UNT-IOP-1

TRANE

Installation-Operation-Programming Guide

September 1993

Fan Coil Air Conditioner
Unit Control Module

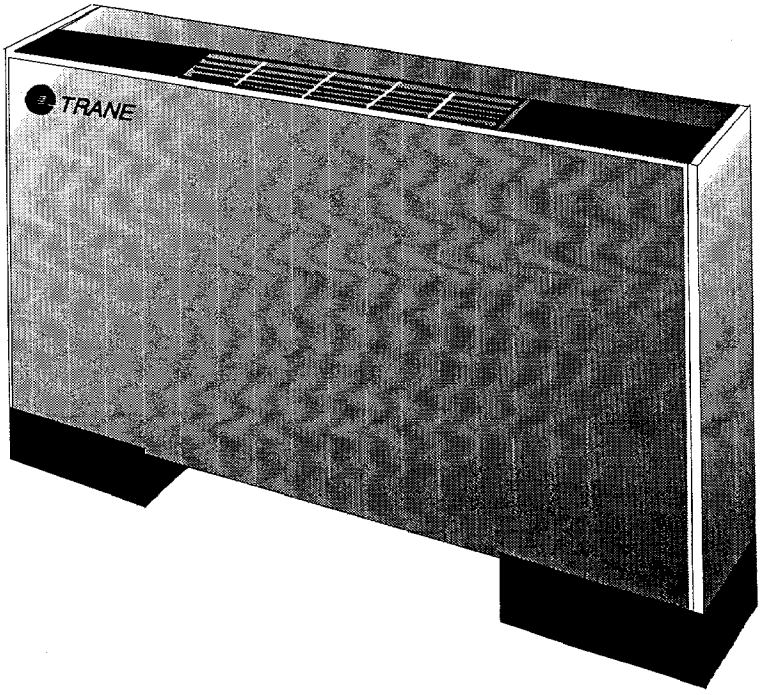


Table of Contents

Related Literature

- Tracer 100 Series Programming Guide (Version 14): EMTB-PG-10
- Fan Coil/Unit Ventilator/Tracer 100 Series Engineering Bulletin: BAS-EB-50

General Information

Chapter Overview

This chapter contains information about the following:

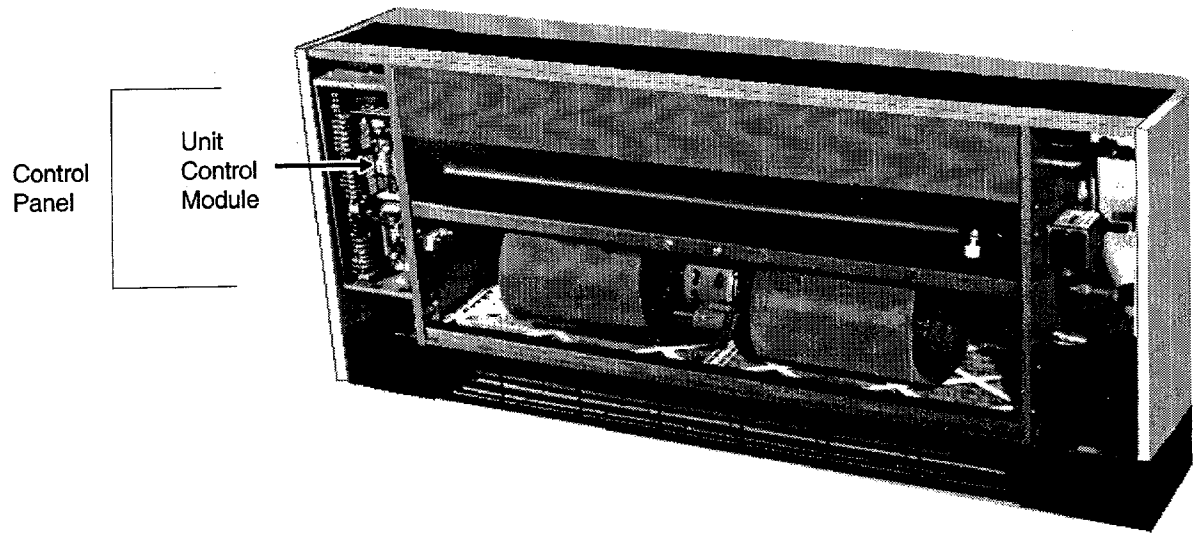
- Introduction to the Unit Control Module.
- UCM system configurations.
- UCM specifications and wiring.
- Communications Interface.

Introduction

The Unit Control Module (UCM) is a microprocessor-based Direct Digital Controller (DDC). It contains the control logic to properly temper the moving air through a Trane Fan Coil Air Conditioner in response to zone load requirements. The UCM controls unit valves, dampers, fans, etc., based on inputs from the operator and/or sensors that measure a variety of environmental conditions (temperature, etc.).

Figure 1-1 shows the location of the UCM in a single duct Fan Coil Air Conditioner.

Figure 1-1 UCM Location



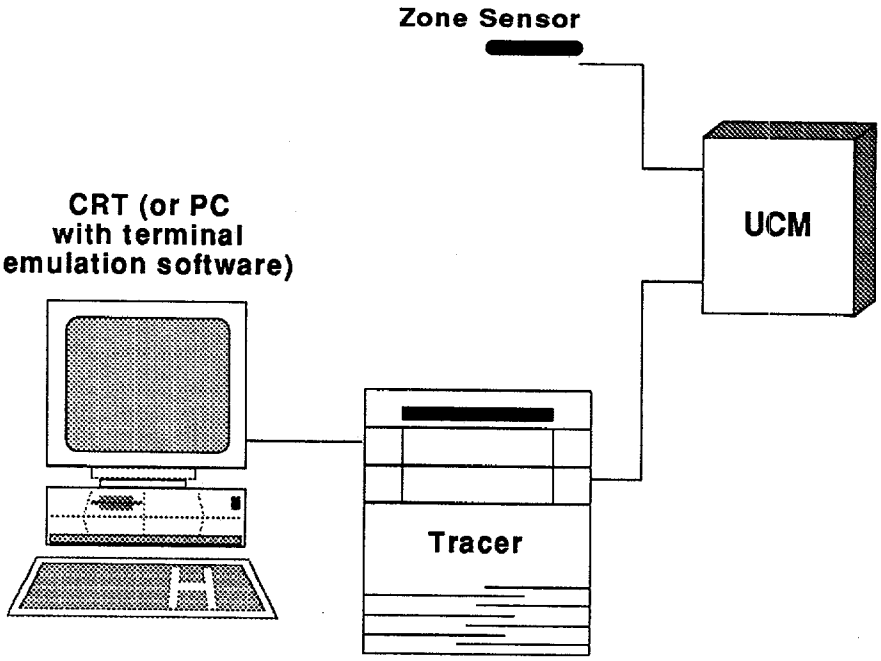
The Unit Control Module is located in the Control Panel of the Fan Coil unit. For Right Hand Piped Fan Coil units, as shown here, the Control Panel and UCM are on the left side. For Left Hand Piped Fan Coil units, the Control Panel and UCM are on the right side.

