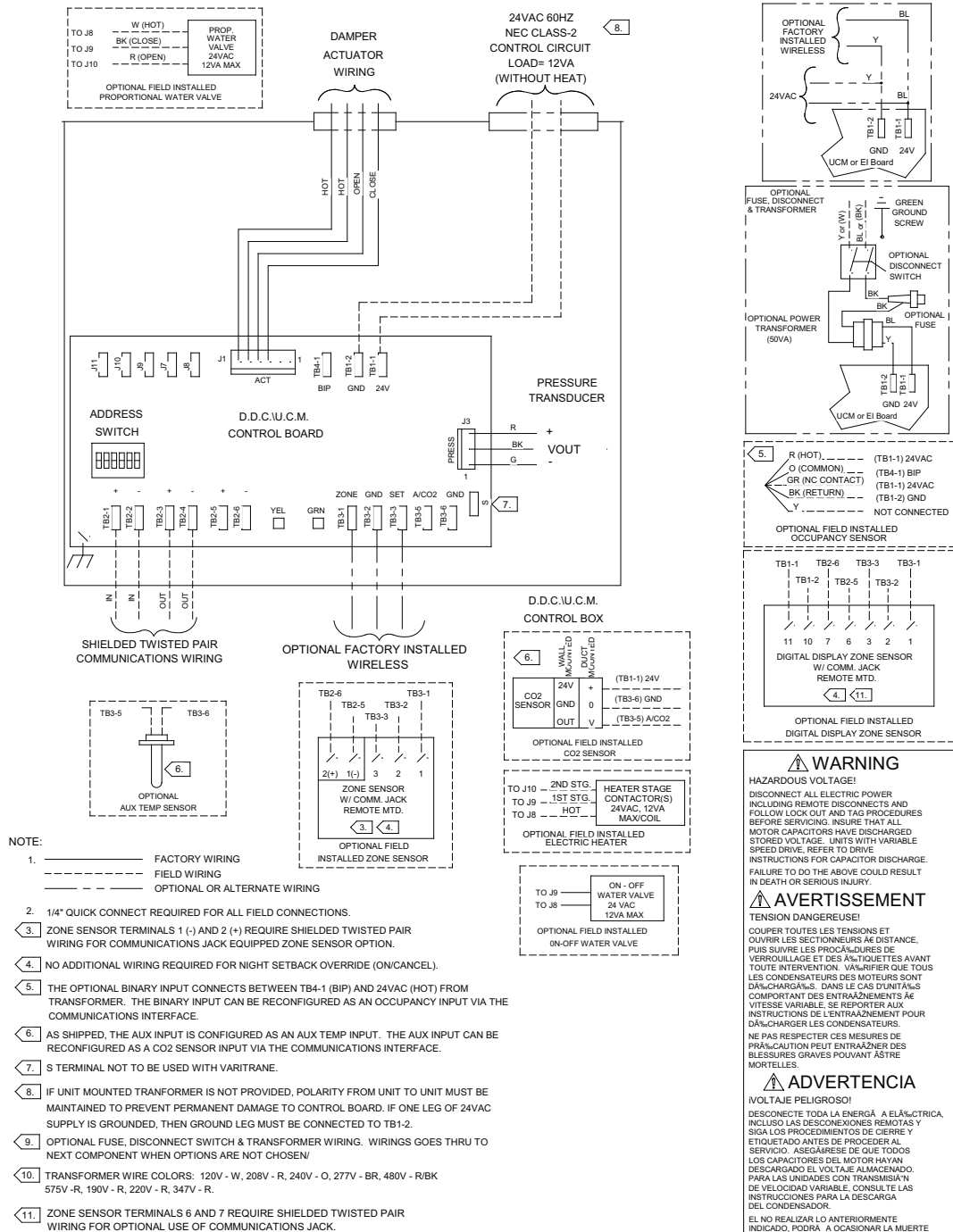
- Remove all association knowledge
  - Revert to a low-power hibernation mode.
  - Send a disassociation request to the receiver. If the sensor and receiver are associated and communicating at the time the sensor is set to 000 and the Test button is pressed, the receiver will also become unassociated and will be available for re-association.
- Read the switches from left to right in the order in which they are numbered (S1, S2, S3).
  - Zero is at the 9 o'clock position.
3. Make a notation of the address and location of the sensor.

### Factory Wiring of the Receiver to the VAV UCM

The required power for the receiver is 24 VAC or 24 Vdc and is less than 1 VA. The receiver is designed to be powered by the VAV UCM controller.

**Note:** A dedicated transformer is not necessary or advised.

**Figure 9. Factory wiring of the receiver to the VAV UCM**



**Table 7. Wiring harness: wire identification**

Wire Label	Color	Function
HEATING SET	N/A	Not used. For future use.
FAN/SYSTEM	N/A	Not used. For future use.
SETPOINT	Red	Space temperature setpoint
ZONE	White	Zone temperature
GND-SIGNAL	Black	Ground for setpoint and zone signal

**Table 7. Wiring harness: wire identification (continued)**

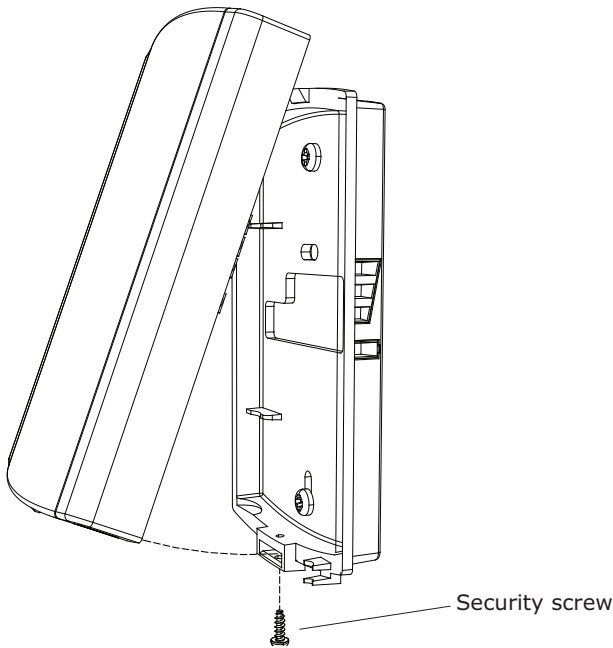
Wire Label	Color	Function
24 VAC/DC	Blue	24 VAC/Vdc power
GND-POWER	Yellow	Ground for 24 VAC/dc
COMM +	N/A	Not used. For future use.
COMM -	N/A	Not used. For future use.

**Note:** Both GND-SIGNAL and GND-POWER must be wired for the receiver to operate (See Figure 3, p. 14, Figure 4, p. 15, Figure 5, p. 16).

## Replacing and Securing the Receiver Cover

1. To replace the receiver cover on the base plate, hook the cover over the top of the base plate. Apply light pressure to the bottom of the cover until it snaps in place.
2. If necessary to keep the cover securely attached, install the security screw into the bottom of the receiver (Figure 10, p. 22).

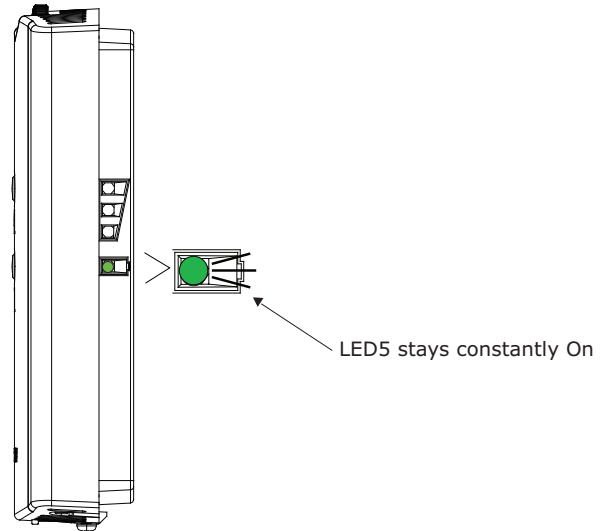
**Figure 10. Snap receiver cover on base plate and attach security screw**



## Applying Power to the Receiver

Restore power to the UCM. Observe LED5 on the receiver (Figure 11, p. 22). It will light and stay constantly On when 24V power is normal.

**Figure 11. LED5 stays on after applying power to the receiver**

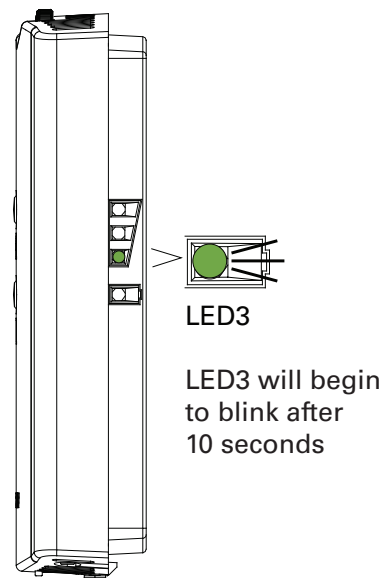


## Receiver Indicates Readiness to Associate

After initial power up, the receiver conducts a channel scan for 10 seconds. During this time, the receiver selects from 16 available channels the clearest channel on which to operate. LED1, LED2, and LED3 flash rapidly in succession (round-robin style) while the channel scan is in progress.

**Note:** Do not attempt association until the channel scan is finished. After the channel scan is finished, LED3 will begin blinking (one-blink pattern) to show that the receiver is ready to be associated with a sensor. LED3 will stop blinking when association has been established (Figure 12, p. 22).

**Figure 12. LED3 blinks when the receiver is ready to be associated with a sensor**



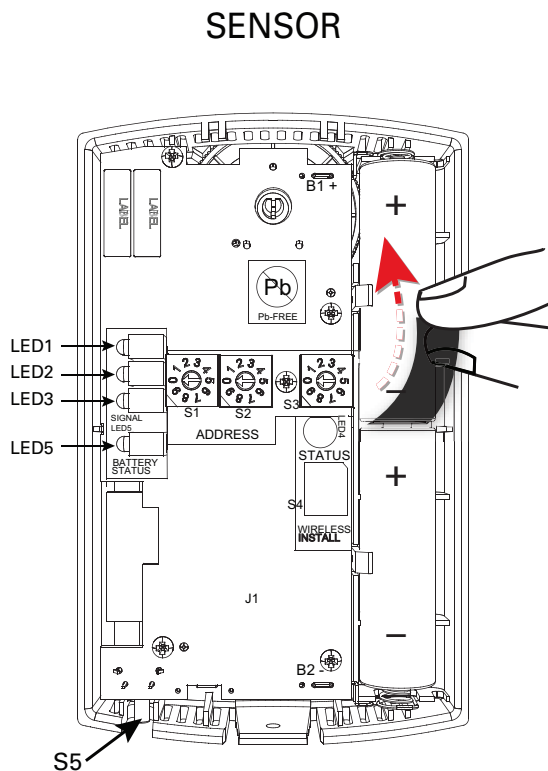
## Powering the Sensor and Associating the Sensor to the Receiver

1. Verify the sensor is set to the same address as the associated receiver.
2. Remove the insulation barrier, which is a plastic strip located between the two batteries (Figure 13, p. 23).
3. Association will automatically occur between the sensor and the receiver. If the first association attempt is unsuccessful, the sensor will automatically reattempt association with the receiver every 10 minutes.

**Note:** A disassociated sensor will transmit an association request every 10 minutes. An associated sensor that has lost communication with the receiver will transmit an association request every 50 minutes.

**Note:** LED3 on the receiver stops blinking to indicate that association has been established.

**Figure 13. Removing the insulation barrier on the sensor**

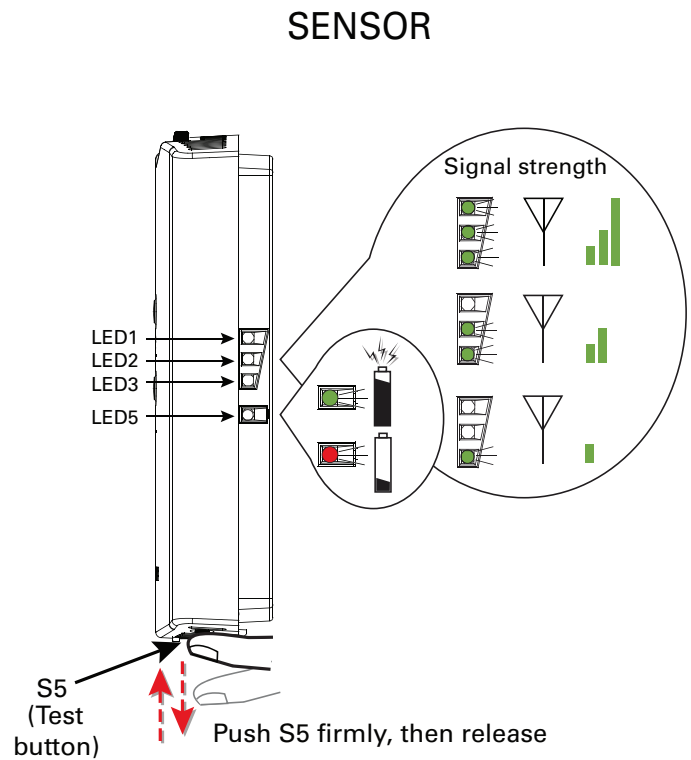


2. View LED1, LED2, and LED3 to determine the strength of the signal. View LED5 to determine the strength of the battery.

**Note:** The LEDs will turn Off after 5 seconds to conserve battery strength.

3. Record the results in your commissioning statement.

**Figure 14. Testing signal and battery strength**



## Disassociation

The receiver removes all stored association information, conducts a channel scan, and restarts itself, if any of the following are true:

- The receiver address is changed from its current setting (001-999)
- The receiver receives a disassociation notification from its associated sensor
- The receiver does not receive a communication from its associated sensor within 35 minutes

## Testing Signal and Battery Strength

The following recommended test indicates signal and battery strength. It verifies that the association process was successful and that the batteries have adequate charge. (For more information on LEDs, see "Troubleshooting," p. 45.)

1. Firmly press and release the Test button (S5) on the bottom of the sensor (Figure 14, p. 23).



# UCM Programming and Operation

## Chapter Overview

This chapter contains information about the following:

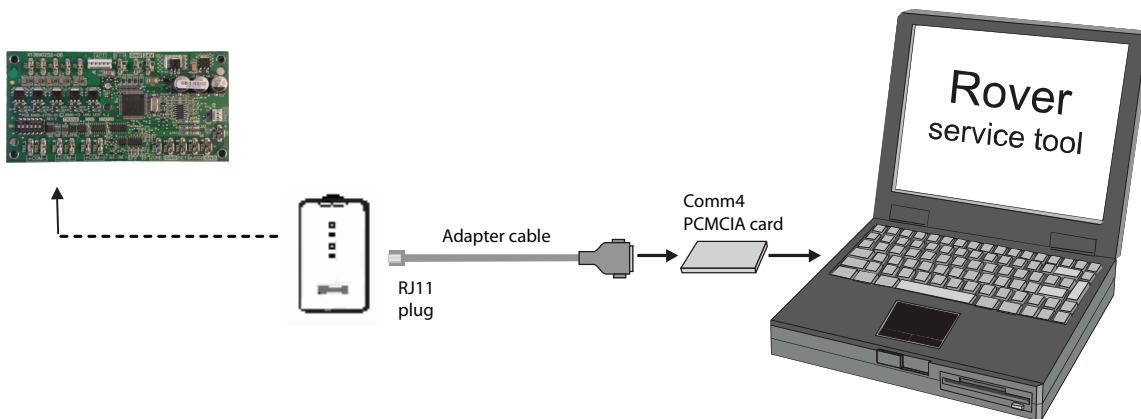
- Accessing Rover/Comm4
- UCM HomeTabs: At a Glance
- UCM HomeTabs: Instructions
- Entering and Exiting the Service Mode
- Overriding VAVs
- Resetting Diagnostics

## Accessing Rover/Comm4

### Rover Overview

Rover is a service tool that allows parameters to be viewed or adjusted in UCM v 2.0 and higher. Prior to UCM v 2.0, you would need to use EveryWare to access units that were stand alone. The operating and programming guide for Rover is EMTX-SVX01\*-EN. Rover Comm4 is a software application for monitoring, configuring, and testing VAV II/III/IV controllers on Comm4 links. Rover Comm4 replaces EveryWare service software.

**Figure 15. Connecting to a Comm4 controller through a zone sensor.**



**Note:** For Instructions on how to use Rover Comm4, refer to the Rover Comm4 online Help by clicking Contents and Index on the Help menu.

### Laptop Requirements and Complete Connection Instructions

For instructions on connecting a PC laptop to a Comm4 link, refer to the Installing Rover ServiceTool Version 5.0, 3270 3275.

**Note:** A hard copy of this document is in the Rover package and an electronic copy (Installation.pdf) can be found on the Rover installation CD-ROM.

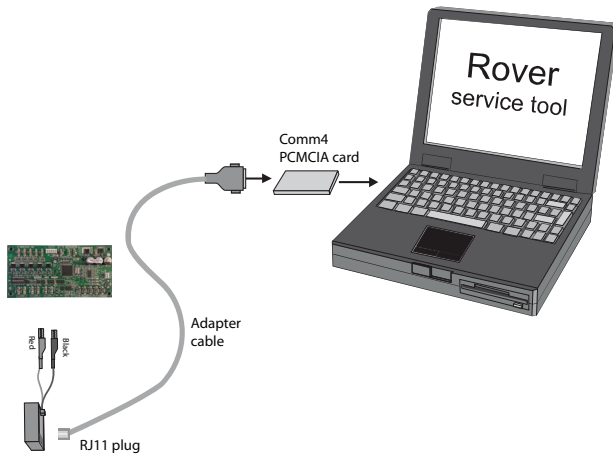
### To connect to a Comm4 Link

1. Insert the Comm4 card in the PC laptop.
2. Connect the cables as shown in the appropriate figure. See [Figure 15, p. 24](#) for connecting to a Comm4 controller through a zone sensor and [Figure 16, p. 25](#) for Connecting to a Comm4 controller using alligator clips.

**Note:** Make sure to maintain polarity.



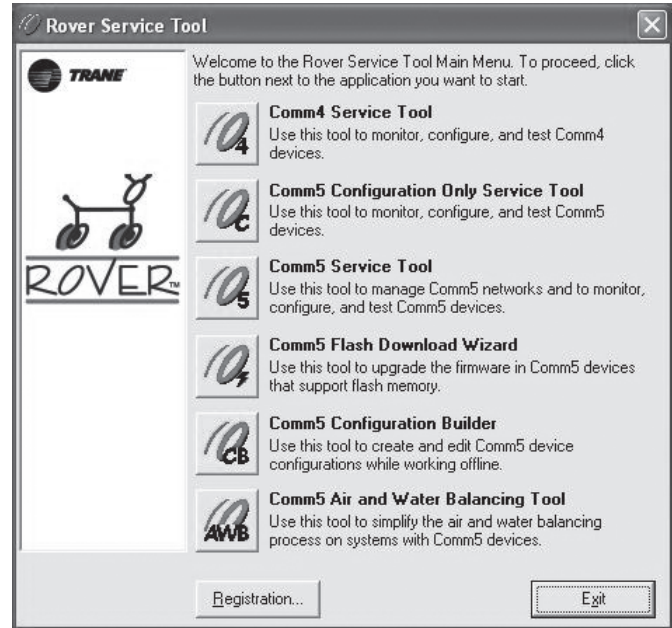
**Figure 16. Connecting to a Comm4 controller using alligator clips**



3. Double-click the Rover icon on the laptop PC desktop. The **Rover Service Tool** screen will appear.

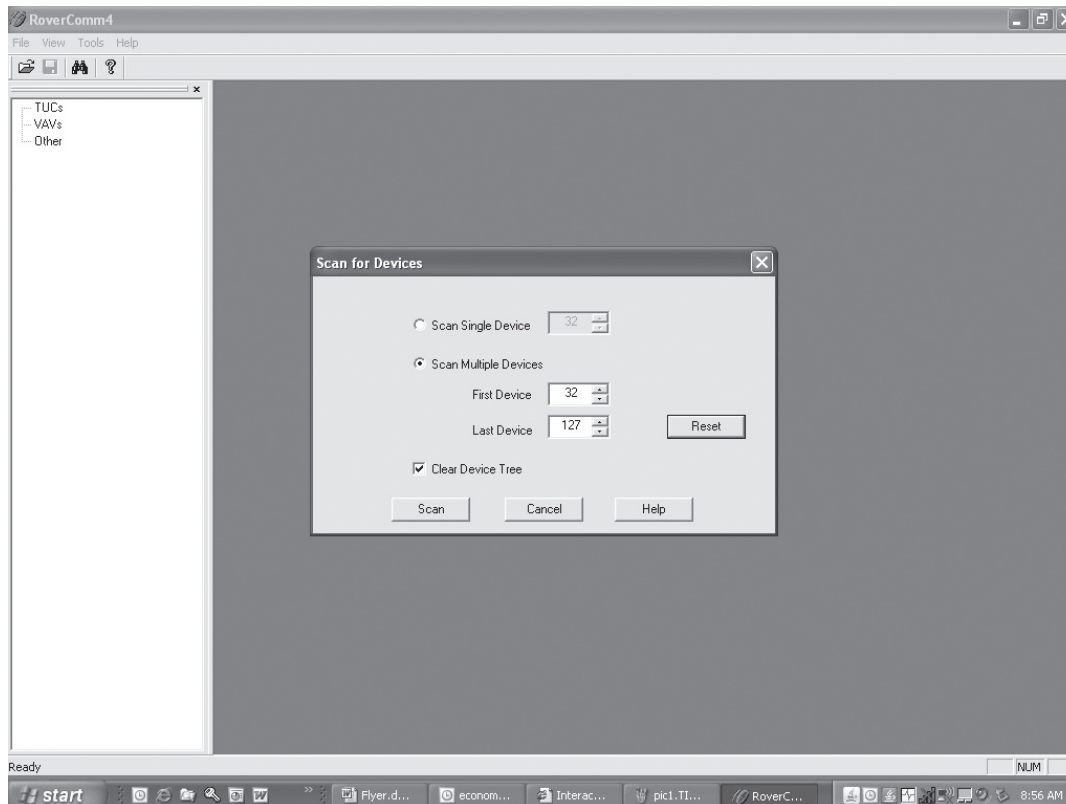
4. Double-click on the **Comm4 Service Tool** icon to access a Comm4 VAV UCM. This tool allows the user to monitor, configure, and test Comm4.

