Installation Operation Maintenance

UniTrane® Fan-Coil Room Conditioners
Force Flo™ Cabinet Heaters
Sizes 02-12

Low Vertical Fan-Coils
Sizes 03-06

Models
"LO" Design Sequence and Later

April 2000

UNT-IOM-6
Supercedes UNT-IOM-5

Table of Contents

General Information

UniTrane® fan-coil and Force Flo™ cabinet heaters units are single room units with load capabilities of 200 to 1200 cfm. See Figure 1 for unit components. Fan-coil units are available as 2-pipe with or without electric heat (one hydronic circuit) or 4-pipe (two hydronic circuits). Force Flo™ units feature 2-pipe hydronic coils, electric heat only, or steam only. Also, units feature a variety of factory piping packages. See the Appendix on page 100 for more information on available factory-installed piping packages.

Three control options are available with the UniTrane® fan-coil and Force Flo™ cabinet heater units.

1. fan mode switch
2. Tracer® ZN.010 and ZN.510, ZN.520
3. terminal unit controller (TUC)

All control options are available as unit or wall mounted. Units with a Tracer® ZN.010, ZN.510, ZN.520 or TUC also feature a split combination: unit mounted fan mode switch with a wall mounted setpoint dial.

The Tracer® controllers (ZN.010, ZN.510 and ZN.520) utilize binary outputs to operate 2-position control valves, supply fan/s, 2-position dampers, and electric heat.

The TUC utilizes binary outputs to control the fan and optional auxiliary heat. In addition, it operates 2-position or 3 wire floating point control valves and the fresh air damper.

Available supply and return openings vary with each cabinet style. In addition, a fresh air opening with either a manual or motorized air damper is an available option. See pages 4-5 for available cabinet styles.

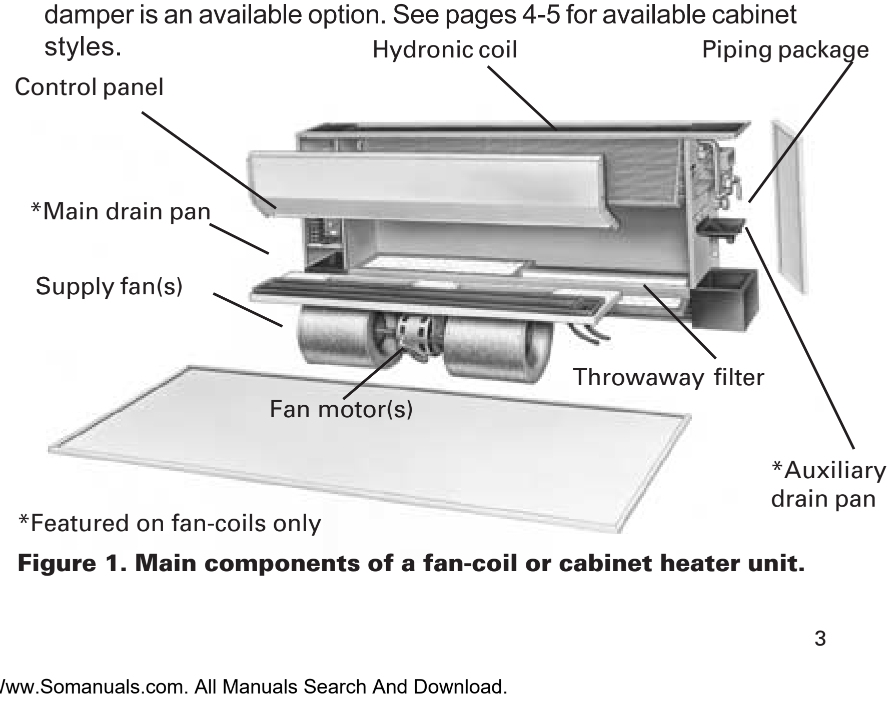
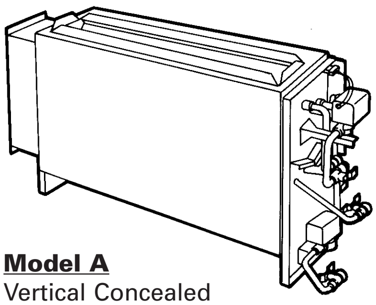
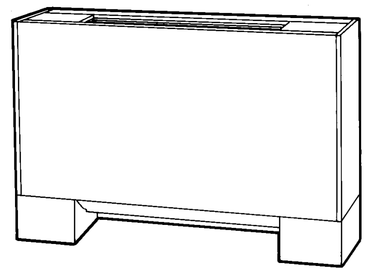


Figure 1. Main components of a fan-coil or cabinet heater unit.