The UCM system consists of the following physical components:

1. Unit Control Module — Contains the sensor input circuits, service adjustments and microprocessor control electronics. Power is supplied by an externally mounted 24VAC transformer.
2. Zone Sensor Modules — A variety of analog sensors that provide temperature sensing and an operator interface to the UCM for operating modes, status and temperature setpoints.
3. Tracer Interface — Interface to Trane Building Automation System.

Figure 1-2 shows the architecture of a typical UCM system.

Figure 1-2 UCM System Architecture

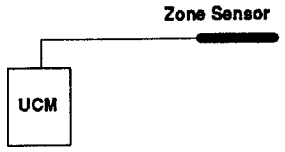


System Configurations

Environmental systems can be configured to meet customer needs. The Unit Control Module can control one Fan Coil Air Conditioner standalone or be controlled by a centrally located Building Automation System.

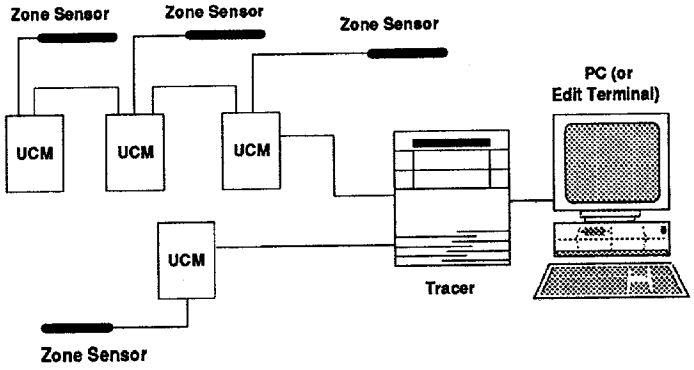
Standalone

A single thermostat / zone sensor controls a single UCM. A single unit failure affects only that unit.



Tracer

Standalone and/or multiple UCMs can be controlled by a Tracer panel (version 14 or higher). UCMs can also interface (generically) to other vendors' automation systems. The UCM is linked to the Tracer panel over a twisted pair of wires.



Specifications

The following list shows the Unit Control Module physical, electrical and environmental specifications.

Dimensions

UCM board and mounting hardware:
Height: 7.9"
Width: 4.6"
Depth: 1.92" maximum

Power Requirements

400 mA (RMS) @ 24VAC 9.6VA
525 mA (RMS) @ 24VAC 12.6VA with option modules

Operating Environments

-20 to 60 degrees C (-4 to 140 degrees F)
5 to 95% relative humidity (non-condensing)

Storage Environments

-40 to 70 degrees C (-40 to 158 degrees F)
5 to 95% relative humidity (non-condensing)

Mounting

The UCM printed circuit board should be mounted vertically (any orientation except heat sink at the low end) on a sheet metal surface within the Fan Coil Air Conditioner. Problems that might occur when the UCM printed circuit board (PCB) is incorrectly mounted include:

1. Accumulation of dust and debris on the PCB surface.
2. Overheated power components on the PCB.

Option boards may be mounted in any vertical orientation. Option board electrical connections should be kept as short as possible and routed away from the power wiring.

Wiring

Wires for temperature sensors, communication lines, 24VAC and contact closure sensing inputs should NOT be bundled with or run near high voltage wiring. Power wiring must be separated from the UCM and all low voltage wires. External input wires should be run in separate conduits from high voltage wires.

Wires connected to pin headers should be formed and routed so as to cause minimum strain on the UCM connector. A minimum 1.5" clearance (from the pin centerline) for wires up to 16 AWG is necessary for bending and forming wires. For maximum noise immunity, triac output wires should NOT be routed with relay output wires.

All sensor and input circuits are normally at or near ground potential. Do NOT connect any sensor or input circuit to an external ground connection. A close-coupled ground connection is required for the UCM.

The following table shows UCM wire types and lengths.

Wire	Type	Length
Contact Closure	18 AWG	up to 1000 ft.
24VAC	16 - 22 AWG	up to 1000 ft.
Thermostat	16 - 22 AWG	up to 1000 ft.
Zone Sensor	16 - 22 AWG	up to 200 ft.
Communications	Belden 8760 or equivalent	up to 5000 ft.

NOTE: Some connections to customer options may be made using bare solid or stranded wire on screw compression connectors. Provisions for fork or ring-tongue connections may be provided using a separately mounted terminal strip.

Communication Interface

The Communication Interface is typically a personal computer running Building Management Network, PCL Edit, Tracer-Access or terminal emulation software. Communication with the Tracer may also be achieved by using an edit terminal, which could also be a PC using terminal emulation software. The RS-232 Interface refers to each UCM by the UCM's unique address on the system. To operate a system properly, each UCM must have a unique Tracer address between 33 and 96.

The Tracer system connected to the Communication Interface can:

1. Monitor UCM status, parameters, sensor data, diagnostic bits and some internal variables.
2. Monitor and change UCM configuration information.
3. Monitor and change UCM setpoints, operating modes or outputs.

Refer to the Tracer system manuals for more information on communications.

Notes

Installation & Wiring

Chapter Overview

This section contains information about the following:

- Connecting the UCM to 24VAC power.
- Connecting the UCM to zone sensors.
- Connecting the UCM communication wiring.
- Setting the configuration DIP switches.
- Customer connections.

Connecting Power

WARNING! Disconnect all power external to the unit to prevent injury or death from electric shock. Use copper conductors only. The use of aluminum or other types of wire may result in overheating and equipment damage. Connect the 24 VAC power plug to terminal TB1.

Connecting Zone Sensors

Location and Mounting

A zone sensor in each control zone should be located in the most critical area of the zone but NOT in direct sunlight or in the zone supply air stream. It may be necessary to subdivide the zone to ensure adequate control and comfort.

Avoid mounting zone sensors in the following areas:

- Near drafts or "dead spots" behind doors or corners
- Near hot or cold air ducts
- Near radiant heat from appliances or the sun
- Near concealed pipes or chimneys
- On outside walls or other unheated or uncooled surfaces
- In air flows from adjacent zones or other units

Wiring

Each UCM must be controlled by a designated compatible sensor. Field wiring must meet the following requirements:

- Must be 16 - 22 AWG, copper twisted shielded pair, and no more than 1000 feet long.
- Shield must be connected at the UCM and taped at the other end.
- If local codes require enclosed conductors, the zone sensor wires should be installed in conduit. Do NOT install zone sensor wires in conduit that contains 24VAC or other high power wires.
- Refer to sensor installation instructions for terminal connections.