**Figure 17. Rover service tool**



5. Rover/Comm4 will launch. Click to launch the **Scan for Devices** dialog box.

**Figure 18. Rover/Comm4 application with the Scan for Devices dialog box.**



## UCM Programming and Operation

- The user may search by the address of a single UCM or scan the range of UCM addresses specified

**Note:** Address for VAV UCM's range from 65-127.

- Select the desired device or range of devices and click the Scan button. You'll be able to watch as the applications scan for the selected data.

**Note:** The numbers selected for each device (65-127) can be referenced back to address selection for the UCM(s). See [Table 6, p. 13, Dip Switch settings](#).

Figure 19. Scanning for Devices screen

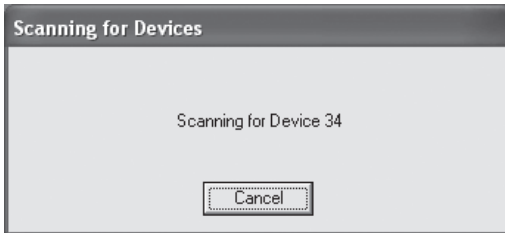
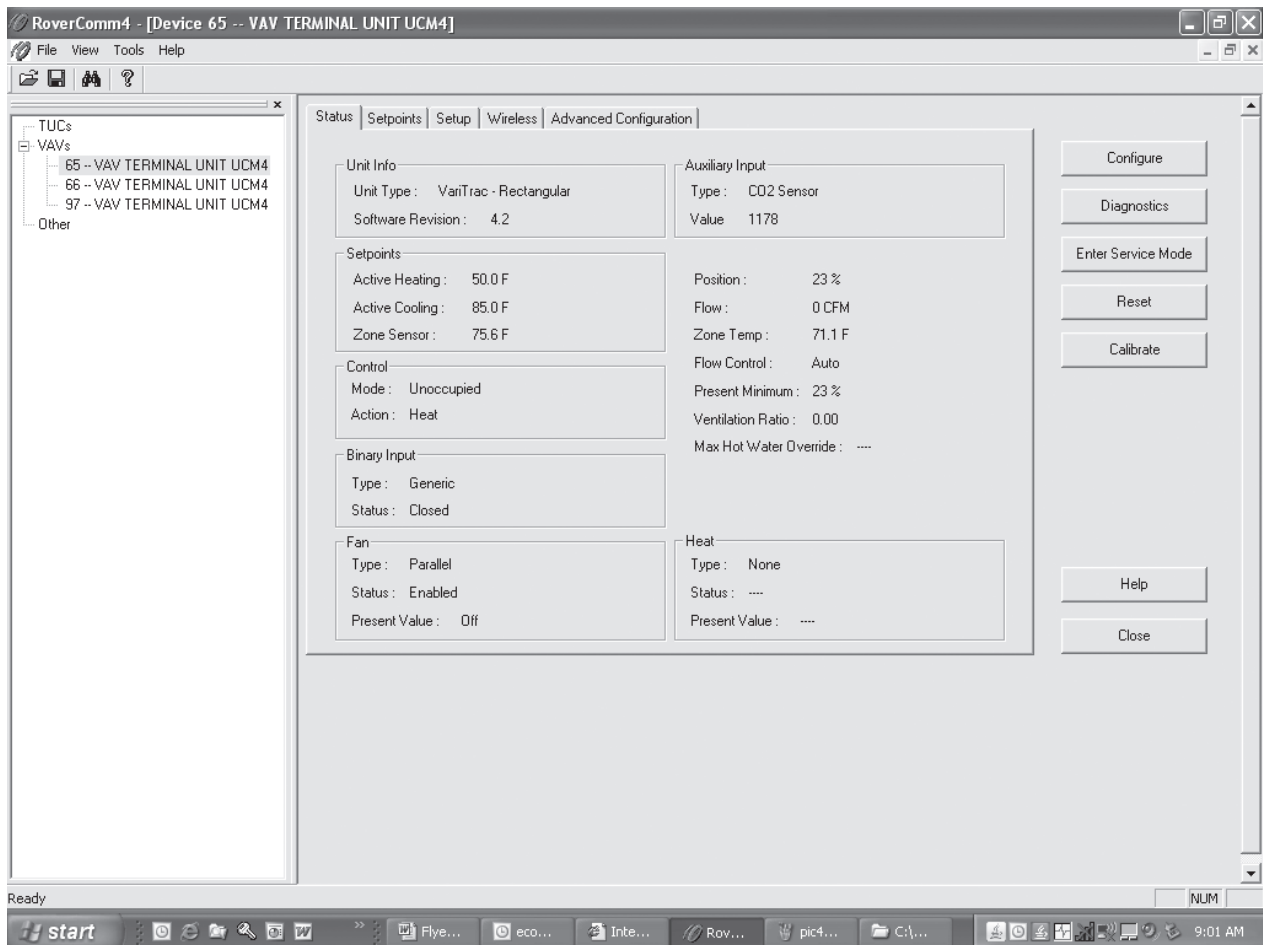
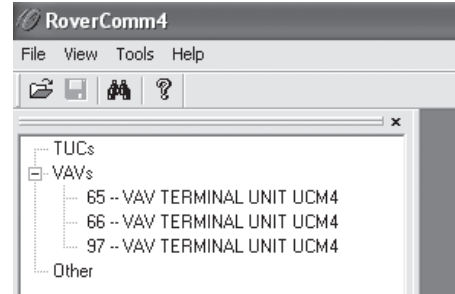


Figure 21. UCM home tabs



- Once the scan is complete, the results will populate the device tree on the left-hand side of the **Rover/Comm4** screen.

Figure 20. Rover/Comm4 screen



- Access the desired UCM from the device tree.

## UCM Home Tabs: At a Glance

### Status Tab

#### Unit Info

**UnitType:** The different types of units for the selected UCM.

**Software Revision:** The version of the UCM software.

#### Setpoints

**Active Heating:** The active (or actual) heating setpoint currently used by the UCM.

**Active Cooling:** The active (or actual) cooling setpoint currently used by the UCM.

**Zone Sensor:** Shows the setpoint set at the zone sensor for the controlled space.

#### Control

**Mode:** Shows whether the UCM is in occupied or unoccupied mode. The control mode determines which heating or cooling setpoints to use.

**Action:** Shows the UCM's heating or cooling action. The cool control action modulates the air valve as if the supply duct air is colder than the space temperature. The heat control action modulates the air valve as if the supply duct air is warmer than the space temperature.

#### Binary Input

**Type:** For version 4.0 or higher UCMs, shows whether the BIP is configured for occupancy or as a Generic BIP.

**Status:** Shows the position of the binary input Open/Closed as a generic input or Occupied Unoccupied from an occupancy input.

#### Fan

**Type:** The type of fan for the unit may be Series, Parallel, or -- (none).

**Status:** Shows whether the fan is enabled or disabled.

**Present Value:** Shows whether the fan is on or off.

#### Auxiliary Input

**Type:** Shows the two types of auxiliary inputs, temperature and CO<sub>2</sub>. They are mutually exclusive to one another.

**Value:** The displayed value will reflect either the temperature (if it has a temperature sensor input) or the PPM (if it is configured with a CO<sub>2</sub> input).

#### Other

**Position:** The air valve or damper position.

**Flow:** This line displays the unit's airflow rate expressed in the flow units selected in the setup menu. This line will not be shown if the UCM is using position control instead of flow control. The UCM will use position control if the flow sensor is failed or not installed. The UCM will also use position control if the

unit's airflow rate is less than 5% or greater than 110% of the unit's cataloged CFM. For example, the UCM will use position control for a size 600 CFM unit if the flow is less than 30 CFM (5%) or greater than 660 CFM (110%).

**Note:** *Although the UCM will read flow down to 5% of cataloged and up to 110% of cataloged, the range of MIN FLOW settings is 0%, or 10% to 100% of cataloged. The range of MAX FLOW settings is 100% of cataloged. In the example above, the lowest allowable MIN FLOW set point is 60 CFM (zero is also permissible) and 600 CFM is the highest allowable MAX FLOW set point.*

**ZoneTemp:** The temperature, as reported by the zone sensor. If the UCM is at version 4 or greater and the unit type is Bypass Damper Round or Rectangular, this field is replaced by the supply air temperature. Dashes appear if the zone sensor is not functioning when allowed to be displayed.

**Flow Control:** The flow control override of the UCM. Valid values: Auto, Open, Closed, Min, or Max.

**Present Minimum:** If the UCM is in pressure independent mode (using flow control), the present minimum, expressed in the appropriate flow units, appears in the **Present Minimum** field. If the UCM is in pressure dependant mode (using position control), the minimum is expressed as percentage open.

**Ventilation Ratio:** The ventilation ratio equals the outside air requirement divided by the air valve flow. Type the occupied outside air requirement and the unoccupied outside air requirement on the **Setpoints** tab.

**Max Hot water Override:** Used to give status if Hot water Valve is being overridden.

#### Heat

**Type:** This field shows the different types of reheat. Choices are 1) None; 2) 3 Stage Electric; 3) Electric Slow Pulse Width Modulation; 4) Proportional Hot Water with -Auxillary Heat; and 5) 3 Stage Hot Water.

**Status:** Shows whether the heat is enabled or disabled.

**Present Value:** Shows whether the heat is on or off.

#### Setpoints Tab

The UCM Home screens that are shown are non adjustable and are used to show values only.

**Note:** *The Setpoints tab will be defined in programming the configuration menus.*

## Wireless Tab

**Note:** This tab displays the older style wireless not to be confused with the new wireless that is being currently offered.

When the UCM version is 3.0 or higher, this tab displays the wireless sensor serial number assignments. Up to five wireless sensors may be assigned to a UCM. Four sensors may be chosen as averaging, one sensor can be chosen as backup. The backup sensors are optional. Backup sensors for temperature and setpoint inputs only affect the UCM if all averaging sensors fail. Backup button functions are always used. Any combination of backup strategies is valid.

For version 4.0 UCMs or higher, if the hardwired sensor is configured as not present then the hardwired zone temperature failure flag will not be set as long as at least one wireless sensor is transmitting a valid zone temperature. Likewise, if the hardwired sensor is

configured as not present then the hardwired setpoint sensor failure flag will not be set as long as at least one wireless sensor is transmitting a valid setpoint.

## Advanced Configuration Tab

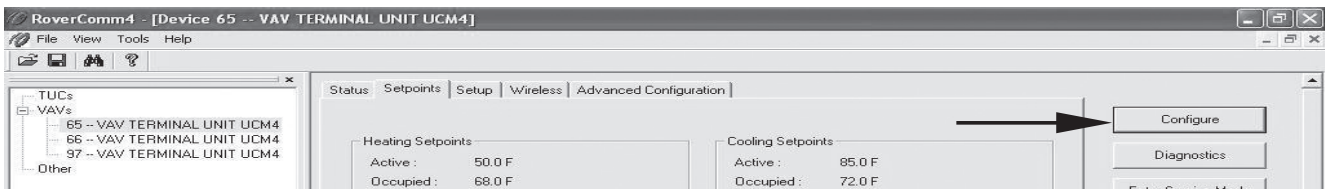
The UCM Home Tabs (and their screens) that are shown are non adjustable and are used to show values only. The advanced configuration tab will be defined in programming the configuration menus

## UCM Home Tabs: Instructions

### Configuration

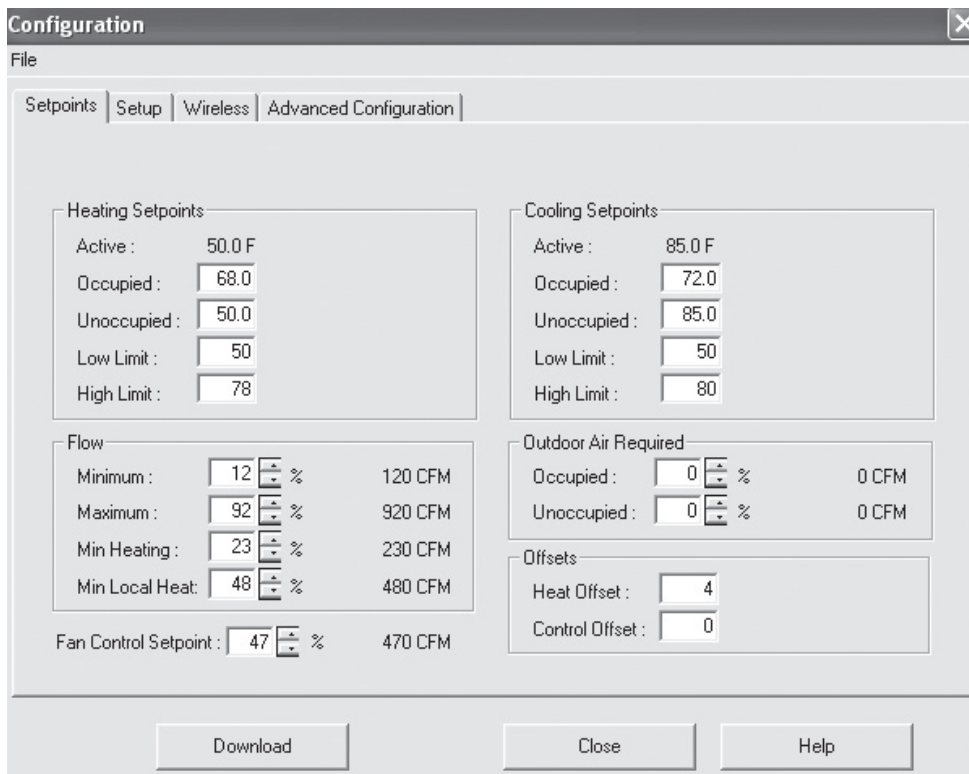
To access the data fields for each tab and to make adjustments, select the **Configure** button as shown in [Figure 22, p. 28](#). To make adjustments, find the correct parameter, change it, and download to UCM.

**Figure 22. Select the configure button**



## Setpoints Tab

**Figure 23. Setpoints tab**



In Rover, the setpoints can be viewed at the UCM **Setpoints** tab and then also changed by selecting the **Configure** button. Following are descriptions of each line on the UCM **Setpoints** tab.

### Heating Setpoints

**Active:** The set point cannot be edited and reflects the set point currently being used for Heating temperature control.

**Occupied:** Set points have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). If a zone sensor thumbwheel set point is not being used, this set point will be used as the UCM's active heating set point during occupied times. The cooling set point must be greater than or equal to the heating set point plus 2.0°F (1.1°C).

***Note:** Occupied cooling and heating set points must be set within the cooling set point high limit and the heating set point low limit in order to control to the proper set points.*

**Unoccupied:** Set points have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). This heating set point is used when the UCM is unoccupied. The unoccupied heating set point must be less than or equal to the unoccupied cooling set point minus 2°F (1.1°C). The unoccupied cooling set point must be greater than or equal to the unoccupied heating set point plus 2.0°F (1.1°C).

**Low Limit:** This limit applies to the occupied mode only starting in UCM version 4.1. Prior to version 4.1, the limits would affect both the unoccupied and occupied setpoints. The occupied heating set point is subject to high and low limits. The cooling set point high limit and the heating set point low limit "cap" your unoccupied set points, which directly impacts energy savings. The upper level device is responsible for preventing the resulting set points from being crossed. This may happen if the heating set point low limit is above the cooling set point high limit. Having the cooling set point high limit and the heating set point low limit set to the factory defaults (cooling high limit = 102°F (38.8°C), heating low limit = 43°F (6.1°C)) should prevent them from impacting field operation.

**High Limit:** This limit applies to the occupied mode only starting in UCM version 4.1. Prior to version 4.1, the limits would affect both the unoccupied and occupied setpoints. Both limits have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). The set point limits will be applied to the active heating set point by the UCM but will not restrict operator entry of set points.

### Cooling Setpoints

**Active:** The set point cannot be edited and reflects the set point currently being used for cooling temperature control.

**Occupied:** Set points have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). If a zone sensor thumbwheel set point is not being used, this set point will be used as the

UCM's active cooling set point during occupied times. The cooling set point must be greater than or equal to the heating set point plus 2.0°F (1.1°C).

***Note:** Occupied cooling and heating set points must be set within the cooling set point high limit and the heating set point low limit in order to control to the proper set points.*

**Unoccupied:** Set points have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). This cooling set point is used when the UCM is unoccupied. The unoccupied cooling set point must be greater than or equal to the unoccupied heating set point plus 2.0°F (1.1°C).

**Low Limit:** This limit applies to the occupied mode only starting in UCM version 4.1. Prior to version 4.1, the limits would affect both the unoccupied and occupied setpoints. Occupied Cooling set point is subject to high and low limits. The cooling set point high limit and the heating set point low limit "cap" your unoccupied set points, which directly impacts energy savings. The upper level device is responsible for preventing the resulting set points from being crossed. This may happen if the heating set point low limit is above the cooling set point high limit. Having the cooling set point high limit and the heating set point low limit set to the factory defaults (cooling high limit = 102°F (38.8°C), heating low limit = 43°F (6.1°C)) should prevent them from impacting field operation.

**High Limit:** This limit applies to the occupied mode only starting in UCM version 4.1. Prior to version 4.1, the limits would affect both the unoccupied and occupied setpoints. Both limits have a range of 30.0°F - 100.0°F (-1.1°C - 37.8°C). The set point limits will be applied to the active heating set point by the UCM but will not restrict operator entry of set points.

### Flow

**Table 8. Valid flow ranges (by model)**

VariTrane C	0, 10-150%
VariTrane D	0, 10-110%
VariTrane F	0, 10-100%

**Minimum:** Although the UCM will read flow down to 5% of cataloged, the range of MIN FLOW settings is 0%, or 10% to 100% of cataloged. The UCM will not drive its flow below this minimum flow value under normal operating conditions while in the cool mode. Cool mode occurs when cool air is in the supply duct. The entry in the Cooling Minimum field must be less than or equal to the entry in the Maximum field.

**Maximum:** This range is 10% to 100% of the unit's cataloged CFM size. Cooling and heating flow can be edited to zero. The UCM will not drive its flow above this maximum flow value under normal operating conditions while in the Cool mode. Cool mode occurs when cool air is in the supply duct. The entry for

## UCM Programming and Operation

Maximum Flow must be greater than or equal to the entry in any of the Minimum fields.

**Min Heating:** The UCM will not drive its position/flow below this value under normal operating conditions while in the HEAT mode (warm air in the supply duct) or while it is using local heat. The Min Heating Flow value must be less than or equal to the Maximum Flow value.

**Min Local Heat:** If the Min Local Heat flow is enabled, then the Min Local Heat flow is used to determine the minimum position/flow instead of the Min Heating Flow when local heat is on. The entry for Min Heating Flow must be less than or equal to the entry for the Maximum Flow.

### Outdoor Air Required

**Occupied:** The UCMs use these values to calculate the ventilation ratio. Valid range: 0 to 100%.

**Unoccupied:** The UCMs use these values to calculate the ventilation ratio. Valid range: 0 to 100%.

### Offsets

**Heat Offset:** This is the value subtracted from the cooling thumbwheel setpoint to derive the heating

setpoint. This defines the minimum difference between the cooling and heating setpoints. Valid Range: 2°F to 10°F.

**Control Offset:** When control offset is active, the UCM adds the value to the edited occupied cooling setpoint and subtracts the control offset value from the edited occupied heating setpoint to determine the active setpoints. The control offset value does not affect a zone sensor thumbwheel setpoint.

### Fan Control Setpoint

The entry on this line determines when a parallel fan will be turned ON and OFF. If "Parallel fan control" has been edited to "DEG" the fan control offset will be entered as a temperature offset (2° - 10°F) (1.1°C - 5.5°C) which will be added to the heating set point. If "Parallel fan control" has been edited to "FLOW" this line will be entered as a percent (0 to 100%) if the unit is a VariTrane unit. The entry field on this line will appear as "-" if the unit does not have a parallel fan.

**Important:** This field is visible ONLY with Parallel Fan Powered units.

### Setup Tab

Figure 24. Setup tab

The screenshot shows the 'Configuration' window with the 'Setup' tab selected. The 'Auxiliary Input' section is highlighted with a red circle. The settings are as follows:

- Unit Type: VariTrac - Rectangular
- Unit Size: 8 x 12 Inches
- Heat Type: None
- Flow Override: Auto
- Max Hot Water Override:
- Local Heat Setpoint:
- Fan Type: Parallel
- Parallel Fan Control: Flow
- BIP Configuration: Generic
- Cooling Flow: Present Value: 0 CFM, Measured Value: 0, Correction Factor: 1.00
- Auxiliary Input: Type: CO2 Sensor, Value: 396, Voltage Ref.: 4.90
- Outputs: 1: Normally Open, 2: Normally Open, 3: Normally Open
- Wired Zone Temperature: Value: 71.1 F, Calibration: 0.0
- Wired Sensor: Use: Averaged, Type: Thermistor, Vote: 1
- Wired Thumbwheel:  Setpoint: 75.6 F, Calibration: 0.0

The following are descriptions of each line on the **Setup** tab. To make changes: Select the **Configure** button in Rover and select the **Setup** tab. Make adjustments if

necessary by opening a drop down arrow or changing a value and press the **download** button.

## Other Fields

**Unit Type:** Select the proper unit type. The unit type information is maintained in the controller's EEPROM.

**Important:** *Edit the unit type BEFORE editing any items on the above list!*

Unit types available for all versions:

- VariTrane C
- VariTrac - Round
- VariTrane D
- Generic

Unit types available for VAV version 4.0 and above:

- Bypass Damper - Round
- Bypass Damper - Rectangular
- VariTrane F - Round
- VariTrane F - Rectangular
- VariTrac - Rectangular

Editing the unit type also affects the following entries:

- Heat type (The default is none)
- Fan type (The default is none)
- Unit size (The default is the smallest unit size)
- Air valve drive time
- Control Algorithm gains (KP, reset times, valve flow constant) for air valve and water valve.