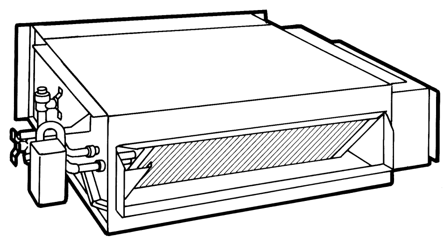
Cabinet Styles



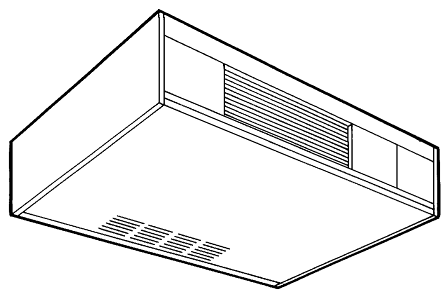
Model A
Vertical Concealed



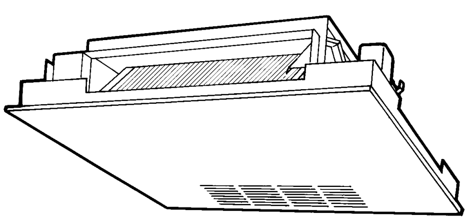
Model B
Vertical Cabinet



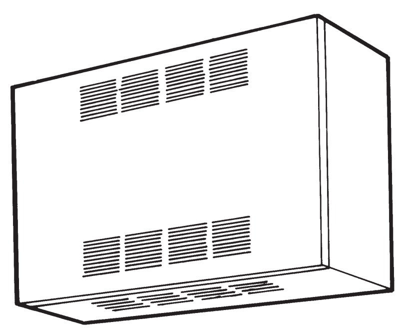
Model C
Horizontal Concealed



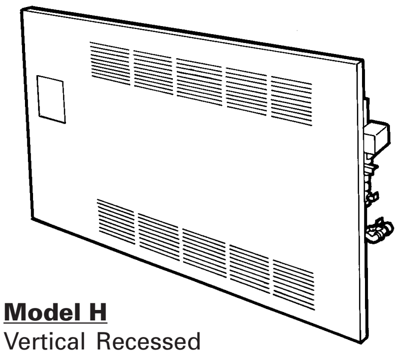
Model D
Horizontal Cabinet



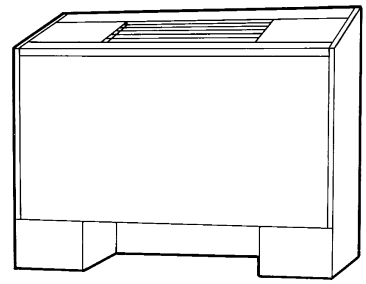
Model E
Horizontal Recessed



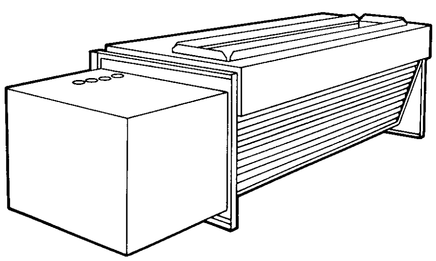
Model F
Wall Hung Cabinet**



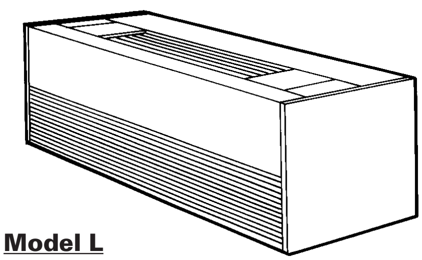
Model H
Vertical Recessed



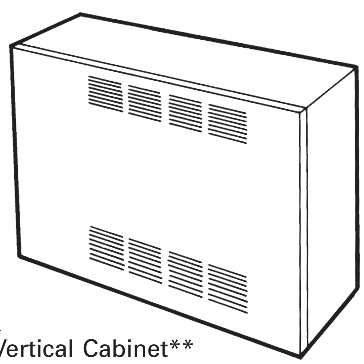
Model J
Vertical Slope Top Cabinet



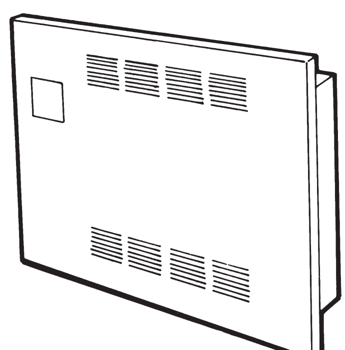
Model K
Low Vertical Concealed*



Model L
Low Vertical Cabinet*



Model M
Inverted Vertical Cabinet**



Model N
Inverted Vertical Recessed**

*Fan-coil only
**Force Flo cabinet heater only

Model Number Description

Each UniTrane® fan-coil and Force Flo ™ cabinet heater has a multiple character model number unique to that particular unit. To determine a unit's specific options, reference the model number on the unit nameplate on the fan scroll. The unit nameplate also identifies the serial number, sales order number, and installation and operating specifications. See Figure 2 for the nameplate location.

Reference pages 7-8 for a detailed explanation of the model number.

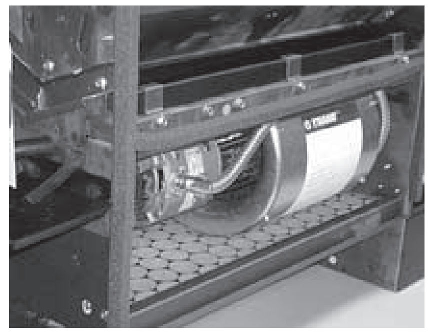


Figure 2. The unit nameplate is on the fan scroll.

Complete the installation checklist on page 13 to ensure proper and safe operation.

Model Number Description

Digits 1 & 2 Unit Type
FC
FF

Digit 3 Model

A	Vertical concealed
B	Vertical cabinet
C	Horizontal concealed
D	Horizontal cabinet
E	Horizontal recessed
F	Vertical wall hung*
H	Vertical recessed
J	Vertical slope top
K	Low vertical concealed
L	Low vertical cabinet
M	Inverted vertical cabinet*
N	Inverted vertical recessed*

Digit 4 Development Sequence
B

Digits 5–7 Unit Size