Zone Sensor Options

The UCM supports a range of zone sensors. The following table lists the zone sensors available for use with the Fan Coil Air Conditioner UCM:

Table 2-1 Zone Sensor Options

Zone Sensor Function	Type A	Type B	Type C
Temperature Measurement	x	x	x
Single Temperature Setpoint (degrees F and C)	x	x	x
* and ** Setpoints	x	x	x
Fan Switch			
OFF	OFF	OFF	OFF
AUTO	AUTO		
LOW	LOW	LOW	
MED			
HIGH	HIGH	HIGH	ON
Override Button			
ON & CANCEL	x	x	x
Communications Service Jack	x	x	x

Connecting Communications

Wiring

The UCM can provide a communications link to a Tracer building automation system. Field wiring of the UCM to the Tracer communications link must meet the following requirements:

- Wiring must be in accordance with the National Electrical Code and all local codes.
- Wiring must conform to the Belden 8760 standard or equivalent. Shields must be daisy chained and grounded at the Tracer only. More than one ground reference will cause communications failures. Tape the shield at the last UCM in the chain to prevent any connection between the shield and another ground.
- The maximum wire length from the Tracer to the last UCM in the chain must not exceed 5000 feet.
- Communications wiring must not pass between buildings.

1. Connect wires to terminal J8-2 (+) and J8-1 (-) on the UCM.

IMPORTANT: Polarity is extremely important and must be observed on all connections. Terminal J8-2 is designated positive (+) and terminal J8-1 is designated negative (-) for this purpose.

2. Connect the shield to terminal of the Tracer or sheet metal ground.
3. Verify that the UCM address is correctly set using the DIP switches. Refer to the following table.

Table 2-2 DIP Switch Address Settings

Unit #	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6	DIP7	DIP8
33	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
34	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
35	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
37	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
38	OFF	OFF	ON	OFF	OFF	ON	ON	OFF
39	OFF	OFF	ON	OFF	OFF	ON	ON	ON
40	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
41	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
42	OFF	OFF	ON	OFF	ON	OFF	ON	OFF
43	OFF	OFF	ON	OFF	ON	OFF	ON	ON
44	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
45	OFF	OFF	ON	OFF	ON	ON	OFF	ON
46	OFF	OFF	ON	OFF	ON	ON	ON	OFF
47	OFF	OFF	ON	OFF	ON	ON	ON	ON
48	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
49	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
50	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
51	OFF	OFF	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
53	OFF	OFF	ON	ON	OFF	ON	OFF	ON
54	OFF	OFF	ON	ON	OFF	ON	ON	OFF
55	OFF	OFF	ON	ON	OFF	ON	ON	ON
56	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
57	OFF	OFF	ON	ON	ON	OFF	OFF	ON
58	OFF	OFF	ON	ON	ON	OFF	ON	OFF
59	OFF	OFF	ON	ON	ON	OFF	ON	ON
60	OFF	OFF	ON	ON	ON	ON	OFF	OFF
61	OFF	OFF	ON	ON	ON	ON	OFF	ON
62	OFF	OFF	ON	ON	ON	ON	ON	OFF
63	OFF	OFF	ON	ON	ON	ON	ON	ON
64	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
65	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
67	OFF	ON	OFF	OFF	OFF	OFF	ON	ON
68	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
69	OFF	ON	OFF	OFF	OFF	ON	OFF	ON

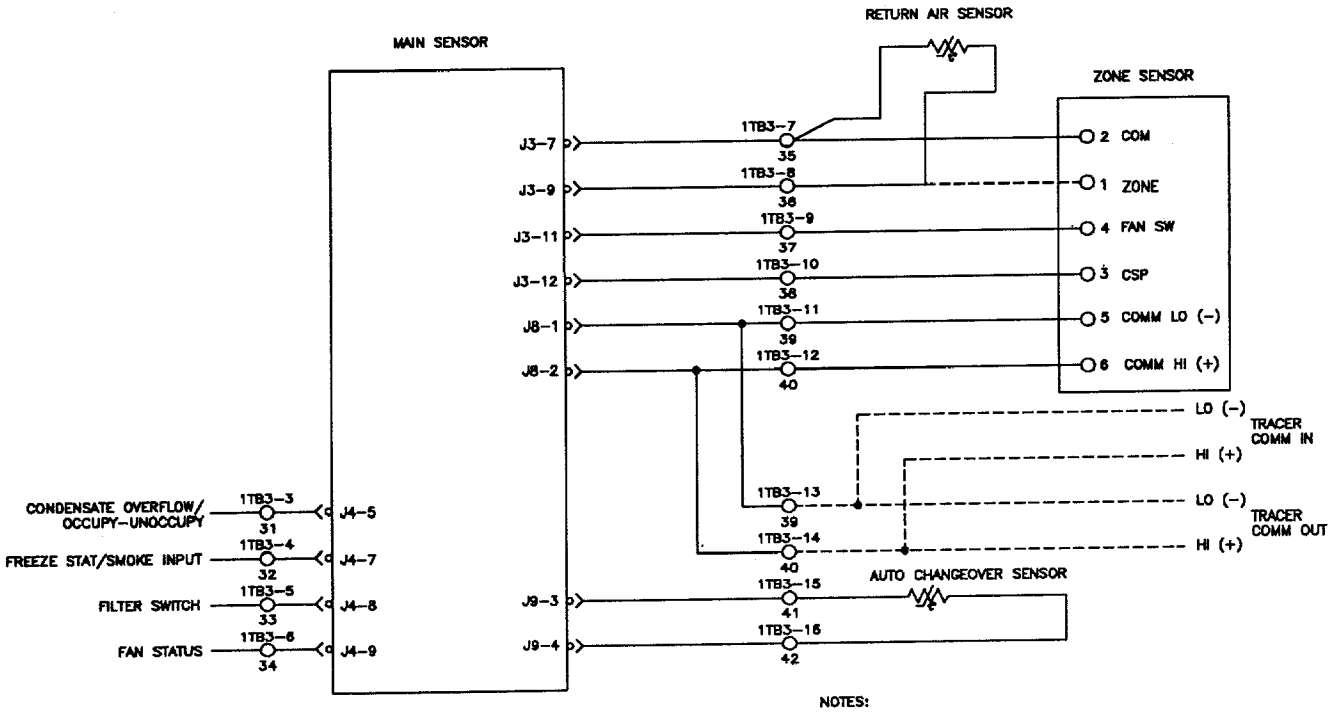
(continued)

(continued from previous page)

Unit #	DIP1	DIP2	DIP3	DIP4	DIP5	DIP6	DIP7	DIP8
70	OFF	ON	OFF	OFF	OFF	ON	ON	OFF
71	OFF	ON	OFF	OFF	OFF	ON	ON	ON
72	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
73	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
74	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
75	OFF	ON	OFF	OFF	ON	OFF	ON	ON
76	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
77	OFF	ON	OFF	OFF	ON	ON	OFF	ON
78	OFF	ON	OFF	OFF	ON	ON	ON	OFF
79	OFF	ON	OFF	OFF	ON	ON	ON	ON
80	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
81	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
82	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
83	OFF	ON	OFF	ON	OFF	OFF	ON	ON
84	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
85	OFF	ON	OFF	ON	OFF	ON	OFF	ON
86	OFF	ON	OFF	ON	OFF	ON	ON	OFF
87	OFF	ON	OFF	ON	OFF	ON	ON	ON
88	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
89	OFF	ON	OFF	ON	ON	OFF	OFF	ON
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF
91	OFF	ON	OFF	ON	ON	OFF	ON	ON
92	OFF	ON	OFF	ON	ON	ON	OFF	OFF
93	OFF	ON	OFF	ON	ON	ON	OFF	ON
94	OFF	ON	OFF	ON	ON	ON	ON	OFF
95	OFF	ON	OFF	ON	ON	ON	ON	ON
96	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF

IMPORTANT: To set the Tracer ICS address, a valid Tracer address must be set on the DIP switches and the test input must be momentarily shorted. The UCM only reads its DIP switches when the test input is shorted. It will not read the DIP switches at power-up. Refer to the "Trouble Analysis" section for more DIP switch functions.