**Heat Type:** The entry in the **Heat Type** field identifies what type of heat control algorithm the UCM should use. If you edit the unit type, Rover automatically changes the heat type to 0 (None). If you edit the heat type or if it changes automatically, Rover automatically assigns the heat outputs per factory specifications.

Possible selections include the following:

- NONE - No heat available
- 1-3 stages electric
- Slow pulse width modulation - Electric (3 min. time base).
- Prop hot water and aux. output
- 1-3 stages hot water/perimeter

**Max Hot Water Override:** When the **Max Hot Water Override** check box is selected, the UCM turns on all hot water outputs. This may be useful for water system balancing. The Maximum Hot Water Override affects only the following heat types:

- 3-Stage Hot Water - Rover energizes all three heat outputs. If the unit has a fan, output 3 is not affected.
- Hot Water with Auxiliary Output - Rover drives open the hot water valve connected to outputs 1 and 2. If not controlling a fan, output 3 energizes.

**Note:** *For the Max Hot Water Override to be effective, the user MUST enable unit heat.*

The UCM will maintain the "Max hot water override" condition over power failures. The only way to cancel a Max Hot Water Override is to clear the Max Hot Water Override check box. If the unit does not have "1-3 stages hot water" or "proportional hot water and aux. output" will be grayed out and non selectable

**Local Heat Setpoint:** When the UCM version is 4.0 and the unit type is not "Bypass Damper - Rectangular" or "Bypass Damper - Round", this value is used to determine whether the Present Cooling Flow is compared to the Min Local Heat Flow setpoint or to the Min Heat Flow setpoint to determine when terminal local heat is allowed.

**Unit Size:** The unit size is dependent on the unit type. Select the unit size from a predetermined list. The unit size for VariTrane C, VariTrane D, VariTrac, and VariTrac-Round type units are designated by their flow size using the appropriate units (CFM, CMS, or L/S). The unit size for VariTrane F-Round, VariTrane F-Rectangular, VariTrac-Rectangular, Bypass Damper-Round, and Bypass Damper-Rectangular type units are designated by the dimensions (in inches) of their blade dampers.

**Flow Override:** The entry in this field has the highest priority of all flow overrides (group, binary inputs, or upper level system functions). Override status can be Auto, Open, Closed, Minimum, or Maximum. When a non-auto flow override is edited from the UCM level, the flow override will be maintained over power failures. See Sequence of Operations for more information.

**Note:** *This is an excellent service point for checking damper operation and CFM flow.*

**Fan Type:** Select the type of fan used by the UCM. If you edit the unit type field, Rover automatically changes the entry to 0 (None). When the value of this field is not None, the configuration of Output 3 is set to Normally Open. Valid Selections: None, Parallel, Series.

**Note:** *The UCM may lockout the fan on its own if any of the following apply: control action HEAT; flow override to drive OPEN, CLOSE, or MAX; or if the zone temperature sensor does not have valid input.*

**Parallel Fan Control:** This entry will determine if a parallel fan will be controlled based on zone temperature or on flow conditions. If "Parallel fan control" has been edited to "DEG" the fan control offset will be entered as a temperature offset (2° - 10°F) (1.1° - 5.5°C) which will be added to the heating set point. If "Parallel fan control" has been edited to "FLOW" this line will be entered as a percent (0 to 100%) if the unit is a VariTrane unit. The entry field on this line will disappear if the unit does not have a parallel fan.

**Note:** *See "Sequence of Operations," p. 38 of this manual for details on parallel fan operation.*



## UCM Programming and Operation

**BIP Configuration:** Version 4.0 or higher UCMs are provided with a binary input that can be used to monitor either an occupancy sensor or provide the status of a generic binary input. Valid Selections: Occupancy, Generic.

BIP Configuration default is Generic. The BIP Configuration interface is for dry relay contacts connected to TB4-1. In generic mode, the state of the input is only passed on from the UCM to Summit. CPL code must be written in order for Summit to utilize any signal received from this generic input. When configured as a generic input and communications are active, an occupancy input state will be reflected by the UCM to the upper level system controller. The upper level system controller shall be responsible for causing any system changes necessary to provide occupied control. When configured for generic mode, loss of communications will result in the UCM defaulting back into occupied mode. In occupancy detector mode, the absence of a 24 VAC signal at TB4-1 indicates occupancy and the presence of 24 VAC indicates non-occupancy. When configured for an occupancy sensor and communications are active, an occupancy input state will be reflected by the UCM to an upper level system controller. The upper level system controller shall be responsible for causing any system changes necessary to provide occupied control. When configured for an occupancy sensor and communications are not active and occupancy is detected, the UCM shall transition to the occupied mode of operation. Upon loss of the occupancy indication from the occupancy detector, the VAV UCM will revert back to unoccupied mode. However, when configured for an occupancy sensor and communications are active, loss of communications does not result in the VAV UCM defaulting to occupied mode.

### Cooling Flow

**Present Value:** This present value shows the current flow being reported by the UCM.

**Measured Value:** If the present value of flow is incorrect the operator can enter the Measured value and Cooling Flow Correction factor will automatically be recalculated.

**Note:** *This can be used to have the correct present value at the UCM as compared to the actual CFM at the inlet of the unit*

**Correction Factor:** Value displayed to show how much the flow input needed to be corrected.

### Auxiliary Input

**Type:** When the UCM version is 4.0 or higher the analog input labelled A/C0<sub>2</sub> can be used to monitor either an auxiliary temperature sensor or a CO<sub>2</sub> sensor. Aux Input Select defaults to AuxTmp Sensor This entry determines the configuration of the A/C0<sub>2</sub> input on terminal TB3-5 of the UCM. Selecting AUXTMP

SENSOR configures the input to use an auxiliary temperature sensor. Selecting CO<sub>2</sub> Sensor configures the input to use a CO<sub>2</sub> sensor. They are mutually exclusive.

**Value:** When the UCM version is less than 4.0 or when the UCM version is 4.0 higher and the Auxiliary Input Type is set to Temp Sensor, the current auxiliary temperature is displayed in this field. The value is reported after applying the calibration offset by the UCM. If the temperature sensor fails, dashes (---) display instead of the temperature.

**Calibration:** The auxiliary temperature calibration offset adds the offset to the value read by the auxiliary temperature sensor.

**EXAMPLE:** If the auxiliary temperature sensor indicates a temperature of 74.0°F (23.3°C) and the auxiliary temperature calibration offset is -1.5°F, the actual temperature used by Rover is 72.5°F (22.5°C). Valid range: -10.0°F - 10.0°F (-5.5°C - 5.5°C).

**Note:** *It may take 30 seconds (after a new offset is entered) before the calibration is factored into the auxiliary temperature.*

### Outputs

**1-3:** The outputs can be either Normally Open or Normally Closed. Outputs 1 and 2 can be edited only when the heat type is 3-Stage Hot Water. In all other cases they are set to Normally Open. If there is a fan, output 3 is set to Normally Open and cannot be edited. If there is no fan, output 3 can be edited if the heat type is either 3-Stage Hot Water or Hot Water with Auxiliary Output.

### Wired Zone Temperature

**Value:** This field displays the value of the wired zone temperature sensor after the UCM has added the wired zone temperature calibration offset. If the zone sensor has failed or is not present, dashes (---) appear.

**Calibration:** The zone temperature sensor calibration offset. The UCM adds the offset to the value read by the zone sensor. After you add a new offset, Rover may take up to 30 seconds to update the displayed temperature. Valid Range: -10°F - 10°F (-5.5°C - 5.5°C).

### Wired Sensor

**Use:** This input determines the function of the wired zone temperature sensor. Select Averaged to use the sensor as part of a wired system OR to use the sensor as an averaging sensor in an older style wireless system.

**Type:** This line is used to edit the type of temperature sensor being used. The sensor type can be selected as either Thermistor or RTD.

**Note:** *Factory supplied sensors are thermistors.*



**Note:** Set point vote determines the weighting of the set point vote. The range is 0-9. This number represents the number of votes the sensor gets when the set points are averaged. If "0" is selected the sensor gets no vote.

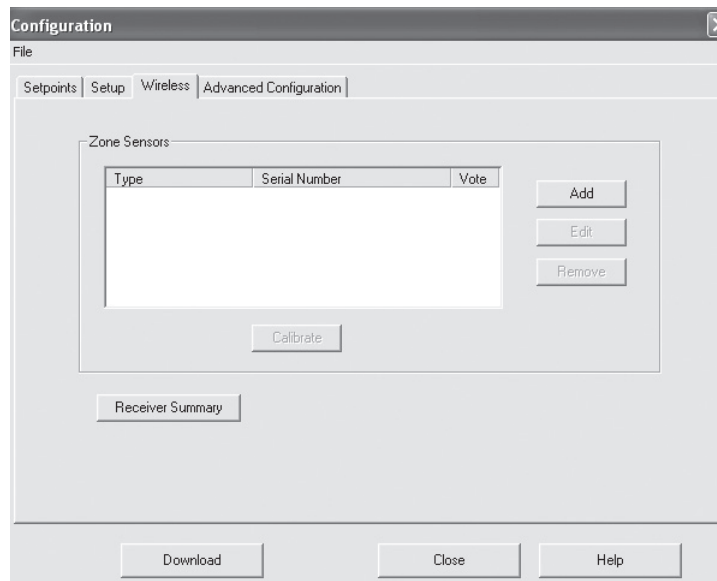
### Wired Thumbwheel

Select the check box to enable the local thumbwheel setpoint input. If the Thumbwheel Setpoint check box is not selected, the UCM does not respond to the following thumbwheel functions:

- Setpoint
- Ability to generate a "drive to max" command
- Ability to generate a "go unoccupied" command

**Note:** Disabling thumbwheel functions does not disable the On/Cancel push button feature.

Figure 25. Wireless tab



This tab was used for the old style wireless system that used spread spectrum technology. For details on how this can be set up for existing applications using the older style wireless sensor see VAV-SVX01B-EN (VAV UCM 4.0).

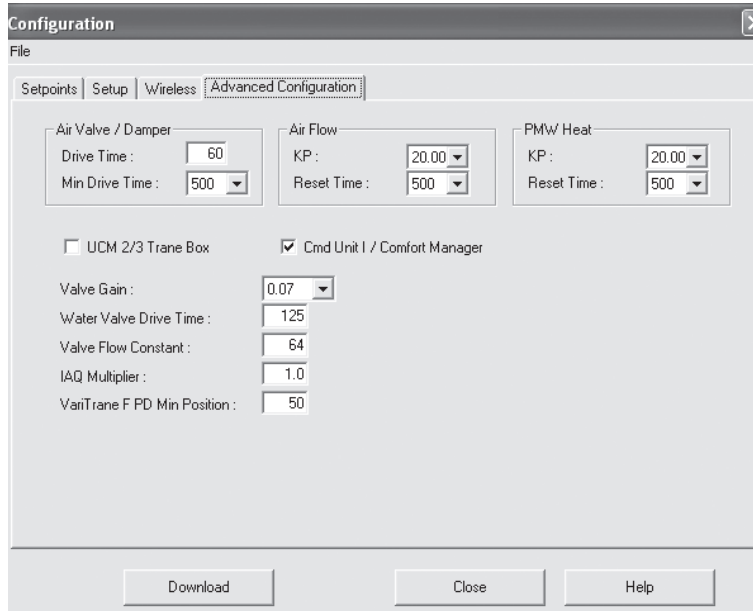
**Setpoint:** This line displays the value of the thumbwheel setpoint after the calibration offset is applied. If the Thumbwheel is placed in the \*\* position and the ON button is pressed, the UCM will request to go unoccupied. If the Thumbwheel is placed in the \* position and the ON button is pressed, the UCM will request a maximum override. Valid Range: 50°F - 85°F (10°C - 29.4°C) Fail, Max, Unocc.)

**Calibration:** The value of the zone temperature sensor calibration offset. The UCM adds the offset to the value read by the zone sensor. After you add a new offset, Rover may take up to 30 seconds to update the displayed temperature. Valid Range: -10°F - 10°F (-5.5°C - 5.5°C).

### Wireless Tab

## Advanced Configuration Tab

Figure 26. Advanced configuration tab



### Air Valve/Damper

**Drive time:** This adjustment can be used to match the DDC UCM 4.2 to the actuator drive time. The air valve damper actuator drive time will be automatically adjusted to the type of Trane Unit type selected.

**Min Drive Time:** Displays the minimum time that the output can be driven. This value restricts the change in the mechanical output. Until the desired change in position will take at least the minimum drive time, the output will not be changed.

### Air Flow

**KP:** This is an internal factor used by the PID control loop that modulates the air valve or damper. The value is predetermined by unit type and unit size.

**Reset Time:** This is an internal factor used by the PID control loop that modulates the air valve or damper. The value is predetermined by unit type and unit size.

### PWM Heat

**KP:** This is an internal factor used by the PID control loop that modulates the terminal heating. The value is predetermined by unit type and unit size.

**Reset Time:** This is an internal factor used by the PID control loop that modulates the terminal heating. The value is predetermined by unit type and unit size.

### Other

**UCM 2/3 Trane Box:** Shows whether the UCM is configured as a Trane box. By default only a box configured as generic is not a Trane box.

**Cmd Unit I / Comfort Manager:** Select the check box to use the VariTrane D best fit configuration. Clear the check box to use the Generic best fit configuration. This check box applies to UCM versions 4.0 and higher. When a VariTrane F style UCM or VariTrac - Rectangular UCM is programmed, it is also configured to its best fit to a generic style or VariTrane D style box. Using this method, newer boxes can be used as replacements or to expand legacy systems.

**Note:** *The Command Unit I and Comfort Managers do not recognize a generic unit type.*

**Valve Gain:** This is an internal factor used by the PID control loop that modulates the air valve or damper. The value is predetermined by unit type and unit size.

**Water Valve Drive Time:** The drive time, in seconds, to stroke the water valve from 0 to 100%.

**Valve Flow Constant:** This is an internal factor used by the PID control loop that modulates the air valve or damper. The value is predetermined by unit type and unit size.

**IAQ Multiplier:** This value is usually sent by the ICS system to adjust the minimum flow setpoint. When the value is greater than 1.0, the VariTrac energy saver feature to ignore minimum flow is ignored and the minimum flow is enforced at the unit controller.

**VariTrane F PD Min Position:** The minimum damper position for a VariTrane F style box when it is operating in the pressure dependant mode. Valid range: 0 to 100%.

## Entering and Exiting the Service Mode

Controllers must be online and in the service mode to receive an override. The service mode disables control from Tracer and places Rover/Comm4 in command of the controller. Controllers that are in the service mode appear in bold in the device tree on the left side of your screen. More than one controller can be in the service mode at one time.

You can place a controller in the service mode manually or let Rover/Comm4 do so automatically when you start an override. Controllers exit the service mode automatically 15 minutes after the last override or when you manually release them.

To enter the service mode:

1. Connect to the Comm4 link and scan for devices. See 'Accessing Rover/Comm4' p. 24
2. In the device list on the left side of your screen, double-click the controller that you want to place in the service mode.
3. Click the **Enter Service Mode** button. While the controller is in the service mode, it appears in bold in the device list.

To exit the service mode, do one of the following:

- Wait for 15 minutes (Rover Comm4 does not need to be online with the controller).
- For each controller in the service mode, click the **Exit Service Mode** button.

## Overriding VAVs

When you override a controller, Rover Comm4 automatically places the controller in the service mode. The controller is automatically released from the service mode after 15 minutes or when you click the **Exit Service Mode** button for the device. You can manually release overrides by selecting the appropriate release command in the **Override** dialog box.

1. On the **Tools** menu, click **Overrides**.
2. Select whether to override TUCs or VAVs.
3. Click the units you want to override.
4. In the list of overrides, click the type of override you want to perform.
5. Click the **Override** button. The controller automatically enters the service mode and exits the service mode 15 minutes after receiving an override.

## Resetting Diagnostics

You can reset diagnostics only for TUCs (not VAV units).

1. In the device list on the left side of your screen, double-click the controller for which you want to reset diagnostics.
2. Click the **Diagnostics** button.
3. Click the **Reset** button. Rover Comm4 attempts to clear all diagnostics on the controller and a message appears.
4. Click OK to close the message and the **Diagnostics** dialog box. You can click the **Diagnostics** button again to verify which diagnostics have been cleared.

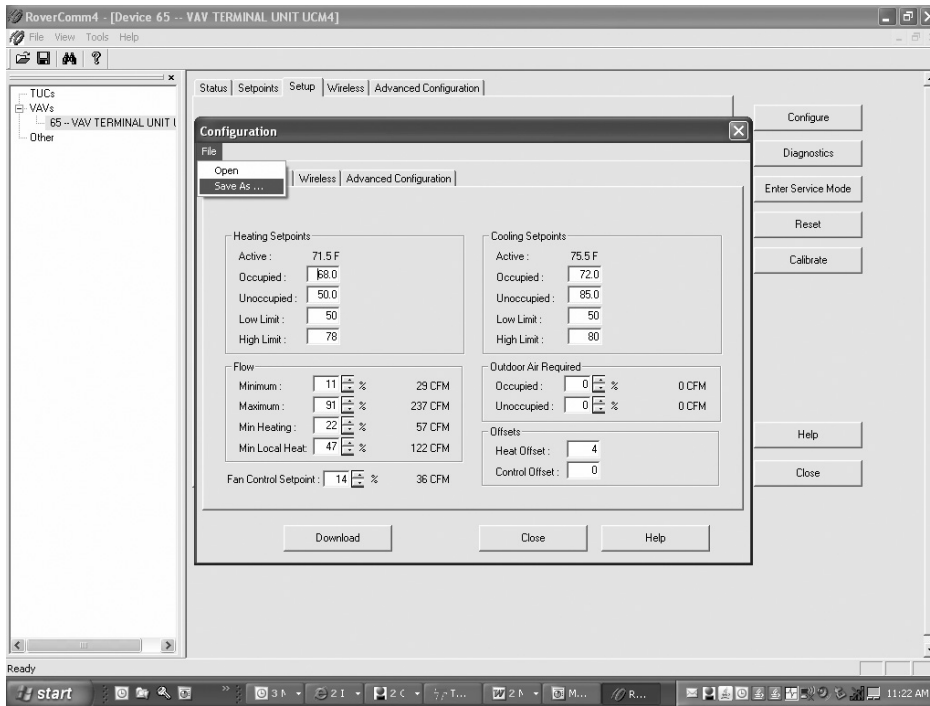
## Saving VAV Program

Each VAV unit with a UCM 4.2 has been factory commissioned with a program that can be saved to your hard drive.

This can be used to save the original program for a backup in case unit needs to be put back to original specifications or to download into a UCM 4.2 DDC controller that has like parameters that has been corrupted.

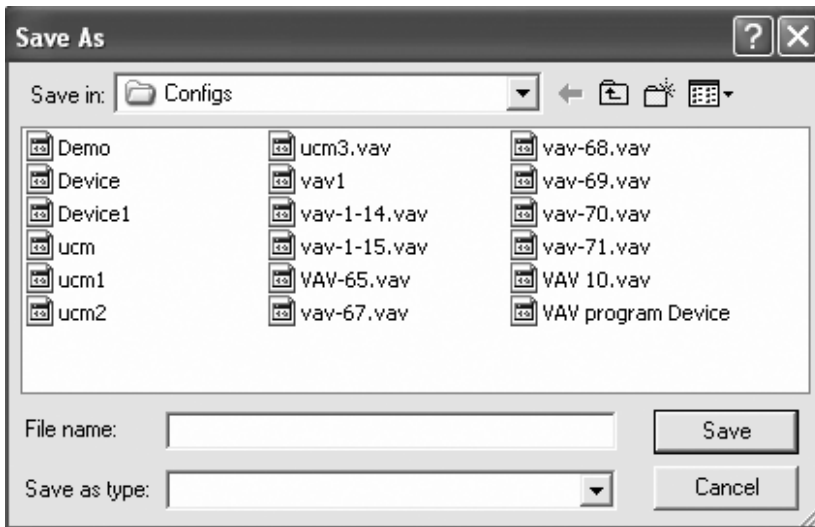
1. Select the **Configure** button, and the **Configuration** screen will appear.

**Figure 27. Configuration screen (save as)**



2. Click the **File** menu and click **Save As**.
3. The **Save As** dialog box will appear. Name unit and click **Save**.

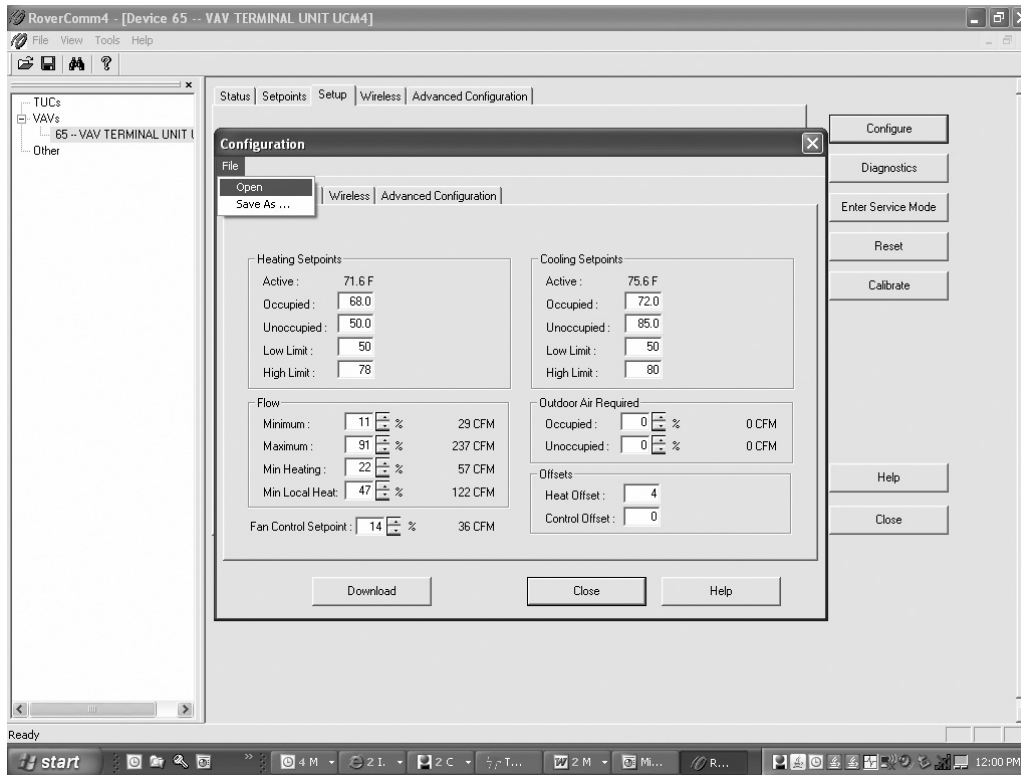
**Figure 28. Save As prompt**



## Downloading Program Files from PC to DDC UCM 4.2

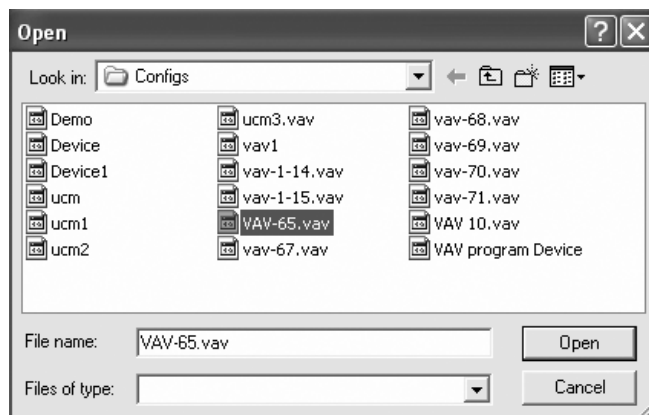
1. Select the **Configure** button, and the **Configuration** screen will appear

**Figure 29. Configuration screen (open)**



2. Click the **File** menu and click **Open**.
3. The **Open** dialog box will appear. Select the file you wish to open and click the **Open** button.
4. Download to DDC VAV controller.
5. Program is now in controller.