020	200 cfm
030	300 cfm
040	400 cfm
060	600 cfm
080	800 cfm
100	1000 cfm
120	1200 cfm

Digit 8 Unit Voltage

1	115/60/1
2	208/60/1
3	277/60/1
4	230/60/1
5	208/60/3
6	230/6j0/3
7	480/60/3
8	110-120/50/1
9	220-240/50/1
A	220-240/50/3
B	380-415/50/3

Digit 9 Piping System Placement

A	W/o piping, RH conn., w/o aux. drain pan
B	W/o piping, LH conn., w/o aux. drain pan
C	W/o piping, RH conn., w/ aux. drain pan
D	W/o piping, LH conn., w/ aux. drain pan
E	W/o piping, RH conn., w/o aux. drain pan, ext. end pocket
F	W/o piping, LH conn., w/o aux. drain
G	W/o piping, RH conn., w/ aux. drain pan, ext. end pocket
H	W/o piping, LH conn., w/ aux. drain pan, ext. end pocket
J	With piping, RH
K	With piping, LH
L	With piping, RH, ext. end pocket
M	With piping, RH, ext. end pocket

Digits 10 & 11 Design Sequence
LO

Digit 12 Inlet

A	Front toe space
B	Front bar grille
C	Front stamped louver
D	Bottom stamped louver
E	Bottom toe space
F	Back duct collar
G	Open return
H	Back stamped louver

Digit 13 Fresh Air Damper

0	None
A	Manual, bottom opening
B	Manual, back opening
C	Manual, top opening
D	Auto, 2 pos., bottom opening
E	Auto, 2 pos., back opening
F	Auto, 2 pos. top opening
G	Auto, economizer, bottom opening
H	Auto, economizer, back opening
J	Auto, economizer, top opening
K	No damper, bottom opening
L	No damper, back opening
M	No damper, top opening

Digit 14 Outlet

A	Front duct collar
B	Front bar grille
C	Front stamped louver
D	Front quad grille
E	Bottom duct collar
F	Bottom stamped louver
G	Top quad grille
H	Top bar grille
J	Top duct collar
K	Bottom bar grille

Digit 15 Color

0	None
1	Deluxe beige
2	Soft dove
3	Cameo white
4	Driftwood grey
5	Stone grey
6	Rose mauve

Digit 16 Tamperproof Locks & Leveling Feet

0	None
A	Keylock panel
B	Keylock access door
C	Keylock panel & access door
D	Leveling feet
E	Keylock panel with leveling feet
F	Keylock access door w/leveling feet
G	Keylock panel & access door w/leveling feet