Customer Connection Diagrams



⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

IMPORTANT

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

NOTES:

1. UNLESS OTHERWISE NOTED, ALL SWITCHES ARE SHOWN AT 25° C (77° F), AT ATMOSPHERIC PRESSURE, AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF, AND AFTER A NORMAL SHUTDOWN HAS OCCURRED.
2. DASHED LINES INDICATE RECOMMENDED FIELD WIRING BY OTHERS. DASHED LINE ENCLOSURES AND/OR DASHED DEVICE OUTLINES INDICATE COMPONENTS PROVIDED BY THE FIELD. SOLID LINES INDICATE WIRING BY TRANE CO.
3. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC), STATE AND LOCAL REQUIREMENTS.
4. SINGLE SHIELDED TWISTED PAIR 16 TO 20 AWG 600V BELDON 8760 OR EQUIVALENT MAXIMUM 5000 FOOT AGGREGATE RUN. THE SHIELD SHOULD BE TAPED TO PREVENT ANY CONTACT BETWEEN THE SHIELD AND GROUND AT THE UNIT. WHEN DAISY-CHAINED, THE SHIELD ENDS SHOULD BE SPLICED AND TAPED TO PREVENT CONTACT WITH GROUND. DO NOT RUN AC WIRING IN THE SAME CONDUIT OR WIRE BUNDLE WITH COMMUNICATION LINK WIRING. REFER TO IOM FOR FURTHER DETAILS.

Notes

Programming & Operation

Chapter Overview

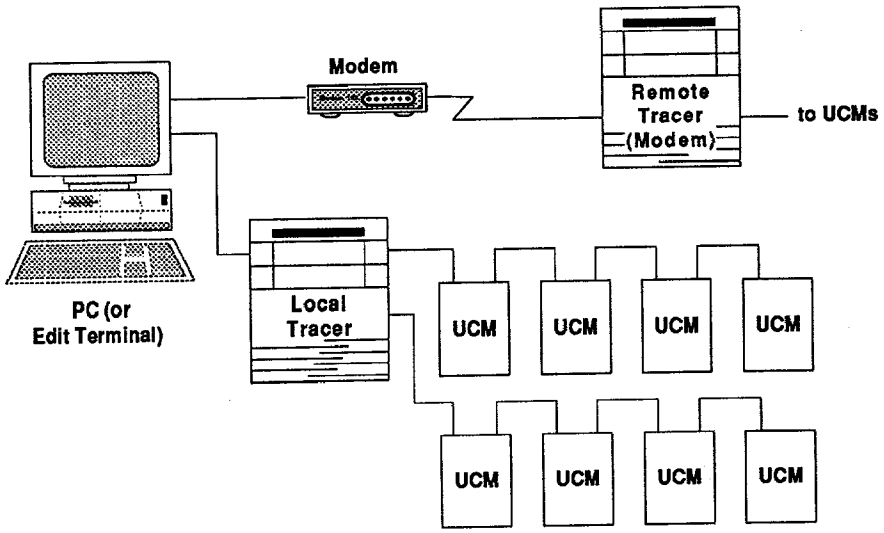
This chapter contains information about the following:

- Introduction to Programming
- Setting Up the Terminal
- Setting Up the Modem
- UCM Priorities and Default Values

Introduction to Programming

In a standalone configuration, the Unit Control Module will use pre-programmed default values to control the temperature and air flow of the Fan Coil Air Conditioner. For information on the default values, see *UCM Priorities and Default Values* at the end of this section. To change the default values, the UCM must be programmed for the new values. The UCM Program can be modified if it is connected to a Tracer, at which point you can communicate with the system using either an edit terminal or a PC running terminal emulation software (local or remote). When connected remotely, a modem must be attached to the terminal. Figure 3-1 shows how the Tracer Panel fits into the overall system configuration.

Figure 3-1 Tracer Architecture



Setting Up the Terminal

An ASCII editing device or PC running either terminal emulation software or Tracer software (Building Management Network, PCL Edit, etc.) must be connected to the Tracer RS-232 port. See Figures 3-2 and 3-3 for details.

To establish communications between the terminal and the Tracer unit, the following parameters must be the same in both units:

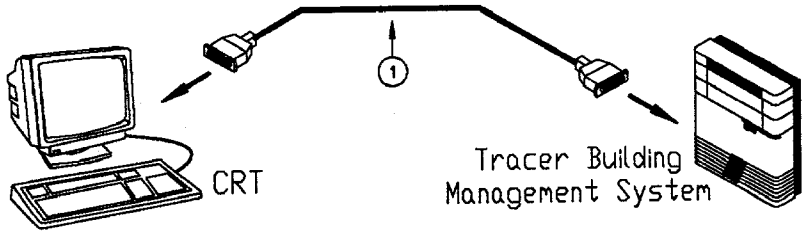
Function	Setting
Baud Rate	2400
Half or Full Duplex	Full
Parity	None
Upper/Lower Case	Upper Case Only
Auto Line Feed	OFF
Data Bits	8
Stop Bits	1

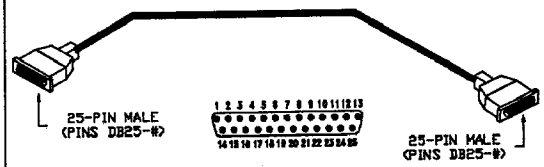
The Baud rate can be changed to 300, 600, 1200, 4800 or 9600 as long as it is changed on both the terminal and the Tracer.

See the Tracer Installation Manual for information on setting the Tracer baud rate.

See the terminal or PC operator's manual for information on setting the terminal parameters.