**Figure 30. Open dialog box**





# Sequence of Operations

## Chapter Overview

This chapter contains information about the following:

- Single Duct Units
- Override Conditions (Single Duct)
- Fan-Powered Units
- Parallel Fan-Powered Units
- Override Conditions (Parallel Fans)
- Series Fan-Powered Units
- Override Conditions (Series Fan)
- Zone Sensor Functions
- Flow Sensor
- Failure Modes

## Single Duct Units

When the UCM control action is COOL, the UCM controls the modulation of the air valve as a cooling source to maintain the “active cooling set point.” Airflow is varied between the minimum and maximum flow set points to maintain temperature set points. A PI control algorithm is utilized to minimize the measured difference between the active zone set point and the actual zone temperature.

It is possible for units to utilize electric or hot water heating coils to maintain temperature set points. After the temperature loop calls for minimum cooling flow and the zone temperature is at or below the heating set point, these units shall control to their respective “Minimum Heating Flow.” Once this “Minimum Heating Flow” is established, heat is allowed to operate according to the “Heat Control Type” specified for the controller. For electric heat units, this heating minimum flow set point must be at or above 20% of the unit cataloged airflow. Electric heat may be pulse width modulation or staged electric heat. Staging has the following ON and OFF switch points. UCM 3.3 and later allow hot water to turn on regardless of flow/position

**Table 9. Set points**

Stage	ON Switch point	Off Switch point
1	At the heating set point	0.5°F above the heating set point
2	1°F below the heating set point	0.5°F below the heating set point
3	2°F below the heating set point	1.5°F below the heating set point

Hot water heat control may be either ON/OFF or proportional. ON/OFF hot water is activated on the same schedule as staged of electric heat.

Utilization of the “Heating Minimum Flow” set point allows separate minimum flows to be active depending on whether or not the unit heat is active.

## Override Conditions (Single Duct)

The UCM occupied controls can be overridden by the following override commands:

### Unoccupied

If the control mode is unoccupied (either as edited by software or as determined by the binary input), the unoccupied cooling and heating temperature set points are used for temperature control. Heat outputs remain active.

### Heating

If the control action is edited to HEAT, the UCM controls the air valve as a heating source rather than cooling. Electric reheat is available the supply air temperature (or auxiliary temperature) is below 70°F. Local hot water reheat is always available to keep the zone above the heating set point. The “Heating Minimum Flow Set Point” will set the minimum flow.

### Flow Control Override

Flow control may be overridden by any of the following commands:

- Drive Air Valve Fully Open. The air valve will be fully open and heat outputs disabled.
- Drive Air Valve Fully Closed. The air valve is driven fully closed and heat outputs disabled.
- Drive Air Valve to Minimum Flow. The air valve is driven to the minimum airflow set point. The heat outputs remain operational.
- Drive Air Valve to Maximum Flow. The air valve is driven to the maximum airflow set point. The heat outputs remain operational.

### Heat Control Override

Heat control can be disabled, locking out heat outputs.

### Control Offset

Control offset may be enabled, which adjusts the edited cooling and heating set points.

### Recalibrate (Reset)

The recalibrate function can be enabled. If enabled, the unit will perform a recalibration.

## Fan-Powered Units

**Table 10. Fan actuation schedule**

FAN TYPE	OCCUPIED		UNOCCUPIED
Series	ON		OFF if valve closed AND reheat off
Parallel based on Temperature	Cool mode: ON if zone temp < heating set point + fan offset + 0.5°F Heat mode: fan off unless reheat is on	Cool mode: OFF if zone temp > heating set point + Heat mode: fan off unless reheat is on	OFF unless local reheat is on
Parallel based on Flow	Cool mode: ON if flow < fan set point OR if flow < active minimum flow set point Heat mode: fan off unless reheat is on	Cool mode: OFF if flow > fan set point + 5% AND flow > active minimum flow set point Heat mode: fan off unless reheat is on	OFF unless local reheat is on

## Parallel Fan-Powered Units

### Occupied Units

Air valve control for parallel fan-powered units is the same as for single duct units.

The first heat output is utilized to control the fan. The remaining outputs are utilized to control heat. Fan energization is a function of the "Parallel Fan Control Offset". The parallel fan control can be specified as an offset temperature in degrees above the heating set point or as a flow offset in CFM. The fan will be energized above the fan control offset if reheat is required.

### Parallel Fan Flow Type Control

If the fan control is based on flow, the unit fan will be energized whenever primary airflow is below this set point. For this parallel fan configuration, the fan control point, if specified in a percentage of unit airflow, must be set between 15% and 30% of the units cataloged airflow to assure proper operation. A differential of 5% exists to avoid excessive fan cycling.

**Note:** The fan control offset is entered in CFM when used on a VariTrane unit.

### Parallel Fan Temperature Type Control

When the fan control offset is in terms of a temperature above the heating set point, the fan shall be energized whenever the zone temperature is below the heating set point plus the fan control offset. A differential of 0.5°F (0.3°C) shall apply to this switch over to avoid fan cycling. Heat stages are energized on the following schedule:

**Table 11. Heat stages**

Stage point	ON Switch point	OFF Switch
1	At the heating set point	0.5°F above the heat set point
2	1°F below the heat set point	0.5°F below the heat set point

Whenever the fan is energized, the primary airflow is controlled at the "Heating Minimum Flow" set point.

## Override Conditions (Parallel Fans)

The UCM occupied controls can be overridden by the following override commands:

### Unoccupied

If the control mode is unoccupied, the unoccupied cooling and heating temperature set points are used for temperature control. Fan and heat outputs are activated at the unoccupied heating set point.

### Heating

If the control action is HEAT, the UCM controls the air valve as a heating source rather than cooling. Fan and heat outputs are disabled for parallel units with electric heat. If the heat type is hot water heat, then the fan will remain on if the heat is on during the heating control action.

### Flow Control Override

Flow control may be overridden by any of the following commands:

- Drive Air Valve Fully Open. The air valve will be driven fully open. Fan and heat outputs are disabled.
- Drive Air Valve Fully Closed. The air valve is driven fully closed. Fan and heat outputs are disabled.
- Drive Air Valve to Minimum Flow. The air valve is driven to the minimum airflow set point. The fan and heat outputs remain operational.
- Drive Air Valve to Maximum Flow. The air valve is driven to the maximum airflow set point. The fan and electric heat outputs are disabled (hot water heat remains enabled).

### Heat Control Override

Heat control can be disabled, locking out heat outputs.

### Fan Control Override

Fan control can be disabled, locking out both fan and heat outputs. This affects only parallel fan-powered units.

### Control Offset

Control Offset may be enabled, which adjusts the edited cooling and heating set points.



## Sequence of Operations

### Recalibrate (Reset)

The recalibrate function can be enabled.

## Series Fan-Powered Units

### Occupied Units

Air valve control for series fan-powered units is the same as both single duct and parallel fan-powered units. During the occupied mode of operation, the series fan is continuously energized. Heat stages are energized on the following schedule:

**Table 12. Heat stages**

Stage	ON Switch point	OFF Switch point
1	At the heating set point	0.5°F above the heating set point
2	1°F below the heat set point	0.5°F below the heat set point

### Override Conditions (Series Fan)

The UCM occupied controls can be overridden by the following override commands:

#### Unoccupied

If the control mode is edited to unoccupied, the unoccupied cooling and heating temperature set points are used for temperature control. The series fan and heat outputs will be activated as necessary to maintain the current unoccupied set points. The fan control point is not utilized on series units. On electric heating and hot water heating units, the fan and heat are energized at the unoccupied heating set point. The minimum cooling flow set point is reset to zero unless minimums are being enforced by a group override. A series fan will be energized anytime the air valve's position is greater than 0%.

#### Heating

If the control action is edited to HEAT, the UCM controls the air valve as a heating source rather than cooling. The unit fan remains operational. Unit heat on an electric heat unit is locked out, but remains active on hot water units.

#### Flow Control Override

Flow control may be overridden by any of the following commands:

- Drive Air Valve Fully Open. The air valve will be driven fully open. Fan operation is unaffected, but heat outputs are locked out.
- Drive Air Valve Fully Closed. The air valve is driven fully closed. The fan and heat outputs are locked out.
- Drive Air Valve to Minimum Flow. The air valve is driven to the minimum airflow set point. The fan and heat outputs remain operational.

- Drive Air Valve to Maximum Flow. The air valve is driven to maximum airflow set point. The fan and heat outputs remain operational.

### Heat Control Override

Heat control can be disabled locking out heat outputs.

### Fan Control Override

Fan control override does not affect fan operation on series fan-powered units.

### Control Offset

Control offset may be enabled which adjusts the edited cooling and heating set points.

### Recalibrate (Reset)

The recalibrate function can be enabled.

## Zone Sensor Functions

The zone sensor utilizes a thermistor element to measure zone temperature. The zone sensor has the following options:

### Zone Temperature

Each zone sensor module includes a zone temperature sensor.

### Set Point

A UCM will only use the zone sensor thumbwheel set point (during occupied time) if "Zone sensor thumbwheel functions" is edited to ENABLE on the UCM setup screen.

### ONTimed Override (TOV) and CANCEL Timed Override (TOV)

The ON (TOV) and CANCEL (TOV) commands can be issued by pressing the ON or CANCEL buttons on any of the UCM zone sensor modules.

- When an ON button on a zone sensor is pressed (shorting the zone temperature sensor circuit), the UCM will set a TOV signal, clear the TOV cancel signal if it is set, and start the two hour timed override timer. The TOV signal will be maintained for two minutes.
- When a CANCEL button on a zone sensor module is pressed for at least two seconds, the UCM must set a TOV cancel signal, clear the TOV signal if it is set, and set the timed override timer to zero.
- Pressing any zone sensor module's ON or CANCEL button will not affect the zone temperature reported from the UCM.

**Note:** TOV push buttons should be pressed for at least 2 seconds and not more than 15 seconds.

### Drive to Max and Go Unoccupied

When a zone sensor thumbwheel is turned to its high-end limit, indicated by a "\*" on the thumbwheel, and the ON button is pressed, the UCM will initiate a "Drive to Max"



command. When a zone sensor thumbwheel is turned to its low limit, indicated by a “\*\*\*” on the thumbwheel, and the ON button is pressed, the UCM will initiate a “Go UNOCCUPIED” command. The UCM will maintain the command until the zone sensor set point is adjusted to within the range of 50° to 85°. Any zone sensor module that has a thumbwheel and ON (TOV) button can initiate these commands.

**Notes:**

- The UCM will not send these commands if “Zone sensor thumbwheel functions” is edited to DISABLE on the UCM setup screen.
- When an ICS is connected to the UCM, the UCM will pass the commands to the ICS without taking any control action of its own. Since this is true, it may take a minute or so after the command is initiated before the UCM actually goes unoccupied or is driven to maximum.
- The UCM will not generate a TOV signal when a Drive Max or Unoccupied command is initiated.
- Pressing the ON button will not affect the zone temperature reported from the UCM.
- The UCM will remain in the Drive Max or Unoccupied status over power failures IF “\*\*” or “\*\*\*” (respectively) have been initiated prior to the power failure.

**Note:** TOV push buttons should be pressed for at least 2 seconds and not more than 15 seconds.

## Flow Sensor

The flow control is pressure independent utilizing the VariTrane flow-sensing ring. The flow ring provides one of the most accurate differential pressure flow measurements in the industry by averaging pressure differentials across 16 sensing points. These sensing points, arranged in a ring configuration to compensate for various inlet duct configurations, provide a signal accurate to within +/-5% of cataloged CFM provided there is 1½-inlet diameters of straight ductwork upstream of the VAV box. The pressure differential signal from the flow ring is then converted to an electrical signal, which is utilized in the control algorithm of the unit controller. It is recommended that the recalibrate sequence be initiated on a weekly basis. Assuming 1½ inlet diameters of straight duct work and proper system recalibration, total system flow measurement accuracy (flow ring, transducer, and UCM controller) during the occupied mode should be +/-5% of cataloged airflow over the typical operating range of 20% to 100% of unit cataloged airflow.

## Failure Modes

Each UCM has diagnostic capabilities, which allow it to sense various failure conditions. This diagnostic capability aids in maintenance and trouble shooting of the system. Along with reporting these failure conditions, the UCM will follow a pre-programmed operating sequence designed

to maintain zone comfort during a failure. The failure conditions and backup operating sequences are explained below.

### Temperature Sensor Failure

Failure of a zone temperature sensor (open or below low limit of 0°F (-17.8°C)) will cause fan and heat outputs to be disabled and airflow to be controlled to the minimum cooling flow set point. If the measured temperature fails above the high limit (short or above 100°F (37.8°C)), the airflow shall be controlled to the maximum flow set point.

**Flow Sensor Failure.** If a flow sensor failure is reported (open, short, fails calibration, or is out of the normal range of 5% to 110% of box cataloged), the UCM will immediately revert to a position-based, pressure dependent control algorithm. This allows full operation of the unit and maintains the ability to control the zone temperature. If a flow sensor has failed, it is periodically checked for proper operation. If found to be operating properly, the UCM will be switched to the standard pressure independent control. Otherwise, position control is used as long as the flow signal remains out of range.

### Local Thermostat Set Point Failure

Failure of a local thermostat set point adjustment potentiometer will cause the UCM to revert to the edited occupied cooling and heating set point.

### Communications Failure

A fifteen-minute failure in communications between the UCM and Tracer Summit will cause the UCM to:

- Operate in the occupied mode (provided that no occupancy sensor is present on input TB4-1).
- Set the IAQ multiplier to 1.0.
- Disable the control offset.
- Use the control action as determined by the auxiliary sensor. The auxiliary temperature is compared to the zone temperature. If the supply air temperature is 10°F (5.5°C) greater than the zone temperature, then the control action will be heat. If the supply air temperature is less than or equal to the zone temperature, the control action will be cool. If the supply air temperature is between the zone temperature and the zone temperature +10°F (5.5°C) (zone temperature < supply air temperature < zone temperature + 10°F) (5.5°C), the control action remains the same and the UCM controls to the minimum flow set point. If an auxiliary sensor is not installed and the VAV unit is not under Tracer Summit control, the UCM will retain the last control action in effect.



# Air and Water Balancing

## Chapter Overview

This chapter contains information about the following:

- Air Balancing
- Water Balancing

## Air Balancing

After the unit has been mounted and all electrical and duct connections have been made, the air distribution system should be balanced. The proper variable air volume balancing procedures depend on the type of VAV system used and the options specified on the VariTrane® unit. This section will cover the basic balancing procedures and calibrations needed to balance an air distribution system using VariTrane units. This section suggests only one balancing procedure. Since there are many possible air balancing procedures, keep in mind that these procedures are only suggestions.

**Note:** Before performing these balancing procedures, the calibration command should be initiated at least 15 minutes prior to the balancing procedure.

### System Checkout

- Check the VAV system installation for conformity to design.
- Walk the entire system from air handling equipment to the terminal unit to determine variations of installation from the plans.
- Check for inadvertent obstructions in the ductwork (such as closed fire dampers).
- Insure that any turning vanes, filters, and dampers (both volume and fire) are installed in the correct position.
- There should be a 1.5 duct diameter long run of straight ducting into the VAV units inlet.

### System Setup

- Set the outside air dampers to their minimum position.
  - Start the supply and return air fan(s).
  - Before balancing the system, ensure that there is enough CFM for all zones.
6. Drive all VAV boxes MAX.
- Starting with each individual branch duct, open all the VAV units in that branch duct to the maximum cooling position.

**Note:** This can be done using Rover or EveryWare by giving each UCM a "Drive Max" command or by rotating the Zone sensor set point knob to the "\*" position, and hold the TOV ON button for two seconds. The damper will remain at its maximum

set point until the zone sensor knob is moved back into the normal operating range.

7. Read airflow at the most remote unit. In most systems, this will be the VAV unit located furthest from the fan. This will be the unit in the system that will be critical from an air delivery set point. If airflow is not adequate, increase the supply fan CFM to achieve adequate airflow.
- If the CFM is at or above design, the system can now be balanced. If the measured CFM is below design, insure the VariTrane unit is in full cooling position.
  - If the air delivery through this VariTrane unit is still below the design requirements, increase the supply fan CFM to achieve adequate airflow.

**Note:** To increase supply fan CFM check to make sure VFD/IGV are giving max output. If not at max output; adjust discharge static setpoint until at max output. If already at max output then make the required adjustments to pulley sizes, motor sizes and electrical connections to accommodate fan speed changes. If any adjustment have been made, repeat step 2.

- If after adjusting the fan to its maximum capacity there is still a shortage of airflow, shut off part of the system to provide enough airflow to balance the other part of the system. This can be done using Rover or the "Override to Unoccupied" command ("\*\*") at the zone sensor.
8. After determining that there is enough CFM for all zones, drive all the VAV boxes to MIN.

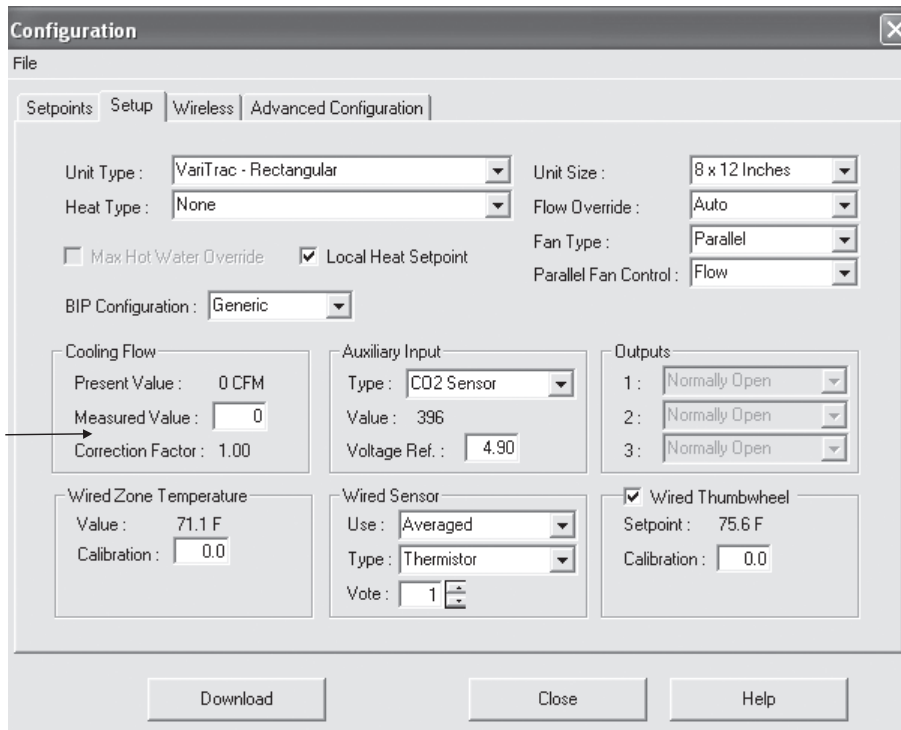
**Note:** If the VAV boxes have already been assigned to groups and these groups are separate thermal zones, then the balancing can be done on a group basis.

## VAV Single Duct Unit Air Balancing

Select a group to balance and give the VAV units a recalibrate command and then the group a flow override Drive MAX command.

**Note:** If the VAV boxes have not been placed in a group, each individual UCM can be overridden to Drive MAX in the Override menu in Rover. However, this will be more time consuming.