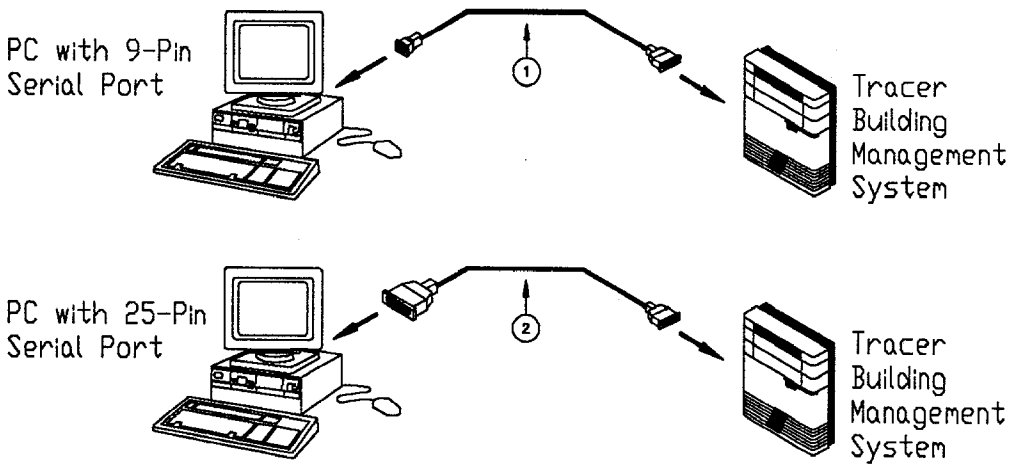
Figure 3-2 CRT Terminal to Tracer

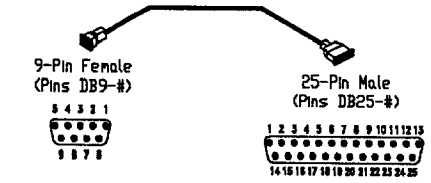
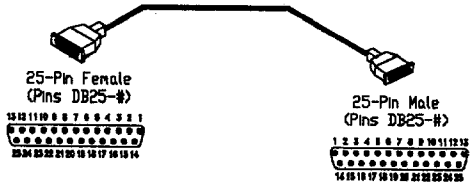


Call-Out Number	Part Num	Description	Illustration	Interconnections	
				Origin (CRT)	Dest. (Tracer)
①	35914208	DB25 Null Modem Cable		DB25-2 DB25-3 DB25-7 DB25-6 DB25-20	DB25-3 DB25-2 DB25-7 DB25-20 DB25-6

DB25-4 DB25-5 DB25-8	Jumper together

Figure 3-3 PC to Tracer



Call-Out Number	Part Number	Description	Illustration	Interconnections	
				Origin (PC)	Dest. (Tracer)
①	35914247	Direct-Connect Cable 9-Pin Connector		1 9 2 3 5 7	20 20 2 3 7 8
②	35914246	Direct-Connect Cable 25-Pin Connector		8 22 2 3 7 4	20 20 3 2 7 8

Setting Up the Modem

To program the UCM from a remote terminal, a modem must be connected to the Terminal. See Figure 3-4 for details.

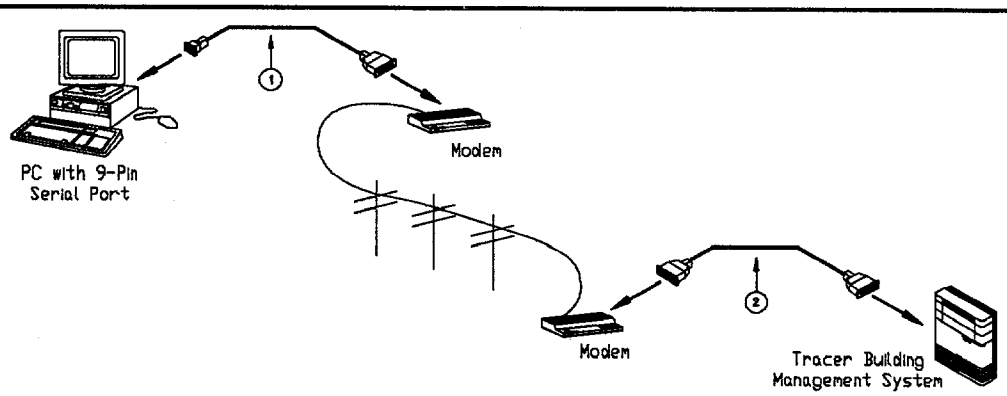
The modem supported by Trane is a 2400 baud US Robotics Sportster external modem.

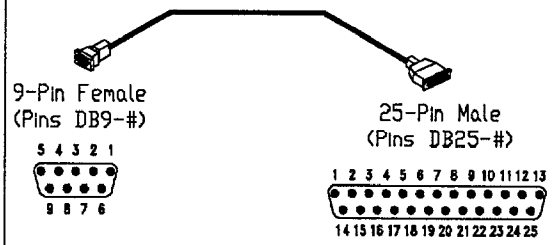
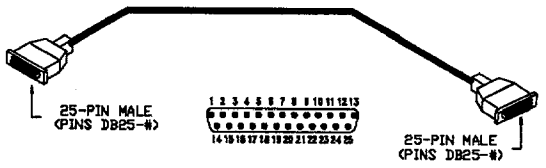
To set up the Trane-supplied modem:

1. Connect the terminal to the modem using the Trane cable (#3591 4206) or a modem bypass cable.
2. Verify that the 8 DIP switches on the back of the modem are set in the UP (ON) position.
3. Power up the modem. Power up the terminal with the CAPS LOCK switch ON. Verify that the baud rate is set to 2400.
4. At the terminal, type the following command: AT&F

   This may or may not appear on the screen as you type.
5. Press the Enter button. The message "OK" or "0" will appear.
6. At the terminal type: ATQ1S0=1E0&C1&W
7. Turn the modem OFF. Set DIP switches 1 and 3 DOWN (OFF).
8. Power up the modem and continue with communications.

Figure 3-4 PC to Tracer Using Modems



Call-Out Number	Part Number	Description	Illustration	Interconnections	
				9 Pin (PC)	25 Pin (Modem)
①	IBM P/N 6323670	IBM Modem Cable		3 2 7 8 6 5 1 4 9	2 3 4 5 6 7 8 20 22
				Tracer	Modem
②	35914206 or 35914251	RS-232 Modem Straight Cable		2 3 4 5 7 8 20	2 3 4 5 7 8 20

UCM Priorities and Default Values

Priorities

When communication is established between the Tracer and the UCM AND a successful download has been completed, the downloaded values take priority over the default values in the UCM. When communication is interrupted, the UCM uses the default values instead of the downloaded values.

Default Values

The default values for the UCM parameters are listed in the following table:

Parameter	Value
Economizer Minimum Position	25 %
Discharge Air Low Limit	38 degrees F
Discharge Air High Limit	170 degrees F
Mixed Air Low Limit	38 degrees F
DX Cooling Outdoor Air Low Limit	50 degrees F
Occupied cooling setpoint	74 degrees F
Occupied heating setpoint	71 degrees F
Unoccupied cooling setpoint	85 degrees F
Unoccupied heating setpoint	60 degrees F
Heating Setpoint Offset	2 degrees F
Unoccupied Timed Override	120 minutes

Notes

Sequence of Operations

Chapter Overview

This chapter contains information about the following:

- UCM Operation
- Zone Sensor Operation

UCM Operation

General Operation

The Fan Coil Air Conditioner consists of:

- A main water coil with an optional control valve and/or bypass damper
- An air supply fan
- An air filter
- An optional auxiliary coil
- Optional electric heater elements
- An optional air ventilation damper

The main coil is used in most applications for cooling; when the auxiliary coil is used it provides heating. The Fan Coil Air Conditioner can be set up to provide cooling, heating or a combination of both.

Fan Operation

The supply air fan will operate at various speeds in the OCCUPY mode unless the unit is controlled otherwise. The fan can also be manually adjusted to different speeds. With outside air control, the fan is turned off and the outside air damper is closed if the discharge air temperature drops below an adjustable low limit setpoint (safety trip-out). The low limit condition can be alarmed at the Tracer. Units equipped with the Fan Status option will indicate an alarm at the Tracer if the supply air fan output and status do NOT match after an adjustable verification delay.

Heating/Cooling Setpoint and Mode

The space temperature cooling setpoint is determined either by a local setpoint adjustment knob, the UCM default setpoint or Tracer downloaded values. The local setpoint adjustment knob will determine the setpoint if the UCM is in LOCAL mode. If the UCM is in REMOTE mode OR if the knob fails, the UCM will use the Tracer downloaded setpoint. If the Tracer is not communicating, the UCM will use its own default setpoint. The cooling setpoint is limited by adjustable parameters in the UCM to prevent it from being set too high or low. The heating setpoint is a UCM calculated value equal to the cooling setpoint minus an adjustable offset and is limited to a value less than or equal to the cooling setpoint. The UCM is set to cooling mode when the space temperature rises one degree F above the cooling setpoint. The UCM is set to heating when the space temperature drops one degree F below the heating setpoint. In the UNOCC mode, the setpoints will be widened to accommodate night setback and are adjustable.

Four Pipe Valve Control

In heating mode, the heating valve will be modulated to maintain the heating setpoint temperature and the cooling valve will be fully closed. In cooling mode, the cooling valve will be modulated to maintain the cooling setpoint and the heating valve will be fully closed. In either mode, the discharge air temperature setpoint will be limited to an adjustable low (usually 50 degrees F) and high (usually 90 degrees F) to prevent extremely cold or hot air from blowing into the space.

Cooling Valve with Primary Electric Heat

In heating mode, the valve will be closed and the electric heat will be cycled to maintain the space temperature setpoint. In cooling mode, the valve will be modulated and, if necessary, the electric heat will be cycled to maintain the space temperature setpoint. If the system and the UCM are in different modes (e.g. UCM in heating mode and chilled water in pipes) the valve will be closed and electric heat cycled to maintain the space temperature setpoint. In either mode, the discharge air temperature setpoint will be limited to an adjustable low (usually 50 degrees F) and high (usually 90 degrees F) to prevent extremely cold or hot air from blowing into the space.

Unoccupied Operation

In the UNOCC mode, the heating and cooling operation will be the same as OCCUPY mode except that the adjustable setpoints will have a wider range of values to accommodate night setback. The outside air damper (if present) will remain closed. The UCM will change to UNOCC operation when commanded.

Safety Shutdown

When the discharge air temperature drops below the low limit setpoint, the heating valve will open fully and the cooling valve will close. The fan will shut off and the OUTSIDE AIR damper will close. The safety shutdown will also occur when there is a smoke alarm or condensate overflow alarm input.

Morning Warm Up

When a warm up is initiated, the fan will turn at high speed, the OUTSIDE AIR damper will close, the heating valve will fully open and the cooling valve will fully close. When the space temperature reaches the heating setpoint, the UCM will operate in the OCCUPY mode.

Morning Cool Down

When cool down is initiated, the fan will turn at high speed, the OUTSIDE AIR damper will close, the cooling valve will fully open and the heating valve will close. When the space temperature reaches the cooling setpoint, the UCM will operate in OCCUPY mode.

Zone Sensor Operation

Zone Temperature

Each zone sensor uses a thermistor element to measure the actual zone temperature. If the sensor has a setpoint option, the setpoint will only be used by the UCM if the Setpoint Source is set to Wall Sensor on the Tracer UCM Setup Screen.

The ON (TOV) and TOV CANCEL commands are issued by the zone sensor when the corresponding buttons are pressed. When the ON button is pressed, the UCM will activate the TOV signal for two minutes, clear the TOV CANCEL signal (if it was set) and start the two hour, adjustable, timed override timer. When the TOV CANCEL button is pressed for at least one second, the UCM will activate the TOV CANCEL signal, clear the TOV signal and set the timed override timer to zero. Pressing either button will NOT affect the zone temperature reported by the UCM.

Zone sensor failure will cause the unit to shut down unless the unit has a discharge air sensor, in which case the UCM will use that sensor for control purposes.

Checkout Procedures

Chapter Overview

This chapter contains information about the following:

- Pre-Power Up Checkout
- Operational Checkout
- Zone Sensor Checkout

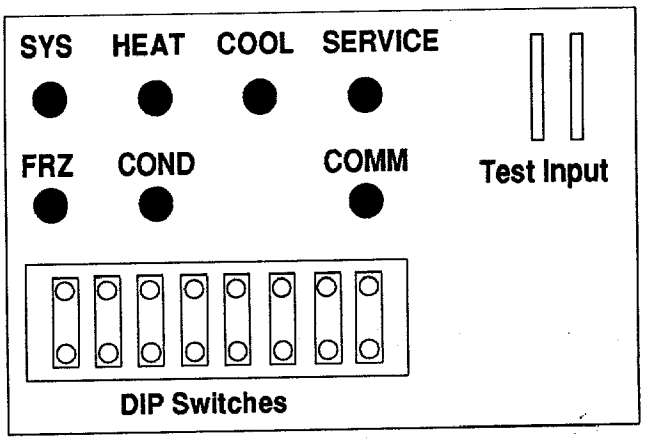
Pre-Power Up Checkout

- Check the supply voltage at UCM terminal J4-3. Voltage should measure 20 to 28 VAC.
- Check the communication wire connections and polarity.
- Verify that the zone sensor connections are correct as detailed in Chapter 2 - Installation and Wiring.
- When you are satisfied that all the above have been checked, power up the system. If the UCM is a standalone unit, operation can be checked using the UCM LEDs. This procedure is explained later on in this chapter. If the system is configured with a Tracer, go to the Tracer display to check status and perform the UCM Setup. Refer to the Tracer manuals for more information on checking status.

Operational Checkout

The UCM contains a service interface panel with LEDs to indicate mode of operation / status and a set of eight DIP switches that are used to set the UCM address and as a service data entry point. Figure 5-1 shows the service interface panel.

Figure 5-1 Service Interface Panel



The TEST INPUT and DIP Switches can be used by service personnel to run diagnostics. These are explained in Chapter 6. In Normal operating mode, the LEDs indicate the current operating condition of the UCM.

SYS
When lit, indicates this UCM is currently powered (ON).

HEAT
When lit, indicates the Fan Coil is in heating mode.

COOL
When lit, indicates the Fan Coil is in cooling mode. When blinking, indicates that the unit is shutdown on a latching diagnostic.

SERVICE
When lit, indicates service is required (dirty filter).