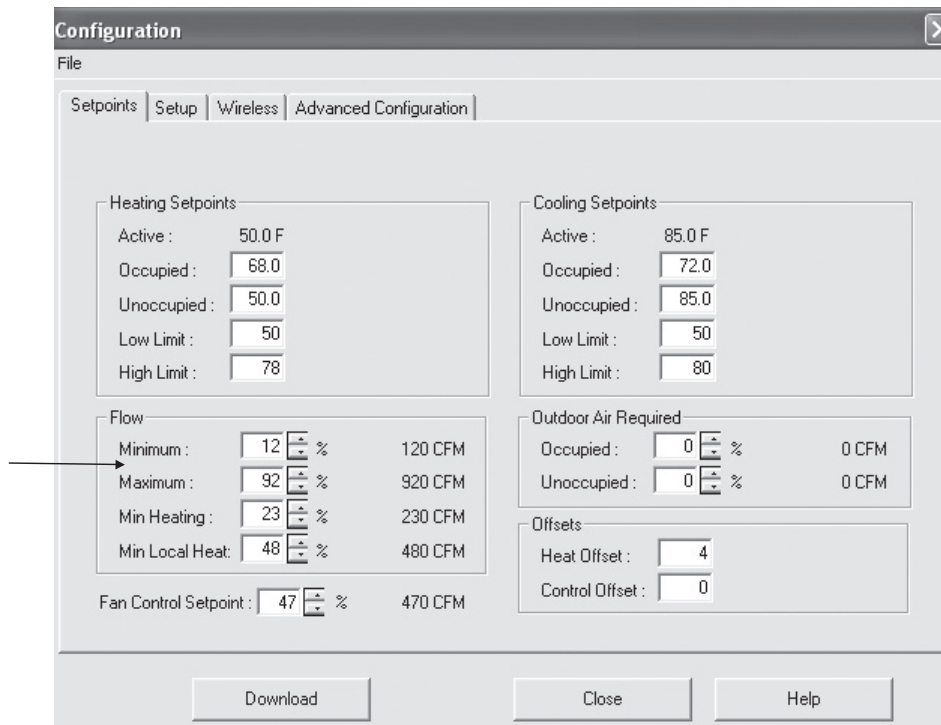
Figure 31. Measured value field



If reported flow in Rover is different from the measured CFM (flow hood measurement) a cooling flow correction

can be calculated by Rover by entering the measured flow in the measured value field. See above, [Figure 31, p. 43](#).

Figure 32. UCM set point menu



## Air and Water Balancing

1. Adjust each VAV box maximum flow set point required for its zone using the UCM set points menu. See [Figure 32, p. 43](#).

**Note:** This could already be done in the factory in its commissioning process.

2. After balancing a group/box, return that group/box flow override to AUTO.

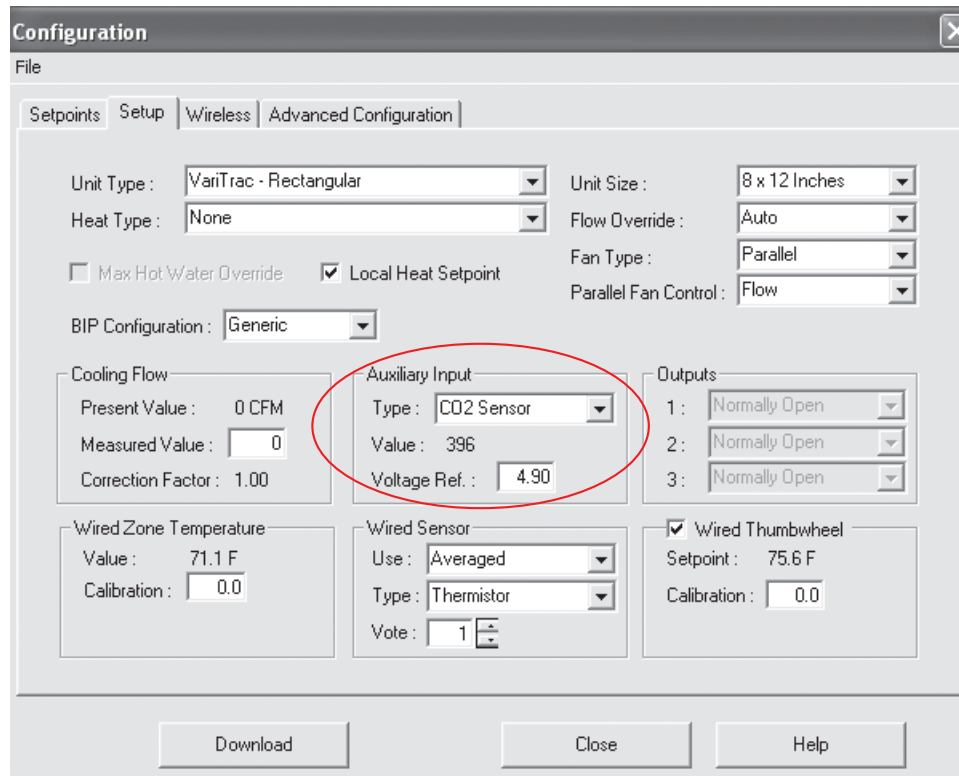
3. Continue to the next group/box repeating VAV unit air balancing procedures until each unit is delivering the correct CFM.

4. Upon completion of the VAV air balancing, remove all overrides.

5. Initiate a recalibrate command.

## Water Balancing

Figure 33. Rover configuration UCM setup menu



The screenshot shows the 'Configuration' window with the 'Advanced Configuration' tab selected. The 'Auxiliary Input' section is highlighted with a red circle. The settings are as follows:

- Unit Type: VariTrac - Rectangular
- Unit Size: 8 x 12 Inches
- Heat Type: None
- Flow Override: Auto
- Max Hot Water Override:
- Local Heat Setpoint:
- Fan Type: Parallel
- Parallel Fan Control: Flow
- BIP Configuration: Generic
- Cooling Flow: Present Value: 0 CFM, Measured Value: 0, Correction Factor: 1.00
- Auxiliary Input: Type: CO2 Sensor, Value: 396, Voltage Ref.: 4.90
- Outputs: 1: Normally Open, 2: Normally Open, 3: Normally Open
- Wired Zone Temperature: Value: 71.1 F, Calibration: 0.0
- Wired Sensor: Use: Averaged, Type: Thermistor, Vote: 1
- Wired Thumbwheel:  Setpoint: 75.6 F, Calibration: 0.0

Each VAV UCM can have its hot water valve overridden to drive fully OPEN (2-position and proportional). This can be done in the Rover Configuration UCM setup menu and can be used to assist in water balancing.

1. Access VAV UCM with Rover service software.
2. Select a VAV box to balance, and drive its hot water valve open (max hot water override).
3. Using hydraulic pressure gauges, measure the flow across the high and low ports. Convert this data from a pressure differential to gallons per minute (GPM).
4. Adjust the circuit setter until it is within design specifications.
5. Once achieved, lock the circuit setter in place. Mark the position with a permanent indicator.
6. Remove all gauges and software overrides.

# Troubleshooting

**⚠ WARNING**

**Live Electrical Components!**

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

## Chapter Overview

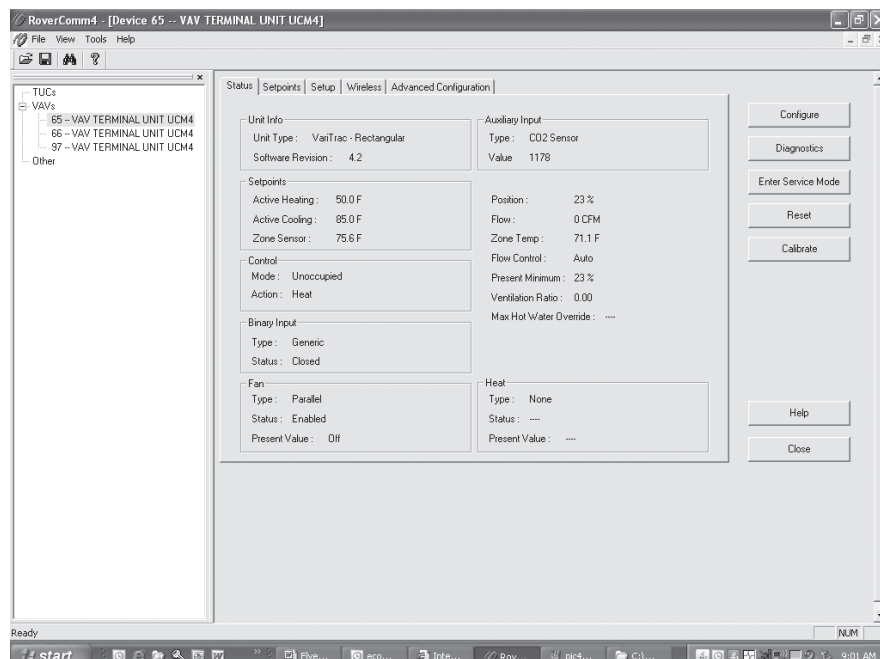
This chapter contains information about the following:

- SP: Diagnosing the Problem
  - Diagnostic Log

## Diagnostic Log

The Diagnostic Log reports diagnostic and informational modes/items that are not in the unit's normal operation.

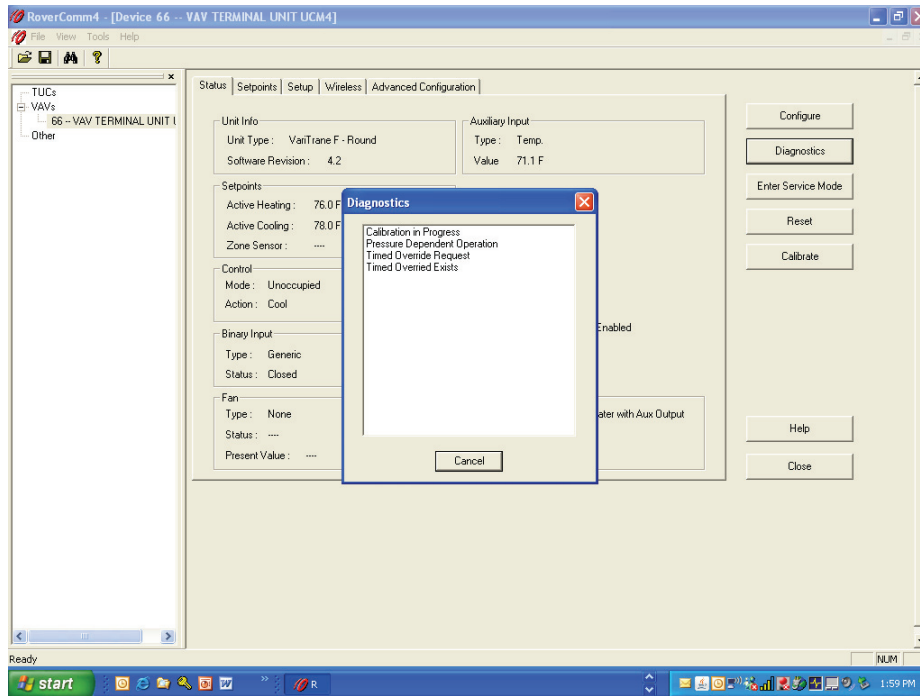
**Figure 34. Diagnostic log**



Some of the items reported (see [Figure 35, p. 46](#)) are listed to aid in understanding current operation. Reported items are: 1) Timed Override Exists, 2) Cancel Timed Override, 3) Auxiliary Temperature Sensor Not Present, 4) Unoccupied Request from Zone Sensor \*\* Function, 5) Max Flow Request from Zone Sensor \* Function, 6) Calibration in Progress, and 7) Pressure Dependent Operation.

- Diagnostic Table
- Troubleshooting Procedures
  - UCM Failure Procedures
  - UCM Communication Loss Procedures
  - Wired Zone Sensor Failure Procedures
  - Wired Zone Setpoint Failure Procedures
  - Wireless Zone Sensor Failure Procedures
  - Airflow Failure Procedures
  - Auxiliary Temperature Sensor Failure Procedures
  - Auxiliary CO<sub>2</sub> Sensor Failure Procedures
  - VAV Damper Failure Procedures
  - VAV Series Fan Failure Procedures
  - VAV Parallel Fan Failure Procedures
- Trane/Honeywell Proportional Valve Check Out Procedures

**Figure 35. Items reported**



## Diagnostic Table

Use the Diagnostic Table (Table 13, p. 46) for failure parameters and Comm. 4 UCM actions to help understand issue.

**Table 13. Failure parameters and Comm. 4 UCM actions**

Sensed Parameter	Failure Criteria	Action Taken
Zone Temperature	Open OR Short (> 25 seconds) AND no active wireless sensors.	If failed open, control valve as if very cold temperature. If failed shorted, control as if very hot temperature.
Thumbwheel Setpoint	Open OR short AND no active wireless sensors.	Setpoints from EEPROM used.
Air Flow	<p>For UCM 3.3 and prior, Flow &lt; 10% when flow control point &gt; 10% OR flow &gt; 110% or 150% for series C.</p> <p>For UCM 4, Flow &lt; 5% when flow control point &gt; 10% OR flow &gt; 115% or 155% for series C.</p> <p>UCM 4 will also indicate open/short for the air flow sensor.</p>	<p>If unsuccessful at recovering flow signal, operate in pressure dependent mode until flow signal regained.</p> <p>For UCM 4, if flow input is open or shorted the flow failure flag will be set and pressure dependent mode will be used.</p> <p>UCM 3.3 is the only version that sets the failure flag if the valve is flowing too much air (&gt;110% or 150% for series C)</p>

**Table 13. Failure parameters and Comm. 4 UCM actions**

Sensed Parameter	Failure Criteria	Action Taken
Auxiliary Temperature	Open or short	Tracer supplied data used for auto changeover logic.
CO(a)	Short or CO <sub>2</sub> value < 200 ppm	For UCM 4 with the aux input configured for CO <sub>2</sub> mode: if the CO <sub>2</sub> input is shorted or reading below 200 ppm, the Failed CO <sub>2</sub> sensor failure flag will be set.
Supply Air Temperature(b) (VariTrac Bypass Damper mode)	Open or short	For UCM 4 in bypass damper mode: if the SAT input is shorted or open, the Failed SAT sensor failure flag will be set.
Supply Air Pressure(a) (VariTrac Bypass Damper mode)	Open or short	For UCM 4 in bypass damper mode: if the SAP input is shorted or open, the Failed SAP sensor failure flag will be set.

(a) UCM 4.0 and above will not detect an open. Instead, it will report 258 ppm.

(b) New to UCM 4.2

## UCM Failure Procedures

In the event that the UCM is not operating, properly inspect the following:

- Incorrect supply voltage/No voltage

- The green LED indicates power and should be "steady" ON.
  - Measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
  - If no voltage, check up stream of controller to see were voltage has been interrupted. See complete wiring diagrams, [Figure 44](#) to [Figure 51](#).
7. Communication wiring error (shorts, open, or reversed polarity)
    - Remove the communication link past the first VAV box and verify the polarity. Check resistance across the communication wires for possible shorts or open circuitry.
  8. Communication link failure/down
    - One UCM failure can bring down all UCM communications. The link is set up as a daisy chain see chapter 2 for details. If whole link is down remove sections of the comm. link from UCMs to isolate portions of the link to find bad UCM(s). Start at the BCU/CCP and remove comm. link from all units except first UCM and see if you can communicate with the one UCM. If the UCM cannot communicate with BCU/CCP, check UCM with Rover. If you can communicate with the UCM with Rover then the issue is in the BCU/CCP. If you can communicate with UCM the problem is further down. Go half way down the link from the BCU/CCP and remove the downstream half of the link and see if the communication comes up with the still attached UCM's. If it does not, you know the bad UCM(s) are in the existing attached link. If communication does come up then the issue is further down the link. Repeat until UCM(s) bringing down comm. link are found.

**Important:** For final step check program by downloading good program using Rover, see page 48.

## UCM Communication Loss Procedures

In the event that the UCM is not communicating properly inspect the following:

1. Incorrect supply voltage/No voltage
  - The green LED indicates power and should be "steady" ON.
  - Measure the power input to TB1-1 (power) and TB1-2 (Common/ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
  - If no voltage, check up stream of controller to see were voltage has been interrupted. See complete wiring diagrams, [Figure 44](#), p. 58 to [Figure 51](#), p. 65.
2. Communication link polarity is reversed.
  - The yellow LED will be ON indicating a reversed polarity. Switch the communication link connection.
3. UCM is not addressed correctly
  - Verify the DIP switch settings on the UCM.
4. Communication link signal has interference
  - Communication link should not be routed near or with any voltage source.
5. Incorrect wire used
  - Recommended wire is twisted shielded pair. See Chapter 2 for the wiring specifications for the UCM.
  - Be sure all other recommended actions listed above have been taken. Disconnect the communication link from the board and check the board's ability to communicate with the Trane Rover/ EveryWare Software. If communications do not exist, the board is assumed defective.
6. UCM not correctly addressed or two UCM's addressed the same
  - Check the DIP switches on the first VAV box and remove the communication link from the second VAV box.

9. Defective UCM board

## Wired Zone Sensor Failure Procedures

In the event that the UCM reports an incorrect zone temperature, properly inspect the following:

1. Actual room temperature is higher or lower than what the UCM reads
  - Check the location and installation of the zone sensor. Change the calibration factor in the UCM setup screens.

**Note:** If Zone sensor is off more than  $\pm 2$  degrees continue to number 2.
2. Zone sensor wired incorrectly
  - Check wiring for the correct connections. See Chapter 2 for further details on zone sensor wiring.
3. Defective zone sensor
  - Disconnect the zone sensor terminal plug from the UCM and using an Ohmmeter, measure the resistance across the terminals 1 and 2. Compare the resistance to temperature using Table 3. The resistance should shown value should be within  $\pm 2$  degrees near those measured with an accurate temperature measuring device. If not, the zone sensor needs to be replaced.
4. Defective wiring or UCM
  - With wires still connected to VAV UCM, disconnect zone sensor wires and check voltage (DC) from

## Troubleshooting

wires that were connected to terminals 1 and 2 of zone sensor. You should measure 5VDC. If you do not have 5VDC then see if the VAV UCM is outputting 5VDC. This can be done by disconnecting the wires on the VAV UCM on terminals TB3-1 and TB3-2 and measure the VDC. It should be 5VDC. If you have 5VDC at the UCM the wires going to the zone have an open. If 5VDC is not present check incoming power to the UCM board on TB1-1 and TB1-2. Should measure 24 VAC  $\pm$  10%. If you measure the proper voltage at TB1-1 and TB1-2 and no voltage at TB3-1 and TB3-2 replace UCM.

**Note:** If no voltage at TB1-1 and TB1-2 see UCM failure procedures

5. Zone sensors shorted out
  - Check the resistance across the wires. Disconnect wires from UCM and zone sensor making sure the ends are not touching each other and measure resistance. It should be infinity or no conductivity. If lower resistance is shown wires are shorted together and needs to be replaced.
6. More than one UCM connected to a single zone sensor
  - Cut jumper wires (W1 and W2) on all slave units. If jumper is not cut it will give erroneous temperature value.

**Table 14. Zone sensor temperature resistance**

Temp (°F)	Thermostat Thumbwheel Resistance (Ohms)	Sensor Resistance (k Ohms)
55	792	17.0
56	772	16.5
57	753	16.1
58	733	15.7
59	714	15.4
60	694	15.0
61	675	14.6
62	656	14.3
63	636	14.0
64	617	13.6
65	597	13.3
66	578	13.0
67	558	12.6
68	539	12.3
69	519	12.1
70	500	11.8
71	481	11.5
72	461	11.2
73	442	11.0
74	422	10.7
75	403	10.4
76	383	10.2
77	364	10.0
78	344	9.7
79	325	9.5

**Table 14. Zone sensor temperature resistance**

Temp (°F)	Thermostat Thumbwheel Resistance (Ohms)	Sensor Resistance (k Ohms)
80	306	9.3
81	286	9.0
82	267	8.8
83	247	8.6
84	228	8.4
85	208	8.2

**Note:** Thumbwheel resistance checks are made at terminal 2 and 3 on the zone sensor. Temperature sensor resistance is measured at terminal 1 and 2 of the zone sensor.

### Wired Zone Setpoint Failure Procedures

In the event that the UCM reports an incorrect zone setpoint, properly inspect the following:

1. Zone sensor setpoint wired incorrectly
  - Check wiring for the correct connections. See Chapter 2 for further details on zone sensor wiring.
2. Defective zone sensor setpoint dial
  - Disconnect the zone sensor terminal connections from the UCM and using an Ohmmeter, measure the resistance across the terminals 2 (common) and 3 (setpoint) of the zone sensor. Compare the resistance to specified set point on sensor using [Table 3, p. 10](#). The resistance shown should correlate within  $\pm$  2 degrees of setpoint shown on [Table 3, p. 10](#). If not, the zone sensor needs to be replaced.
3. Defective wiring or UCM
  - With wires still connected to VAV UCM, disconnect zone sensor setpoint wires and check voltage (DC) from wires that were connected to terminals 2 and 3 of zone sensor. These should measure 5VDC. If meter does not read 5VDC then see if the VAV UCM is outputting 5VDC. This can be done by disconnecting the wires on the VAV UCM on terminals TB3-2 and TB3-3 and measure the VDC. It should be 5VDC. If 5VDC is shown on terminals TB3-2 and TB3-3 at the UCM the wires going to the zone have an open. If 5VDC is not present check incoming power to the UCM board on TB1-1 and TB1-2. This should measure 24 VAC  $\pm$  10%. If you measure the proper voltage at TB1-1 and TB1-2 and no voltage at TB3-2 and TB3-3 replace UCM.

**Note:** If no voltage at TB1-1 and TB1-2 see UCM see UCM failure procedures.
4. Zone sensor setpoint is shorted out
  - Check the resistance across the wires. Disconnect wires from UCM and zone sensor making sure the ends are not touching each other and measure resistance. It should be infinity or no conductivity. If lower resistance is shown wires are shorted together and needs to be replaced.
5. More than one UCM connected to a single zone sensor



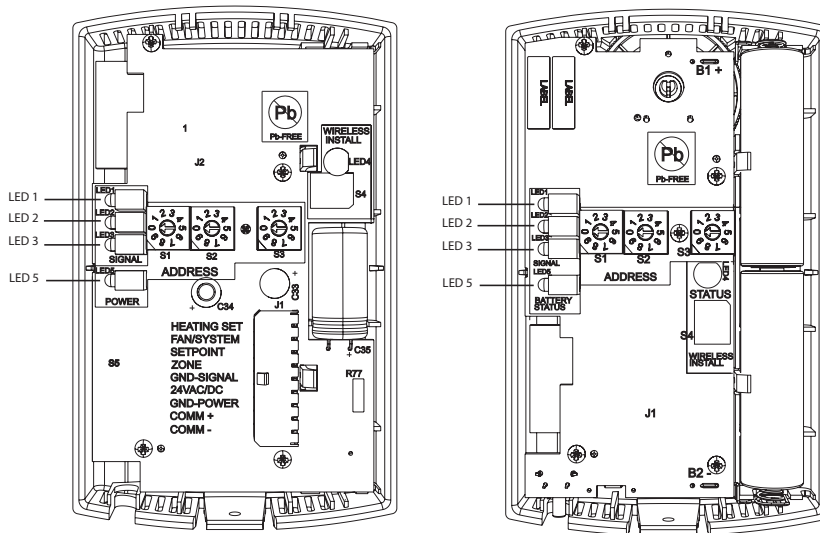
- Cut jumper wires (W1 and W2) on all slave units. If jumper is not cut it will give erroneous temperature setpoint value.

**Note:** No special tools or software are necessary to service and test the wireless zone sensor system. The system can be testing by using the following: 1) LEDs 1, 2, 3, and 5 on the sensor and on the receiver; 2) The Test button (S5) on the sensor; 3) The address test mode on the receiver; and 4) A common volt-ohm meter.

## Wireless Zone Sensor Failure Procedures

In the event that the UCM reports an incorrect zone Temperature/setpoint, properly inspect the following:

**Figure 36. Wireless sensor set components with base plates removed**



## Diagnostics

**Note:** Reading diagnostics can show if the sensor has an issue or it has not been setup properly. Use this information as a starting point

- LED1, LED2, and LED3 will respond to diagnostics by exhibiting specific blinking patterns. They will occur on the sensor as a result of pressing the Test button (S5) (Table 18, p. 50). They will occur on the receiver independently of any user action (Table 18, p. 50).

**Table 15. Diagnostics: LED1, LED2, LED3 on the sensor**

User Action	LED Display <sup>(a)</sup>	Indicates...
Press Test Button (SS)	LED1: Off LED2: Off LED3: 1-blink pattern repeated 3 times	Disassociated: * Sensor is not associated with a receiver
Press Test Button (SS)	LED1: Off LED2: Off LED3: 2-blink pattern repeated 3 times	Address set to 000: * Address not set to between 001-999
Press Test Button (SS)	LED1: Off LED2: Off LED3: 3-blink pattern repeated 3 times	Not Configured: * Sensor configuration properties not properly set (defective sensor)
Press Test Button (SS)	LED1: Off LED2: Off LED3: 4-blink pattern repeated 3 times	Input Voltage Too High: * No RF transmission is permitted with an input battery voltage greater than 3/9 V

(a) Blink pattern is On for ¼ s, Off for ¼ s, with 2 s Off between repetitions.

**Table 16. Diagnostics: LED1, LED2, LED3 on the receiver**

User Action	LED Display <sup>(a)</sup>	Indicates...
None	LED1: Off LED2: Off LED3: 1-blink pattern repeated continuously	Disassociated * Receiver is not associated, waiting for a sensor. * Receiver lost communication with sensor. * Receiver has no devices on its wireless personal area network. * Association with a device has been manually removed.
None	LED1: Off LED2: Off LED3: 2-blink pattern repeated continuously	Address set to 000 * Address not set to between 001-999
None	LED1: Off LED2: Off LED3: 3-blink pattern repeated continuously	Not Configured * Receiver configuration properties not properly set (defective receiver)

(a) 1 Blink pattern is On for ¼ s, Off for ¼ s, with 2 s Off between repetitions.

### 1. If the wireless zone sensor system failure

- Observe LED5 on the receiver. LED5 will be On solid green whenever the receiver is powered.
- Make sure the receiver is properly grounded. Both the black wire (GND SIGNAL) and the yellow wire (GND-POWER) must be grounded.

## Troubleshooting

- Press the Test button (S5) on the sensor. LED5 should turn On solid green, indicating proper battery strength. LED1, LED2, and LED3 will indicate signal strength (See table 2).

**Table 18. Signal quality: LED1, LED2, LED3 on the sensor**

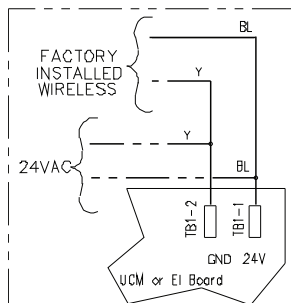
User Action	LED Display	Indicates...
None	LED1:Off LED2:Off LED3:Off	Normal state * No Test button press
Press Test Button (SS)	LED1:Off LED2:Off LED3:Off	Associated; no communication with receiver * Associated, but no signal from the receiver after pressing Test button
Press Test Button (SS)	LED1:On LED2:On LED3:On Displays for 5 seconds, then constantly off	Excellence signal quality * Adequate signal margin for reliable communication.
Press Test Button (SS)	LED1:Off LED2:On LED3:On Displays for 5 seconds, then constantly off	Marginal signal quality * Reduced battery life likely. * Consider moving the sensor or receiver to a better location.
Press Test Button (SS)	LED1:Off LED2:Off LED3:On Displays for 5 seconds, then constantly off	Poor signal quality * Unreliable communication. * Strongly recommend moving the sensor or receiver to a better location.

**Table 17. Battery status: LED5 on the sensor**

User Action	LED Display	Indicates...
Press Test Button (SS)	Solid green for 5 seconds	Battery condition is adequate for proper operation.
	Solid red for 5 seconds	Battery condition is low. Batteries should be replaced.
	No light	Batteries are totally dead or not installed properly, or sensor is defective.
None	Blinking red: 1-blink pattern <sup>1</sup> repeated 5 times. Cycle repeats every 15 minutes.	Battery condition is low. Approximately 14 days of operation remain before the battery is too weak to power the sensor.

**Note:** 1 Blink pattern is On for ¼ s, Off for ¾ s, with 2 s Off between repetitions.

**Figure 37.**



**Note:** When checking signal strength, both LED1 and LED3 on the receiver and sensor should illuminate in unison if the sensor and receiver are associated. Use this feature to confirm association. If not associated, see setup procedures in Wireless chapter. If unit still does not work proceed in checking Receiver and sensor with testing procedures below.

### 2. Procedure for Testing the Receiver

- Make sure the receiver is powered.
- Set the receiver address to 000 to force the zone temperature output and zone temperature setpoint output to their test mode values (see Table 19, p. 50).

**Table 19. Output failure modes of operation**

Situation	Zone Temperature Output	Zone Setpoint Output
Receiver address = 000	11.17 kΩ, 72.5 °F (22.5 °C), indefinitely	451 Ω, 72.5 °F (22.5 °C), indefinitely
Receiver address = 001 to 999 Receiver has powered up, but has not received a communication from sensor.	11.17 kΩ, 72.5 °F (22.5 °C)	451 Ω, 72.5 °F (22.5 °C)
Receiver address = 001 to 999 Receiver does not receive a communication within 35 minutes from the sensor it is associated with	Open	Open
Receiver has no power	Open	Open
Thermistor in sensor has failed to either open or close	Open	Normal value
Setpoint potentiometer has failed to either open or close	Normal value	Open

### 3. Measure the receiver output resistance by following the procedures

- Make sure the black wire (GNS-SIGNAL) and the yellow wire (GND-POWER) are grounded (see above for wiring diagrams).
- Make sure the receiver is powered up.
- Disconnect the SETPOINT wire (red) and the ZONE wire (white) from the host unit controller.
- Measure resistance between the grounded GND-SIGNAL wire and either the SETPOINT or ZONE wire. Compare resistance measurements to those presented in Table 20, p. 50.

**Table 20. Receiver resistance table**

Zone or Setpoint Temperature	Nominal Zone Temperature Output Resistance	Nominal Space Temperature Setpoint Output Resistance
55 °F (12.8 °C)	17.47 k Ω	812 Ω
60 °F (15.6 °C)	15.3 k Ω	695 Ω
65 °F (18.3 °C)	13.49 k Ω	597 Ω
70 °F (21.1 °C)	11.9 k Ω	500 Ω

**Table 20. Receiver resistance table (continued)**

Zone or Setpoint Temperature	Nominal Zone Temperature Output Resistance	Nominal Space Temperature Setpoint Output Resistance
75 °F (23.9 °C)	10.5 k Ω	403 Ω
80 °F (26.7 °C)	9.3 k Ω	305 Ω
85 °F (29.4 °C)	8.25 k Ω	208 Ω

- When the test is complete, reset the receiver address to its previous setting.
- Press the Test button (S5) on the sensor to force re-association.

Confirm association and communication by noting LED1, LED2, and LED3 as described in "Signal Quality Test"

- Pressing the Test button (S5) on the sensor initiates a signal quality test. LED1, LED2, and LED3 respond by indicating excellent, marginal, or poor signal quality. The LEDs can be observed on both the sensor (Table 21, p. 51) and the receiver (Table 20, p. 50).

**Table 21. Signal quality: LED1, LED2, LED3 on the sensor**

User Action	LED Display	Indicates...
None	LED1: Off LED2: Off LED3: Off	Normal state * No Test button press
Press Test Button (SS)	LED1: Off LED2: Off LED3: Off	Associated; no communication with receiver * Associated, but no signal from the receiver after pressing Test button
	LED1: On LED2: On LED3: On Displays for 5 seconds, then constantly off	Excellence signal quality * Adequate signal margin for reliable communication.
	LED1: Off LED2: On LED3: On Displays for 5 seconds, then constantly off	Marginal signal quality * Reduced battery life is likely. * Consider moving the sensor or receiver to a better location.
	LED1: Off LED2: Off LED3: On Displays for 5 seconds, then constantly off	Poor signal quality * Unreliable communication. * Strongly recommend moving the sensor or receiver to a better location.

- If sensor and receiver still do not operate properly, replace bad components. If unit passes tests, check UCM operation.

#### 4. Defective VAV UCM

- Disconnect the receiver sensor wires on the VAV UCM on terminals TB3-1 and TB3-2 and measure the VDC. It should be 5VDC. If 5VDC is not present check incoming power to the UCM board on TB1-1 and TB1-2. Should measure 24 VAC ± 10%. If you

measure the proper voltage at TB1-1 and TB1-2 and no voltage at TB3-1 and TB3-2 replace UCM.

**Note:** If no voltage at TB1-1 and TB1-2 see UCM see UCM failure procedures

- Disconnect the receiver setpoint wires on the VAV UCM on terminals TB3-2 and TB3-3 and measure the VDC. It should be 5VDC. If 5VDC is not present check incoming power to the UCM board on TB1-1 and TB1-2. Should measure 24 VAC ± 10%. If you measure the proper voltage at TB1-1 and TB1-2 and no voltage at TB3-2 and TB3-3 replace UCM.

**Note:** If no voltage at TB1-1 and TB1-2 see UCM see UCM failure procedures

### Airflow Failure Procedures

In the event that the air valve is reading position instead of flow or in the event that the measured flow reads incorrectly, i.e. different from the balance report, properly inspect the following:

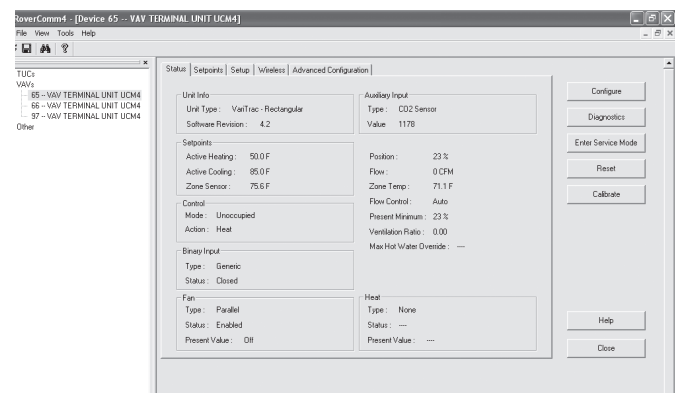
- Recalibrate VAV unit by cycling power to unit. This can also be accomplished with Rover, Summit or CCP software.

**Note:** Cycling power to the VAV board will automatically cause the unit to calibrate, however, following the procedure outlined below will provide a more accurate calibration. It is only necessary to perform this procedure in instances where you are experiencing incorrect flow readings or if the unit reverts to pressure dependent mode despite being above 5% and below 110% of cataloged flow and performing a "normal calibration") does not correct the problem.

#### 1. Steps for Calibration

- Log on to the UCM with Rover software.
- Turn the central air handler "off." If this is not possible, Trane recommends pulling the transducer tubes off during the calibration process to simulate this.
- Select the "calibrate unit" option button

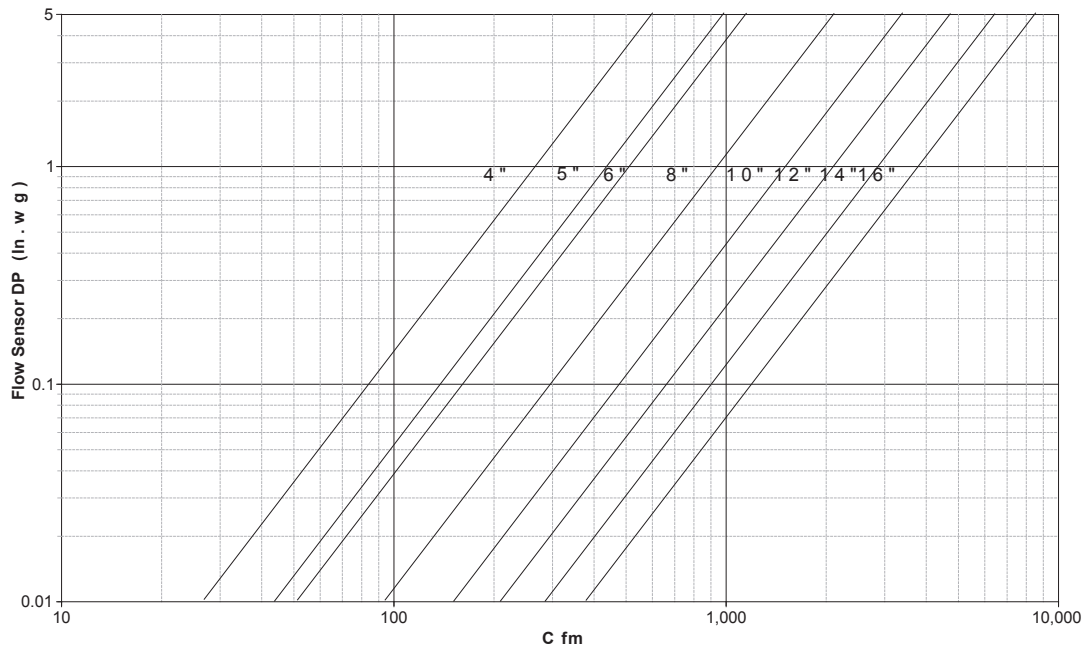
**Figure 38. Rover software**



## Troubleshooting

- Rover software will indicate that calibration is taking place in diagnostic log
  - When calibration is complete, the box will release to auto. Drive the box open to make sure that the box is not below 5% of its cataloged CFM. The controller is accurate in reading flow from 5% to 110% of cataloged CFM.
  - Release the box to auto and perform any necessary balancing work. See ["Air and Water Balancing," p. 42](#) for details.
  - Check to see if flow has been established, **If flow not established or inaccurate proceed to Step 2.**
- The tubing or flow ring is off, reversed, plugged, or has a leak.
    - Check with a magnehelic gauge and compare with the delta pressure (DP) chart located on the VAV box.

**Figure 39. Sensor signal vs. airflow delivery**



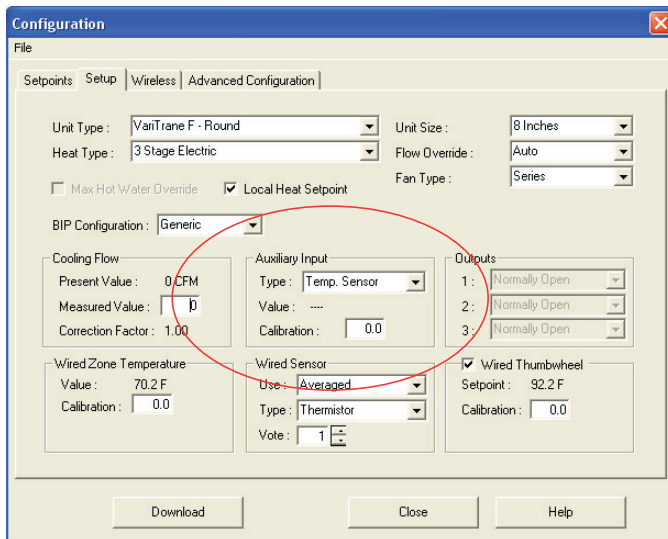
- Check the tubing for reversal and/or leaks.
  - Check the flow ring for plugged holes. Blow out with compressed air if necessary.
- Wrong unit size downloaded into the UCM setup menu
    - Verify that the actual unit size matches the unit's nameplate.
  - Poor inlet configuration
    - Trane recommends 1½-duct diameters of straight duct before the inlet of the box (a 12-inch box should have 18\" of straight run duct before the inlet).
  - To determine whether or not the transducer has failed, perform the following steps:
    - Check the 24 volts AC supply at TB1-1 and TB1-2 on the UCM board. Voltage should be between 20 volts AC and 28 volts AC. If voltage not available see UCM failure procedures.
    - Read the input voltage to the transducer from the UCM controller between the green and red wires on J3 of the UCM board. The voltage should be between 4.50 volts DC and 5.50 volts DC (5 volts DC cataloged). If voltage not available replace UCM.
    - Remove the high and low tubes from the transducer (to simulate no flow). Read the transducer output voltage on J3 of the UCM board between the green and the black wires with a voltmeter. The voltage should be between 0.20 volts DC and 0.30 volts DC (0.25 volts DC is the null voltage output of the transducer indicating zero flow). If voltage not available replace transducer
- Note:** The formula for the Transducer output voltage is  $0.25 + 0.75 * \Delta P$ , where  $\Delta P$  is the pressure in inches of water column.  $\Delta P$  can range from 0 to 5 inches of W.C.
- With flow across the flow ring measure the differential pressure with a magnahelic and use Transducer output voltage formula to check accuracy of reported value. Read the transducer output voltage between the green and the black wires. The measured value should correspond to the value given in the transducer output formula. If transducer is off by  $\pm 5\%$ , replace transducer.

## Auxiliary Temperature Sensor Failure Procedures

In the event that the UCM reports an incorrect or failed Auxiliary temperature, properly inspect the following:

1. Make sure VAV UCM has been configured for auxiliary input

**Figure 40. UCM setup screen**



2. Actual auxiliary temperature is higher or lower than what the UCM reads

- Check the location and installation of the Auxiliary zone sensor. Change the calibration factor in the UCM setup screens.

**Note:** If Auxiliary sensor is off more than  $\pm 2$  degrees continue to number 3.

3. Auxiliary sensor wired incorrectly

- Check wiring for the correct connections. See “UCM 4.2 Installation and Wiring,” p. 11 for further details on Auxiliary sensor wiring.

4. Defective Auxiliary sensor

- Disconnect the zone sensor terminal plug from the UCM and using an Ohmmeter, measure the resistance across the auxiliary sensor wires. Compare the resistance to temperature using Table 3, p. 10. The resistance should shown value should be within  $\pm 2$  degrees near those measured with an accurate temperature measuring device. If not, the Auxiliary sensor needs to be replaced.

5. Defective wiring or UCM

- See if the VAV UCM is outputting 5VDC. This can be done by disconnecting the wires on the VAV UCM on terminals TB3-5 and TB3-6 and measure the VDC. It should be 5VDC. If the meter does not read 5VDC at the UCM the wires going to the zone have an open. If 5VDC is not present check incoming power to the UCM board on TB1-1 and TB1-2.

Should measure 24 VAC  $\pm 10\%$ . If proper voltage measured on TB1-1 and TB1-2 and no voltage at TB3-1 and TB3-2 replace UCM.

**Note:** If no voltage at TB3-5 and TB3-6 see UCM see UCM failure procedures.

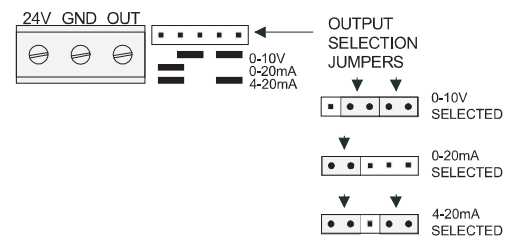
6. More than one UCM connected to a single zone sensor
  - Cut jumper wires (W4) on all slave units. If jumper is not cut it will give erroneous temperature value.

## Auxiliary CO<sub>2</sub> Sensor Failure Procedures

In the event that the UCM reports an incorrect or failed Auxiliary CO<sub>2</sub> sensor input temperature, properly inspect the following:

1. Check configuration of the VAV unit
  - Auxiliary sensor needs to be configured as CO<sub>2</sub>
2. Check jumper position on CO<sub>2</sub> sensor

**Figure 41. Jumper position**



- Needs to be set up as 0-10VDC
  - Check voltage between J3-6 and J3-5 with the sensor connected
  - Should be between 1-10VDC. If it is not check incoming power
  - Check voltage input to CO<sub>2</sub> Sensor with voltmeter
  - Voltage needs to be between 20 to 26VAC; nominal 24 VAC
3. If proper voltage is measured at incoming power and you have no VDC output at J3-6 and J3-5, replace sensor. If no voltage, check up stream of controller to see were voltage has been interrupted. See Figure 44, p. 58 to Figure 51, p. 65 for correct unit diagrams.

## VAV Damper Failure Procedures

In the event that the air valve is not modulating, properly inspect the following:

1. Tracer Summit or Rover has enabled an override function in VAV UCM
  - The overrides are Open, Closed, Min, or Max. Disable all overrides.

**Note:** See UCM programming and operation chapter to be able to release override with Rover

## Troubleshooting

- UCM is going through a recalibrate (reset) command. This is shown in the diagnostic log in Rover
  - Wait for calibration to finish.
2. Zone temperature is greater than the heat set point or less than the cool set point
    - Change the heat and/or cool set points.
  3. Actuator not driving full drive time
    - Drive time in advanced configuration not set at 90 seconds on current VariTrane units or 60 seconds for varitrac units
    - Adjust to correct damper travel time using Rover software. See Operation and Programming chapter.
    - Damper actuator loose on shaft
    - Tighten damper actuator set screw to damper shaft
    - Measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability and cause damper to not be driven its full range.
    - If no voltage, check up stream of controller to see were voltage has been interrupted. See [Figure 44, p. 58](#) to [Figure 51, p. 65](#) for correct unit diagrams.
  4. Actuator motor has failed
    - Check voltage at J1-6 to TB1-2, should have 24 VAC. If 24VAC is not present check incoming power to the UCM board on TB1-1 and TB1-2. Should measure 24 VAC  $\pm$  10%. If proper voltage is measured at TB1-1 and TB1-2 and no voltage at J1-6 and TB1-2, replace UCM.
    - Check motor by applying 24 VAC directly to common (blue) and jumper open (black) wire to a ground to drive damper open.
    - Damper should drive open
    - Check motor by applying 24 VAC directly to common (blue) and jumper closed (red) wire to a ground to drive damper closed
    - Damper should drive closed
    - If damper actuator does not open or close replace actuator

### VAV Series Fan Failure Procedures

In the event that the fan output is not energizing, properly inspect the following:

1. Verify the output configuration in the UCM setup menu.
  - Unit needs to be configured as Series fan
2. Outputs on the UCM are configured as normally closed
  - Verify the output configuration in the UCM setup menu.