COMM
When lit continuously, indicates a bad connection in the communication link. When OFF continuously, indicates the communication link is wired correctly and there is no activity on the link. When blinking continuously, indicates activity on the link. Short blinks (.2 sec) indicate the UCM is responding. Long blinks (.5 sec) indicate the UCM does NOT recognize the signals on the link.

Zone Sensor Checkout

If an erroneous temperature is being reported to the UCM, use the following table to verify the integrity of the sensor or thermostat thumbwheel. Using an ohmmeter, measure thumbwheel resistance at terminals 2 and 3 on the thermostat. Also measure sensor resistance at terminals 1 and 2 on the zone sensor. The values listed in this table may vary + or - 10%.

Temperature (°F)	Temperature (°C)	Thumbwheel resistance — ohms	Sensor resistance — ohms
55	12.8	792	17.0
56	13.3	772	16.5
57	13.9	753	16.1
58	14.4	733	15.7
59	15.0	714	15.4
60	15.6	694	15.0
61	16.1	675	14.6
62	16.7	656	14.3
63	17.2	636	14.0
64	17.8	617	13.6
65	18.3	597	13.3
66	18.9	578	13.0
67	19.4	558	12.6
68	20.0	539	12.3
69	20.6	519	12.1
70	21.1	500	11.8
71	21.7	481	11.5

Temperature (°F)	Temperature (°C)	Thumbwheel resistance — ohms	Sensor resistance — ohms
72	22.2	461	11.2
73	22.8	442	11.0
74	23.3	422	10.7
75	23.9	403	10.4
76	24.4	383	10.2
77	25.0	364	10.0
78	25.6	344	9.7
79	26.1	325	9.5
80	26.7	306	9.3
81	27.2	286	9.0
82	27.8	267	8.8
83	28.3	247	8.6
84	28.9	228	8.4
85	29.4	208	8.2

Notes

Trouble Analysis

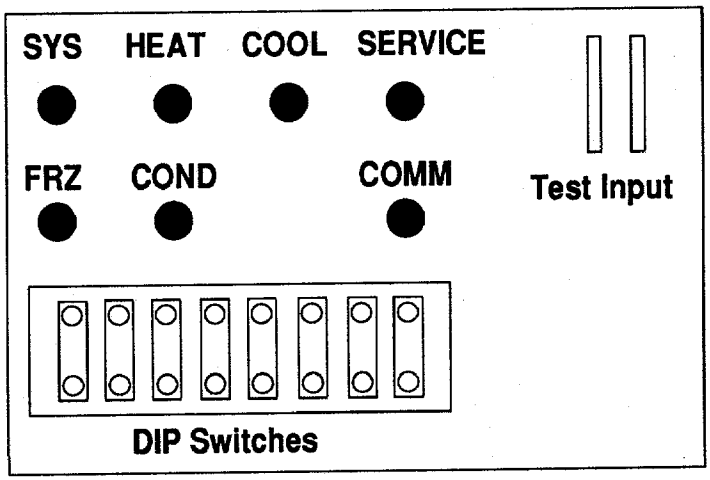
Chapter Overview

This chapter contains information about the following:

- Service Interface Panel Tests
- Binary Inputs and Outputs
- UCM Problems

The UCM contains a service interface panel that can be used to run diagnostic tests. Figure 6-1 shows the service interface panel.

Figure 6-1 Service Interface Panel



Test Input

When shorted together using a jumper wire, the input leads can either set the ICS address for the UCM or perform one of three service test functions on the UCM.

The following table shows the DIP switch settings for each test mode.

Mode	Description	1	2	3	4	5	6	7	8
01	ICS Address	Off	Off	Off	Off	Off	Off	Off	On
02	Auto Cycle	Off	Off	Off	Off	Off	Off	On	Off
08	Diagnostic	Off	Off	Off	Off	On	Off	Off	Off

ICS Address

If the DIP switches are set to a valid Tracer ICS address (see Table 2-2) and the test input is shorted, the UCM will assume the address defined by the DIP switches.

The current ICS address can be read from the Service Interface Panel by setting the DIP switches to mode 01 and shorting and holding the test input. The four LEDs

(SYS, HEAT, COOL, SERVICE) act as the bits of information. The address is displayed back in three separate LED blinking stages. The first stage is all four LEDs off. The second stage is the four high order bits of the address. The last stage is the four low order bits of the address. For example, say the UCM was to be given an address of 40.

First, use Table 2-2 to find that the DIP switches should be set as:
OFF OFF ON OFF ON OFF OFF OFF. Then, short the test input to set the address.

Next, verify the address by using the Service Interface Panel. Set the DIP switches to mode 01: OFF OFF OFF OFF OFF OFF OFF ON. Then short and hold the test input.

You should see the following information displayed on the four LEDs:

1st blink	2nd blink	3rd blink
OFF OFF OFF OFF	OFF OFF ON OFF	ON OFF OFF OFF

Notice, the first blink always contains all four LEDs OFF.

The second blink corresponds to the four high order bits of the address (i.e., DIP switches 1, 2, 3, and 4). The third blink corresponds to the four low order bits of the address (i.e., DIP switches 5, 6, 7, and 8).

Auto Cycle

The UCM can be placed into an auto cycle test mode by setting the DIP switches to mode 02 (OFF, OFF, OFF, OFF, OFF, OFF, ON, OFF). To step through the various test modes of operation, the test input needs to be shorted. Each time the input is shorted, the UCM advances to the next operation condition. The four LEDs indicate, in binary form, the current operating test mode of the UCM. In addition, the 6th LED (the one labeled COND) should be blinking at a rate of once per second to indicate that the UCM is in the auto cycle test mode.

Auto Cycle Stage	LED 1	LED 2	LED 3	LED 4	Description
0	OFF	OFF	OFF	OFF	Off
1	OFF	OFF	OFF	ON	Fan LO
2	OFF	OFF	ON	OFF	Fan MED
3	OFF	OFF	ON	ON	Fan HI
4	OFF	ON	OFF	OFF	Economizer (energize 2-position)
5	OFF	ON	OFF	ON	Cool (open valve)
6	OFF	ON	ON	OFF	Heat (open valve)
7	OFF	ON	ON	ON	Electric heat output 1
8	ON	OFF	OFF	OFF	Electric heat output 2
9	ON	OFF	OFF	ON	Electric heat output 3

Diagnostic

The four LEDs define a two-digit diagnostic code. The information is displayed in three segments. The first stage is all four LEDs OFF. The second stage lights the appropriate LEDs representing the high order binary bits for the diagnostic code. The third stage lights the appropriate LEDs for the low order bits. As an example, if diagnostic code 10 was to be displayed, the first stage would be all four LEDs OFF. The second stage would be OFF OFF OFF OFF, and the third stage would be ON OFF ON OFF. The second and third stages together make up the eight bits which define all diagnostic codes. In this example, diagnostic code 10 has the binary representation OFF OFF OFF OFF ON OFF ON OFF.