**Note:** Series fan powered units in the occupied mode has the fan continuously energized. See operation Chapter for details

3. Tracer Summit has the fan output disabled
  - Check group, global, and/or Tracer overrides to make sure they are not inhibiting fan operation.
4. A flow override exists locking out the fan output
  - Check to make sure Tracer or Rover has released fan disable override.
5. If VAV UCM is calling in the status menu for the Fan to be on and it is not then check UCM Triac output wiring; and Relay output.
  - Override damper open
  - See if fan cycles on
    - Check J8 to TB1-2. Should have 24 VAC; if it does not, measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
    - Triac can be checked with purchasing a 24 VAC LED and see if it lights up on call for fan UCM if LED does not light up replace UCM
    - Remove fan wires from UCM and apply 24 VAC directly to fan relay wires.
    - Fan relay should energize. If it does not check wiring. If wiring is OK replace fan relay.

### NOTICE:

#### Equipment Damage!

**UCM Outputs are switched to ground. Do not jumper 24 VAC to J9, J10, or J11 because damage will occur.**

6. After all checks have been completed, check motor fan winding integrity and bearing failure.

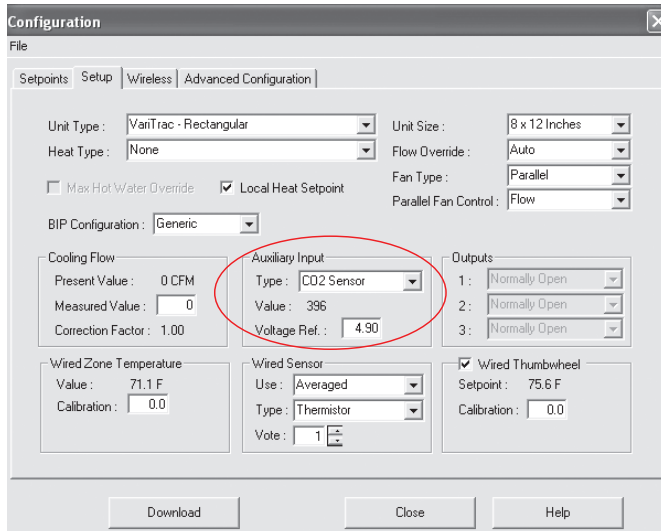
### VAV Parallel Fan Failure Procedures

In the event that the fan output is not energizing, properly inspect the following:

1. Verify the output configuration in the UCM setup menu.
  - Unit needs to be configured as parallel fan
2. Outputs on the UCM are configured as normally closed
  - Verify the output configuration in the UCM setup menu.

**Note:** Parallel fan can be enabled by either a differential temperature above the heating setpoint or CFM flow. See "UCM Programming and Operation," p. 24 for details.

**Figure 42.**



3. Tracer Summit has the fan output disabled
  - Check group, global, and/or Tracer overrides to make sure they are not inhibiting fan operation.
4. A flow override exists locking out the fan output
  - Check to make sure Tracer or Rover has released fan disable override.

**Note:** If fan cycling is based on temperature go to step 5 and if it is based on flow go to step 6.
5. If fan control is based on temperature and Zone temperature is at or above the heating set point plus heating offset on units configured as temperature control. A factory set differential of 0.5°F (0.3°C) exists to prevent short cycling.
  - Increase the UCM heating set point causing fan to be cycled on.
  - Lower the Heating setpoint by .6° and the fan should cycle off.
6. If the fan control is based on flow, the unit fan will be energized whenever primary airflow is below this set point. For this parallel fan configuration, the fan control point, if specified in a percentage of unit airflow, must be set between 15% and 30% of the units cataloged airflow to assure proper operation. A differential of 5% exists to avoid excessive fan cycling.
  - Override damper closed until CFM is below enabled flow setpoint
  - See if fan cycles on
  - Override damper open until CFM is above enabled flow setpoint fan should cycle off
7. If VAV UCM is calling in the status menu for the Fan to be on and it is not then check UCM Triac output, wiring, and Relay output.
  - Check J8 to TB1-2. Should have 24VAC; if it does not if not measure the power input to TB1-1 (power) and

TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.

- Triac can be checked with purchasing a 24 VAC LED and see if it lights up on call for fan UCM if LED does not light up replace UCM.
- Remove fan wires from UCM and apply 24 VAC directly.
- Fan relay should energize. If it does not check wiring. If wiring is OK replace fan relay

**Note:** UCM Outputs are switched to ground. Do not jumper 24 VAC to J9, J10, or J11 because damage will occur.

8. After all checks have been completed, check motor fan winding integrity and bearing failure.

### PSC Variable Speed Motor Check Out

If PSC Variable speed motor control not changing speed of the motor inspect the following:

- Wires connected improperly
  - Check wiring to make sure speed control is wired correctly. See [Figure 48, p. 62](#) and [Figure 49, p. 63](#) for wiring schematic.
  - Check voltage selection switch on side of variable speed motor control.
  - Should be set for motor voltage.
  - To check speed control
    - Turn voltage selection switch fully CCW
    - Turn Motor speed control potentiometer fully CCW
    - Motor should remain off
    - Turn voltage selection switch fully CW
    - Motor speed control potentiometer still fully CCW
    - Measure motor voltage. Should be no more than 8VAC lower than line voltage
    - With voltage selection switch still fully CW
    - Turn Motor speed control potentiometer slowly fully CW (HI)
    - Should go to full speed smoothly

If it fails any of these tests replace PSC motor speed controller.

### Testing ECM-DCU and ECM-VCU Fan Control

If ECM is not controlling Fan Motor properly inspect the following:

**Note:** The ECM controller has 4 wire pin connector that has an enable binary output and a Variable speed analog output.

1. Incorrect supply voltage/No voltage

## Troubleshooting

- Measure the power input to 24 VAC terminal and Common/ground terminal of the ECM board. The supply voltage should be between 19.2 and 28.2 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
  - If low or no voltage, check up stream of controller to see how voltage has been interrupted. See complete wiring diagrams (Figure 50, p. 64 and Figure 51, p. 65).
2. Testing Binary Output
    - Measure voltage from White to Green wire on connector
    - Should be between 9 to 30VDC. If not replace ECM
  3. Testing Analog variable speed output
    - On ECM-DCU change board selector switches to 0 on each one of the switches to give a 100% output signal. On ECM-VCU adjust potentiometer until LED's read a 100% output.
    - Measure voltage from green to red wires on 4 pin connector and document. See Figure 50, p. 64 and Figure 51, p. 65 for correct unit wiring diagram.
    - Should measure above 9VDC
    - Change ECM-DCU board selector switches to 9 on tens digit an 9 on units digit to give a 99% output signal. On ECM-VCU adjust potentiometer until LED's read a 99% output
    - Measure voltage from green to red wires on 4 pin connector and document. See Figure 50, p. 64 and Figure 51, p. 65 for correct unit wiring diagram.
    - Should measure less than previous reading
    - Continue process until all selector switch positions have been checked to find any dead spots in selector switches
    - If unit ECM board fails any of these tests replace board. If ECM is found to be good but motor still does not operate contact VAV technical support.
  2. Verify the output configuration in the UCM setup menu.
    - Unit needs to be configured as 3 stage Electric heat
  3. Tracer Summit has the electric heat output disabled
    - Check group, global, and/or Tracer overrides to make sure they are not inhibiting heat operation.
  4. Minimum heating CFM is not being met, airflow is too low
    - Increase the airflow or lower the minimum heating flow.
  5. Heat relays have failed
    - If VAV UCM is calling in the status menu for the electric heat to be on and it is not then check UCM Triac output; wiring; and Relay output.
    - Check J8 to TB1-2. Should have 24 VAC; if it does not measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
    - Heat Triac(s) can be checked with purchasing a 24 VAC LED and see if it lights up on call for Heat stage UCM. If LED does not light up replace UCM.

### NOTICE:

#### Equipment Damage!

**UCM Outputs are switched to ground. Do not jumper 24 VAC to J9, J10, or J11 because damage will occur.**

- Move electric heat relay wires from UCM and apply 24 VAC directly.
- Electric heat stage should energize. If it does not; check wiring, safeties and electric heat contactor. Replace components as necessary.

## VAV Proportional Hot water failure

### Check binary outputs

In the event that the heat outputs are not energizing, properly inspect the following:

1. Zone temperature is at or above the heating set point
  - Increase the UCM heating set point.
2. Verify the output configuration in the UCM setup menu
  - Unit needs to be configured as proportional hot water
3. Tracer Summit has the heat output disabled
  - Check group, global, and/or Tracer overrides to make sure they are not inhibiting heat operation.
4. Heat relays have failed
  - If VAV UCM is calling in the status menu for the valve to be open and it is not then check UCM Triac output; wiring; and Relay output.

Figure 43. ECM



## VAV Electric Heat Stage(s) Failure Procedures

In the event that the heat outputs are not energizing, properly inspect the following:

1. Zone temperature is at or above the heating set point
  - Increase the UCM heating set point.



- Check J8 to TB1-2. Should have 24VAC; if it does not if not measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.
- Heat Triac(s) can be checked with purchasing a 24 VAC LED and see if it lights up on call for Heat output to be open or closed by UCM. If LED does not light up replace UCM.

### NOTICE:

#### Equipment Damage!

UCM Outputs are switched to ground. Do not jumper 24 VAC to J9, J10, or J11 because damage will occur.

### Check controller proportional hot water logic

- Reconfigure controller setup from a VariTrane F unit into a VariTrac unit with proportional hot water heat.
- Recalibrate unit.
- Drive time configured in rover should be 120 seconds.
- Raise the temp 4° above the space temp (4 degrees offset must be maintained during test) it should take 3.2 min. from close to open. The temperature from space to setpoint must remain 4 degrees over the length of the test. If unit does not pass test check actuator and valve. After valve and actuator are found to be ok, repeat test and if it is still failing replace controller.

**Note:** *If the controller is not reconfigured as a varitrac unit and remains configured as a varitrane unit with proportional hot water it would take 1.1 hrs to move from completely closed to completely open.*

- Put original configuration back in controller

## Trane/Honeywell Proportional valve check out procedures

Two problems can occur with the cartridge/ actuator or both that can result in over conditioning the space.

### Cartridge Failure

- If the actuator is driven closed but there is 1/8" or more play in the indicator (move with your finger), or the piston has not returned up past the A port or has "frozen". In either case, the cartridge is not closed off completely. This will result in over heating (or over cooling) in the space.

### Actuator Failure

- If the actuator has stopped moving to the closed position when commanded to, and there is no play in the lever, the actuator has failed.

- Remove the actuator and work the cartridge stem manually. If the stem moves freely, then only the actuator has failed. If the stem is sluggish or stuck, the actuator and the cartridge have failed.

**Note:** *Actuator indicator on the side of the actuator should be positioned at the top of the actuator when valve is closed.*

## VAV Two Position Hot water failure

### Check binary outputs

In the event that the heat outputs are not energizing, properly inspect the following:

1. Zone temperature is at or above the heating set point
  - Increase the UCM heating set point
2. Verify the output configuration in the UCM setup menu
  - Unit needs to be configured as two position hot water
3. Tracer Summit has the heat output disabled
  - Check group, global, and/or Tracer overrides to make sure they are not inhibiting heat operation.
4. Heat relays have failed
  - If VAV UCM is calling in the status menu for the valve to be open and it is not then check UCM Triac output, wiring, and Relay output.
  - Check J6 to TB1-2. Should have 24 VAC; if it does not, measure the power input to TB1-1 (power) and TB1-2 (ground) of the UCM board. The supply voltage should be between 20 and 28 VAC (24 VAC cataloged). However, voltages at either extreme may result in system instability.

### NOTICE:

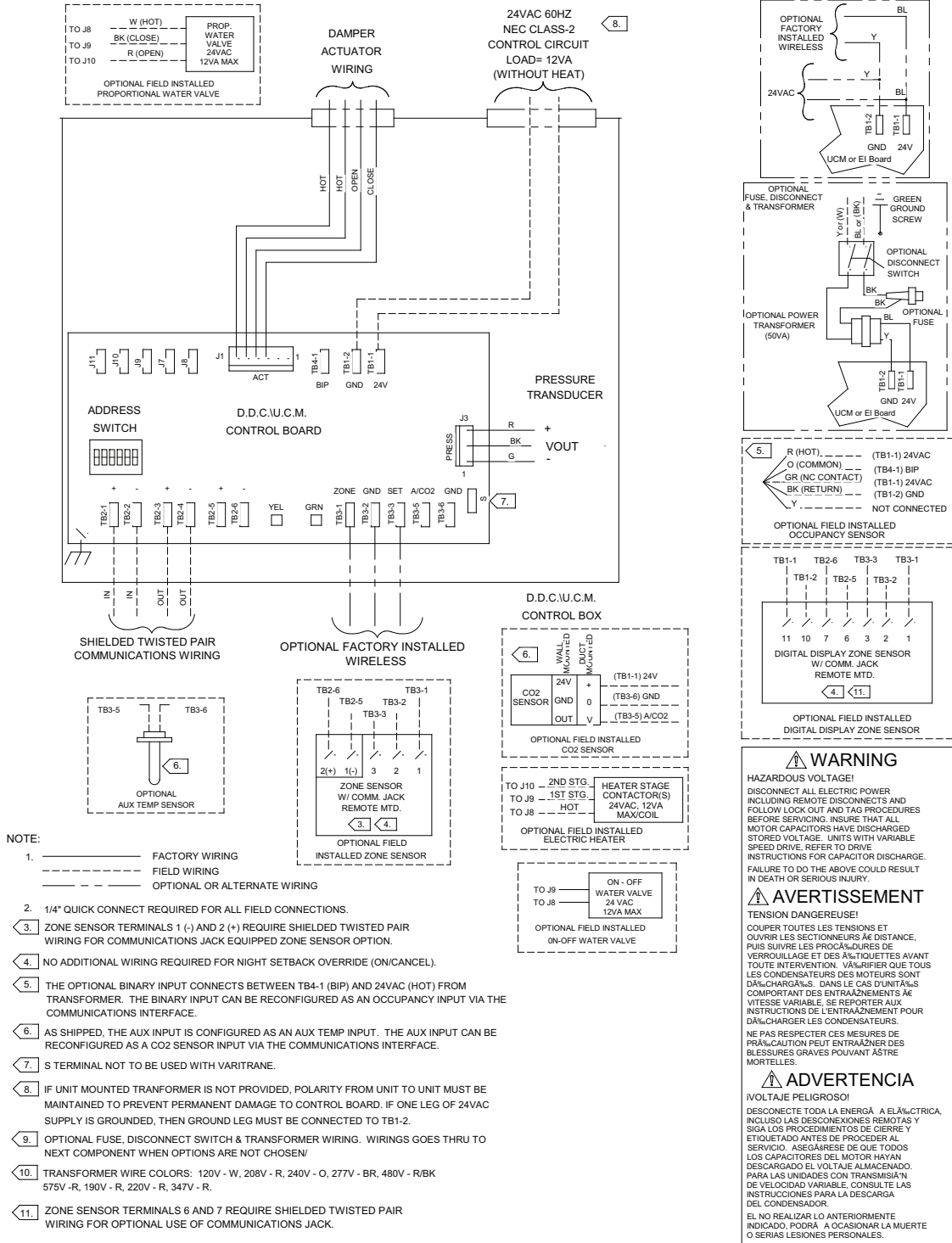
#### Equipment Damage!

UCM Outputs are switched to ground. Do not jumper 24 VAC to J9, J10, or J11 because damage will occur.

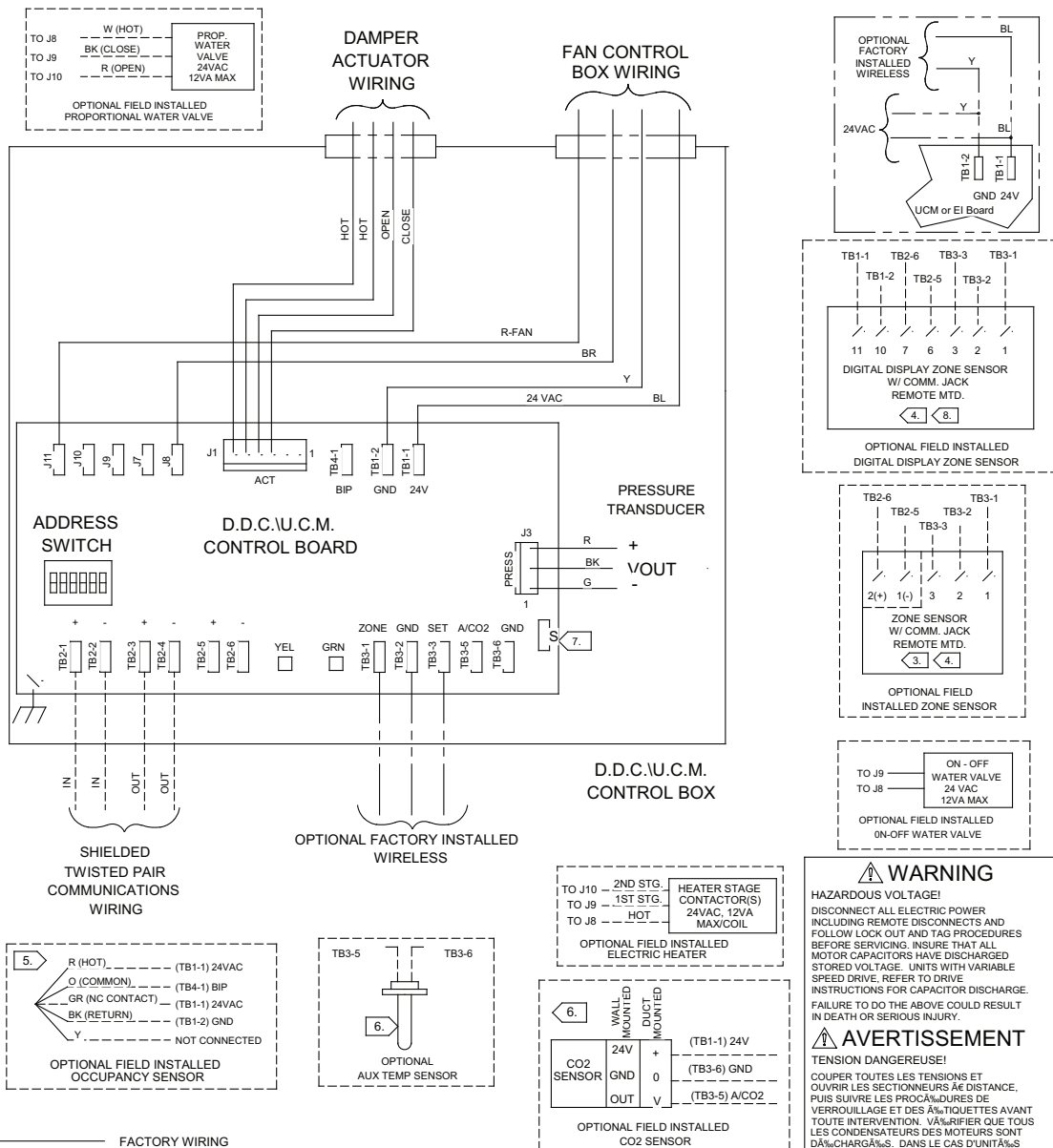
- Heat Triac(s) can be checked with purchasing a 24 VAC LED and see if it lights up on call for heat output to be open by UCM. If LED does not light up replace UCM.

# Wiring Diagrams

Figure 44. Wiring diagram for single duct unit that is either cooling only, hot water, or field installed reheat



**Figure 45. Wiring diagram for fan powered unit that is either cooling only, hot water, or field installed reheat**



**NOTE:**

1. \_\_\_\_\_ FACTORY WIRING  
 - - - - - FIELD WIRING  
 - - - - - OPTIONAL OR ALTERNATE WIRING
2. 1/4" QUICK CONNECT REQUIRED FOR ALL FIELD CONNECTIONS.
3. ZONE SENSOR TERMINALS 1 (-) AND 2 (+) REQUIRE SHIELDED TWISTED PAIR WIRING FOR COMMUNICATIONS JACK EQUIPPED ZONE SENSOR OPTION.
4. NO ADDITIONAL WIRING REQUIRED FOR NIGHT SETBACK OVERRIDE (ON/CANCEL).
5. THE OPTIONAL BINARY INPUT CONNECTS BETWEEN TB4-1 (BIP) AND 24VAC (HOT) FROM TRANSFORMER. THE BINARY INPUT CAN BE RECONFIGURED AS AN OCCUPANCY INPUT VIA THE COMMUNICATIONS INTERFACE.
6. AS SHIPPED, THE AUX INPUT IS CONFIGURED AS AN AUX TEMP INPUT. THE AUX INPUT CAN BE RECONFIGURED AS A CO2 SENSOR INPUT VIA THE COMMUNICATIONS INTERFACE.
7. S TERMINAL NOT TO BE USED WITH VARITRANE.
8. ZONE SENSOR TERMINALS 6 AND 7 REQUIRE SHIELDED TWISTED PAIR WIRING FOR COMMUNICATIONS JACK EQUIPPED ZONE SENSOR OPTION.

**WARNING**  
 HAZARDOUS VOLTAGE!  
 DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS AND FOLLOW LOCK OUT AND TAG PROCEDURES BEFORE SERVICING. INSURE THAT ALL MOTOR CAPACITORS HAVE DISCHARGED STORED VOLTAGE. UNITS WITH VARIABLE SPEED DRIVE, REFER TO DRIVE INSTRUCTIONS FOR CAPACITOR DISCHARGE. FAILURE TO DO THE ABOVE COULD RESULT IN DEATH OR SERIOUS INJURY.

**AVERTISSEMENT**  
 TENSION DANGEREUSE!  
 COUPER TOUTES LES TENSIONS ET OUVRIR LES SECTIONNEURS À DISTANCE, PUIS SUIVRE LES PROCÉDURES DE VERROUILLAGE ET DES ÉTIQUETTES AVANT TOUTE INTERVENTION. VÉRIFIER QUE TOUTS LES CONDENSATEURS DES MOTEURS SONT DÉCHARGÉS. DANS LE CAS D'UNITÉS COMPORTANT DES ENTRAÎNEMENTS À VITESSE VARIABLE, SE REPORTER AUX INSTRUCTIONS DE L'ENTRAÎNEMENT POUR DÉCHARGER LES CONDENSATEURS. NE PAS RESPECTER CES MESURES DE PRÉCAUTION PEUT ENTRAÎNER DES BLESSURES GRAVES POUVANT ÊTRE MORTELLES.

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 DESCONECTE TODA LA ENERGÍA A ELÁCTRICA, INCLUSO LAS DESCONECIONES REMOTAS Y SIGA LOS PROCEDIMIENTOS DE CIERRE Y ETIQUETADO ANTES DE PROCEDER AL SERVICIO. ASEGÚRESE DE QUE TODOS LOS CAPACITORES DEL MOTOR HAYAN DESCARGADO EL VOLTAJE ALMACENADO. PARA LAS UNIDADES CON TRANSMISIÓN DE VELOCIDAD VARIABLE, CONSULTE LAS INSTRUCCIONES PARA LA DESCARGA DEL CONDENSADOR. EL NO REALIZAR LO ANTERIORMENTE INDICADO, PODRÁ A OCASIONAR LA MUERTE O SERIAS LESIONES PERSONALES.

**Figure 46. Single duct with single phase voltage electric heat**

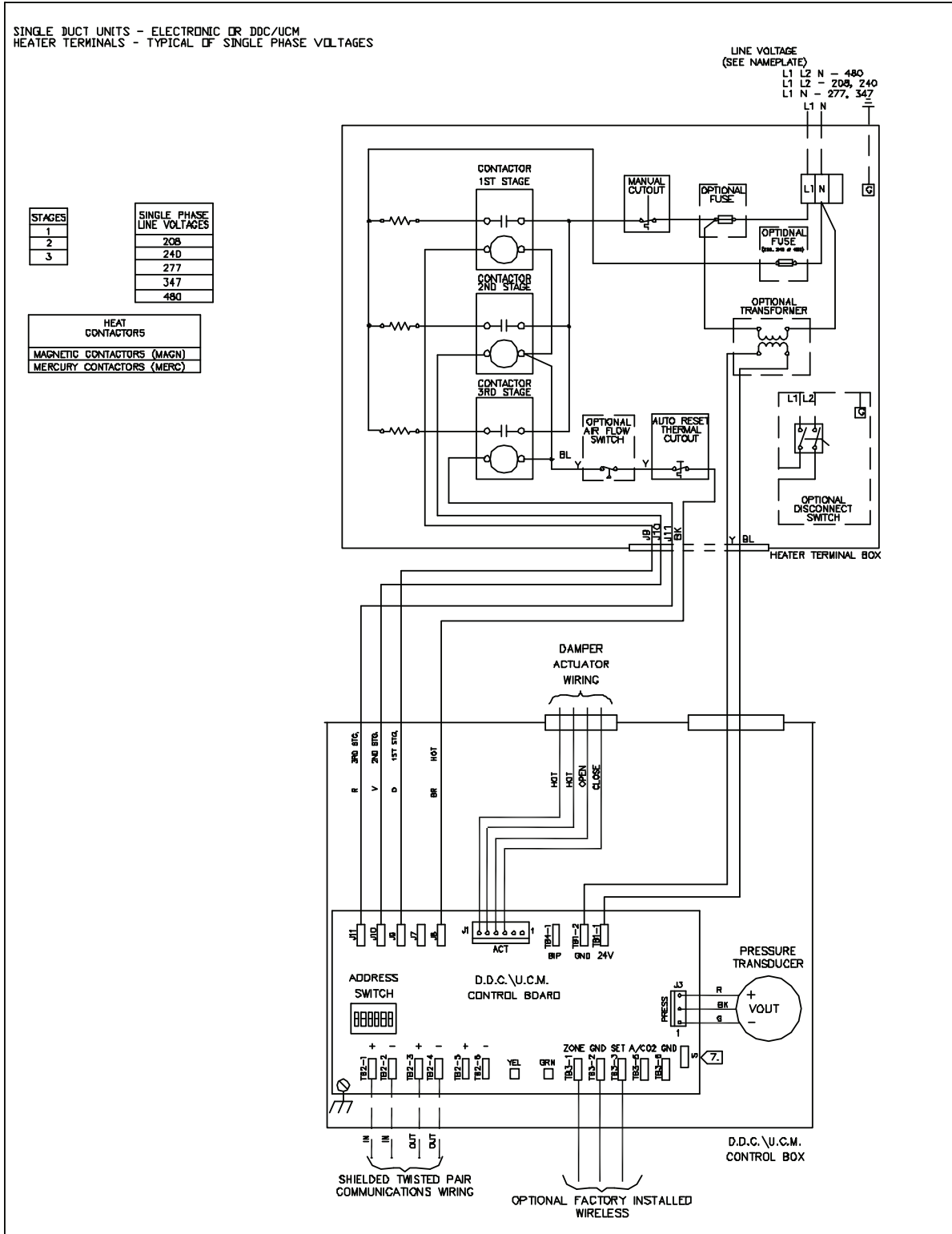
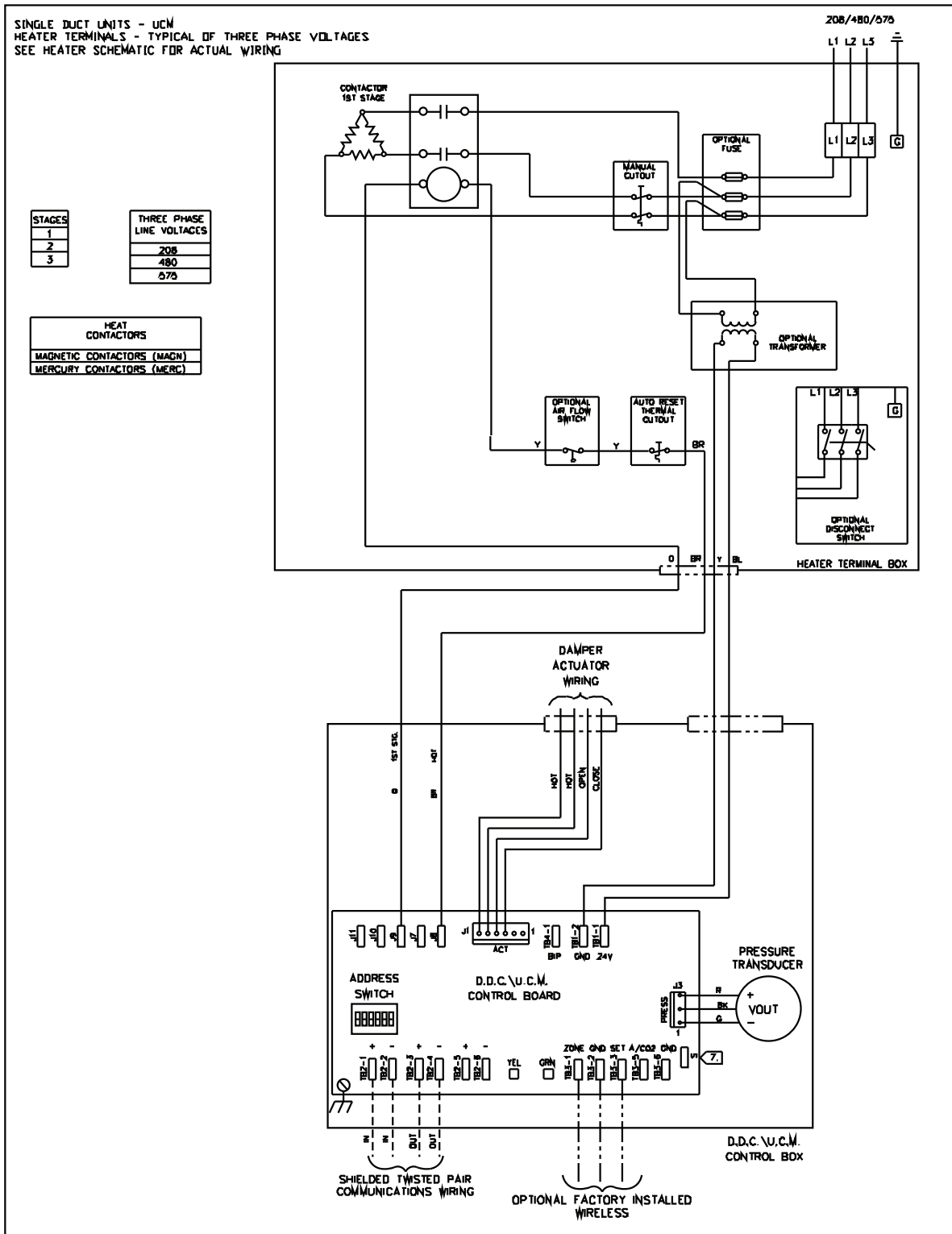


Figure 47. Single duct with three phase voltage electric heat



**Figure 48. SCR/PSC fan powered with single phase voltage electric heat**

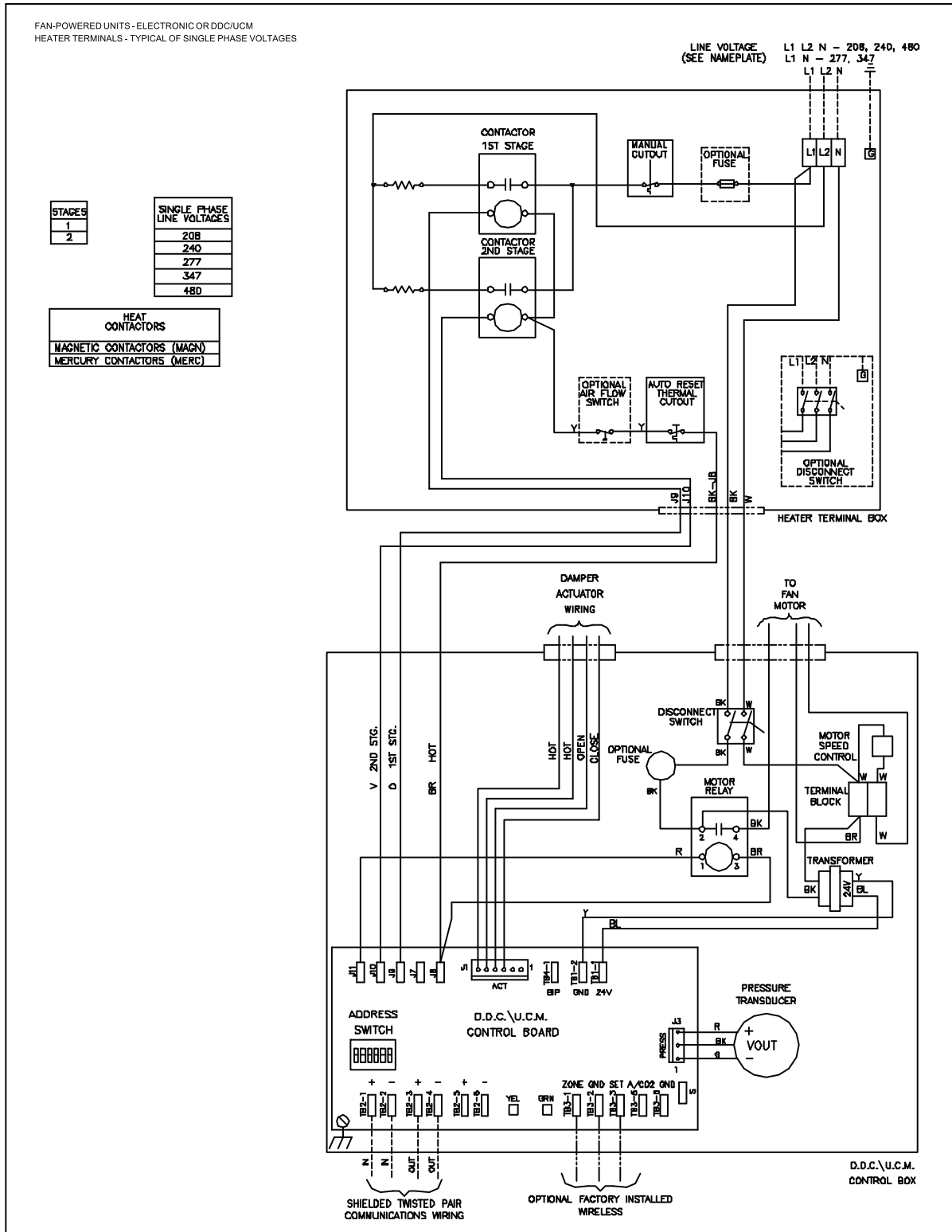
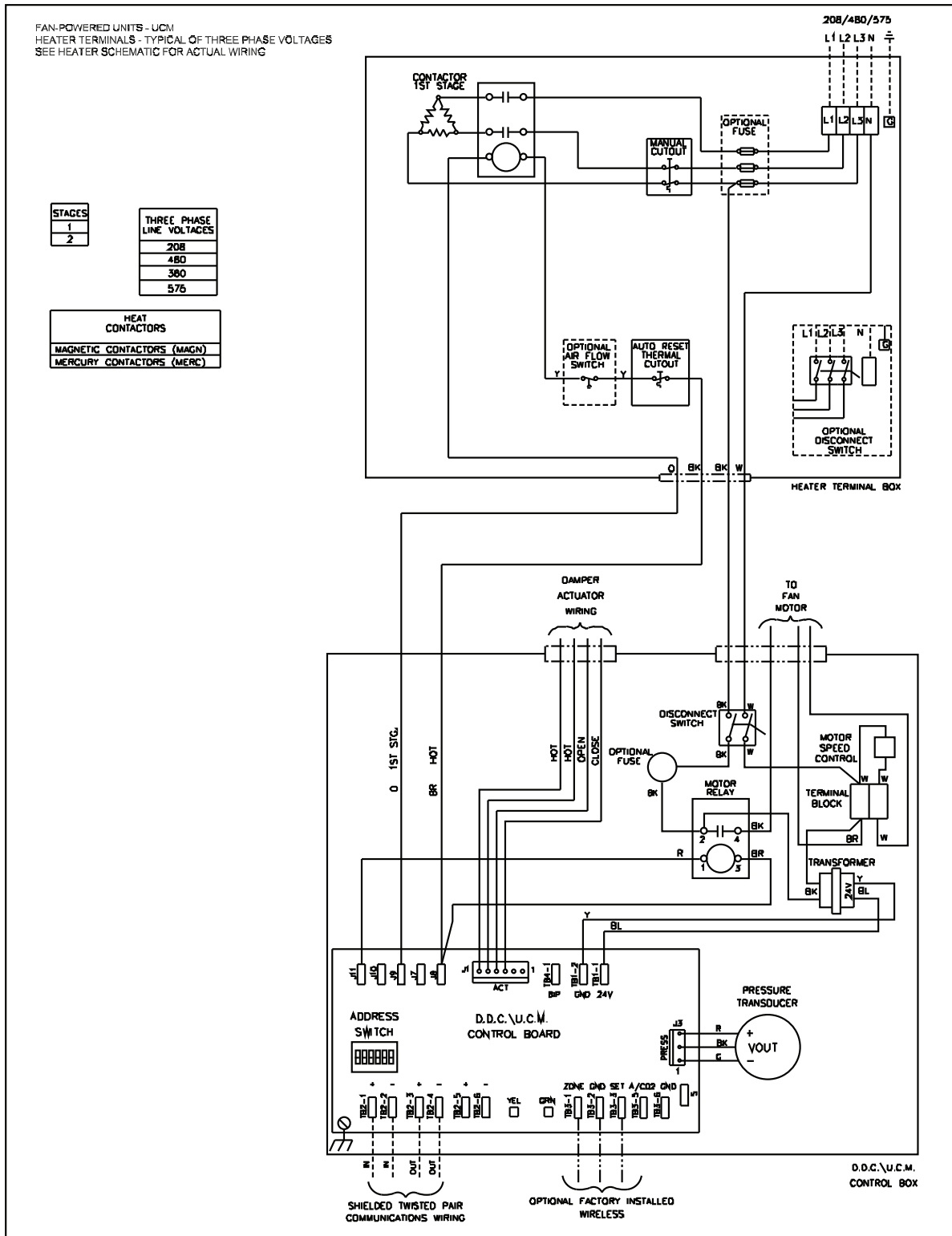


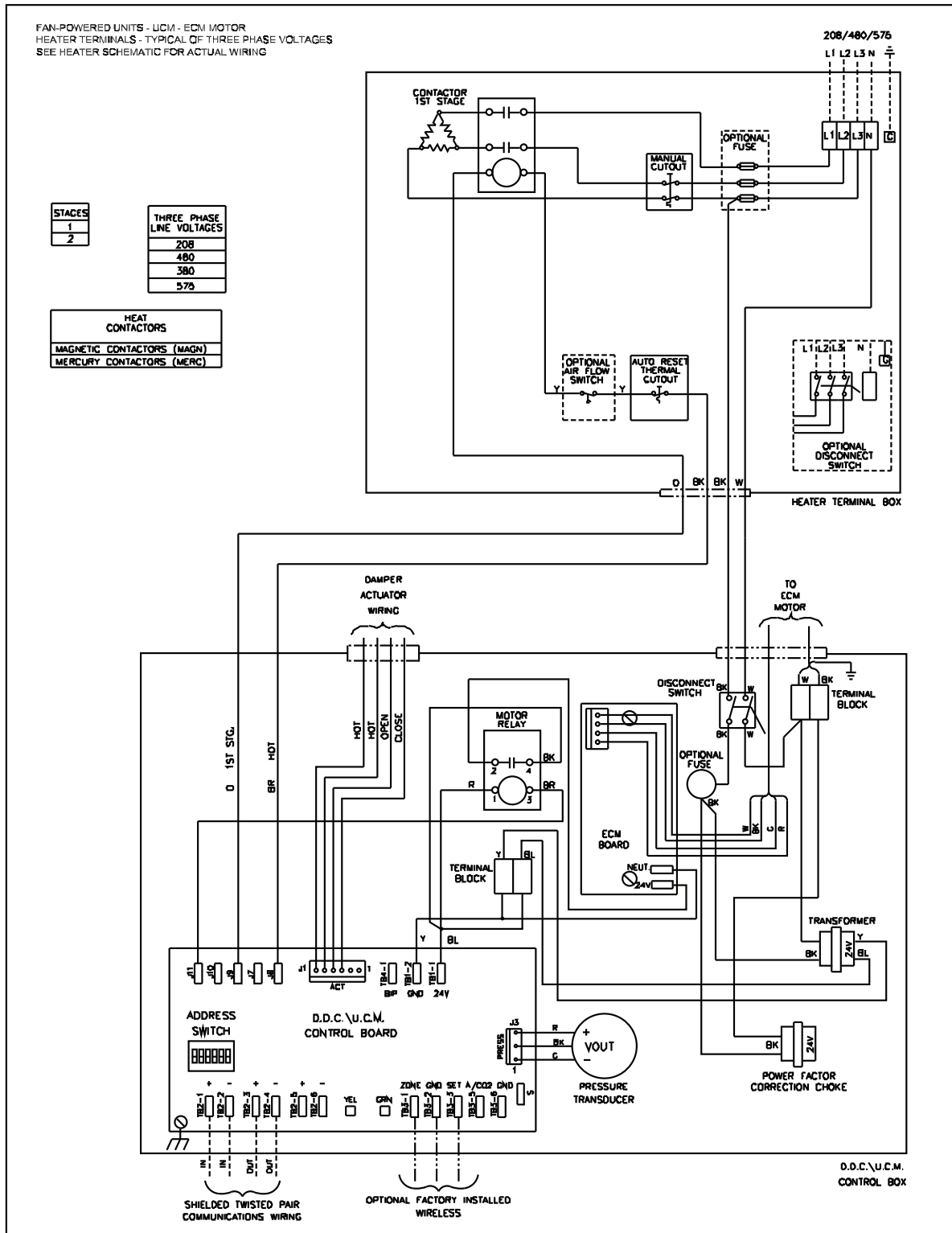
Figure 49. SCR/PSC fan powered with three phase voltage electric heat







**Figure 51. ECM fan powered with three phase voltage electric heat**





# Appendix

AC	Alternating Current
AHU	Air Handling Unit
AIP	Analog Input
AOP	Analog Output
AVG	Average
AWG	American Wire Gauge
BCU	Building Control Unit
BIP	Binary Input
BMS	Building Management System
BOP	Binary Output
°C	Celsius
CCP	Central Control Panel
CFM	Cubic Feet per Minute
CMS	Cubic Meters per Second
CO <sub>2</sub>	Carbon Dioxide
COM	Communication
CPL	Custom Program Language
CU	Command Unit
DDC	Direct Digital Control
DEG	Degree
DP	Differential Pressure
EEPROM	Electrically Erasable Programmable Read Only Memory
°F	Fahrenheit
Hz	Hertz
ICS	Integrated Comfort™ System
I/O	Input/Output
IOP	Installation, Operation, and Programming
LED	Light Emitting Diode
MAX	Maximum
MIN	Minimum
NEC	National Electric Code
PPM	Parts Per Million
PROM	Programmable Read Only Memory
PWM	Pulse Width Modulation
RSSI	Receiver Signal Strength Indicator
RTD	Resistance Temperature Detector
SAP	Supply Air Pressure
SAT	Supply Air Temperature
TB	Terminal Block
TOV	Timed Override
TR	Time since last transmission was received
UCM	Unit Control Module
UL	Underwriter's Laboratories
VA	Voltage Ampere
VAC	Voltage Alternating Current
VAV	Variable Air Volume
ZSM	Zone Sensor Module





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