1st Blink				2nd Blink				3rd Blink				Description
LED1	LED2	LED3	LED4	LED1	LED2	LED3	LED4	LED1	LED2	LED3	LED4	
OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	Bad configuration
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	ON	Smoke alarm
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	OFF	OFF	OFF	Fan status
OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	Zone and supply temp sensors failed
OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	ON	ON	Low coil entering air temp
OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	ON	ON	Condensate overflow
OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	Low discharge air temp

Binary Inputs and Outputs

The following table lists the binary inputs and outputs for the Fan Coil UCM.

Binary Input	Application
High Pressure Cutout	Senses 24VAC applied to the compressor contact coil.
Low Pressure Cutout	A refrigerant pressure switch with a sensing port connected to the compressor suction.
Freeze Protection Switch	Provides contact closure by sensing low temperature across the entering face of the main coil.
Condensate Overflow Switch	Float switch in condensate pan to indicate overflow.
Condensate Overflow Probe	Probe in condensate pan to indicate overflow.
Air Filter Pressure Switch	Differential pressure switch with air ports communicating across the air filter.
Fan Status Air Flow Switch	Flow switch at the discharge end of the fan.
Occupied/Unoccupied	Reports occupancy in a controlled space.
Smoke	Smoke or other air contaminant switch.
Enable/Disable	Input connected to user device.
Aux Heat Water Temp Switch	Temperature switch that senses supply water temperature.
Firestat	Temperature switch that senses return air temperature.
Reheat Input	Status switch used in reheat control.
Test Input	Sets the UCM to service mode.
Fan Speed Control	Controls fan (ON/OFF, speed)
Valve Operators	Controls valves (OPEN/CLOSE)
Damper Operators	Controls dampers. Outdoor air - OPEN/CLOSE Outdoor air - ON/OFF
Electric Heat - ON/OFF	Contactors that energize electric heat elements.
Electric Heat - PWM	Contactors that modulate the slow energizing of electric heat elements.

Binary Input	Application
Exhaust Fan	Starts the exhaust fan to allow outdoor air into the space.
Alarm	Outputs to an external alarm indicator to indicate a need for service.
Aux Heat - Tracer Generic Output	Operates an external relay to provide external heat.

UCM Problems

The following lists potential problems, possible causes and solutions. Causes are listed in order of probability from most to least likely.

UCM doesn't communicate

UCM is not addressed correctly.
Verify / reset the DIP switch settings.

Signal interference on the link
Verify that the link wires are not routed near or with voltage source wires.

Incorrect wiring
Verify that link wiring is twisted pair as specified in Chapter 2 of this manual.

Incorrect supply voltage
Verify the input power is 20-28 VAC at all UCMs in the system.

Defective UCM board
If all of the previously listed solutions do not fix the problem, disconnect the communication link from the UCM board. Replace the board if necessary.

UCM does not display data

UCM is not addressed correctly or two UCMs have same address
Verify / reset the DIP switch settings.

Wiring problem
Disconnect the link past the first UCM and verify polarity. Check resistance across the wires for possible short or open condition.

UCM has no power
Check the system LED and verify the input power is 20-28 VAC .

Defective UCM
If all of the previously listed solutions do not fix the problem, check the other UCMs in the system. One UCM failure can affect communications to all other UCMs.

UCM reports incorrect zone temp or setpoint

Incorrect wiring

Verify that wiring is connected as specified in Chapter 2 of this manual.

Defective zone sensor
Disconnect the zone sensor plug. Using an ohmmeter, check the resistance according to the Zone Sensor Checkout procedure described in Chapter 5 of this manual. Check the installation and location of the zone sensor.

Incorrect calibration
Change the calibration factor on the UCM Setup screens (see Chapter 3).

Setpoint wheel disabled
Enable the zone sensor using the UCM Setup screens (see Chapter 3).

Fan Control outputs not energizing

UCM downloaded incorrectly

Check unit type and control parameters.

Outputs on UCM have failed
Check using the Auto Cycle test.

Fan / control relay failed
Remove the fan / heat wires from the UCM and apply 24 VAC directly to the relay.

Note: To avoid damage, do NOT jumper 24 VAC to J1.

Tracer fan / control outputs disabled
Using the Tracer, check group, global and Tracer overrides (refer to the Tracer manuals).

UCM outputs configured as normally closed
Verify the output configurations using the UCM Setup screens (see Chapter 3).

Zone temp is at or above high setpoint
Increase the high limit using the UCM Setup screens (see Chapter 3).

Glossary

Acronym
An abbreviation, typically the first letter of each word in a name. The following is a list of acronyms:

AIP	Analog Input Point
AOP	Analog Output Point
ASCII	American Standard Code for Information Interchange
BAS	Building Automation System
BIP	Binary Input Point
BMN	Building Management Network
BMS	Building Management System
BOP	Binary Output Point
CPU	Central Processing Unit
DDC	Direct Digital Control
MWU	Morning Wake Up
NSB	Night Setback
OPR	Operator Override
PCL	Process Control Language
UCM	Unit Control Module
VAV	Variable Air Volume

Address
A number used by a central processing unit (CPU) to specify a location in memory or define a system device (e.g. communication link).

Alarm
An audible or visual signal that warns of an abnormal and critical operating condition.

Analog Input Point (AIP)
A varying voltage, current or resistance signal which can be converted to engineering units of temperature, pressure, humidity, wattage, etc.

Analog Output Point (AOP)
A varying voltage or current signal used to change the position of a device such as an electric valve. AOPs are typically used in DDC loops.

Analog Sensor
A device that measures the exact value of a varying parameter (temperature, humidity, flow, etc.) and transmits a signal to the Building Management System indicating that value.

ASCII
American Standard Code for Information Interchange. A binary code designed to represent each of 256 different alphanumeric characters and other non-printing characters used to control computer devices.

Backup
A copy of one or more computer files to a storage medium for safekeeping in case the original is damaged or lost.

Baud Rate
The speed, in bits per second, at which information is transmitted over communication lines.

Binary
1 - A numbering system with two digits (0 and 1) in which each symbol has a decimal power of two.

2 - Any system that has only two possible states or levels (e.g. a switch that is either on or off).

3 - A computer circuit that indicates the presence (1) or the absence (0) of a signal.

Binary Input Point (BIP)
An on / off input to a processor, used to indicate status (e.g. flow switch, limit switch, other contact).

Binary Output Point (BOP)
An on / off control output from a processor.

Boot (Bootstrap)
The act of starting a computer.

Buffer
1 - A device or memory area that stores information temporarily during data transfer.

2 - An electronic device used for isolation.

Building Automation System (BAS)
A combination of controllers and other software products that control various mechanical systems in a building such as heating, cooling, ventilation, lighting, access, etc.

Building Management Network (BMN)
A Trane PC based software system, with a graphic interface, that allows an operator to remotely monitor and control Tracer and / or Tracker building management systems.

Building Management System (BMS)
A combination of controllers and other software products that control various mechanical systems in a building such as heating, cooling, ventilation, lighting, access, etc. *Same as Building Automation System.*