Digit 17 Motor

A	Free discharge
B	High static

Digit 18 Coil

A	2 row cooling/heating
B	3 row cooling/heating
C	4 row cooling/heating
D	2 row cooling, 1 row heating
E	2 row cooling, 2 row heating
F	3 row cooling, 1 row heating
G	2 row cooling or heating only
H	3 row cooling or heating only
J	4 row cooling or heating only
K	2 row cooling/heating, elec. heat
L	3 row cooling/heating, elec. heat
M	4 row cooling/heating, elec. heat
N	Electric heat only, 1 stage
P	2 row cooling/heating, 1 row heating
Q	2 row cooling/heating, 2 row heating
R	3 row cooling/heating, 1 row heating
U	Electric heat only, 2 stage
V	Electric heat only, low kw, 1 stage
W	Steam coil

Digit 19 Coil Fin Series

2	144

Digit 20 Air Vent

A	Automatic
M	Manual

Digits 21, 22, & 23 Electric Heat kW
[208 V kW derate in brackets]

000	None
010	1.0 [0.75]
015	1.5 [1.1]
020	2.0 [1.5]
025	2.5 [1.9]
030	3.0 [2.2]
040	4.0 [3.0]
045	4.5 [3.3]
050	5.0 [3.7]
060	6.0 [4.4]
070	7.0 [5.3]
075	7.5 [5.7]
080	8.0 [6.0]
100	10.0
105	10.5 [7.9]
110	11.0 [9.0]
120	12.0
135	13.5 [10.2]
150	15.0
180	18.0 [13.5]
200	20.0 [15.0]

*Force Flo™ cabinet heater only

Digit 24 Reheat

0	None
A	Steam
B	Hot water

Digit 25 Disconnect Switch

0	None
D	With disconnect

Digit 26 Filter

0	None
1	1" TA
2	1" TA pltd. media
3	1" TA + 1 extra
4	1" TA pltd. media + 1 extra
5	1" TA + 2 extra
6	1" TA pltd. media + 2 extra
7	1" TA + 3 extra
8	1" TA pltd. media + 3 extra

Digit 27 Main Control Valve

0	None
A	2 way, 2 pos., N.O. (25 psig)
B	3 way, 2 pos., N.O. (30 psig)
C	2 way, 2 pos., N.C. (25 psig)
D	3 way, 2 pos., N.C. (15 psig)
E	2 way, 2 pos., N.O. (50 psig)
F	3 way, 2 pos., N.O. (50 psig)
G	2 way, 2 pos., N.C. (50 psig)
H	3 way, 2 pos., N.C. (50 psig)
J	2 way, mod., Cv = 0.7 (50 psig)
K	3 way, mod., Cv = 0.7 (50 psig)
L	2 way, mod., Cv = 1.5 (50 psig)
M	3 way, mod., Cv = 1.5 (50 psig)
N	2 way, mod., Cv = 2.5 (50 psig)
P	3 way, mod., Cv = 2.5 (50 psig)
Q	2 way, mod., Cv = 4.0 (50 psig)
R	3 way, mod., Cv = 4.0 (50 psig)

Digit 28 Auxiliary Control Valve

0	None
A	2 way, 2 pos., N.O. (25 psig)
B	3 way, 2 pos., N.O. (30 psig)
C	2 way, 2 pos., N.C. (25 psig)
D	3 way, 2 pos., N.C. (15 psig)
E	2 way, 2 pos., N.O. (50 psig)
F	3 way, 2 pos., N.O. (50 psig)
G	2 way, 2 pos., N.C. (50 psig)
H	3 way, 2 pos., N.C. (50 psig)
J	2 way, mod., Cv = 0.7 (50 psig)
K	3 way, mod., Cv = 0.7 (50 psig)
L	2 way, mod., Cv = 1.5 (50 psig)
M	3 way, mod., Cv = 1.5 (50 psig)
N	2 way, mod., Cv = 2.5 (50 psig)
P	3 way, mod., Cv = 2.5 (50 psig)
Q	2 way, mod., Cv = 4.0 (50 psig)
R	3 way, mod., Cv = 4.0 (50 psig)

Digit 29 Piping Package

0	None
A	Ball valve supply & return
B	Ball valve supply & manual circuit setter return
C	Ball valve supply & auto circuit setter
D	Ball valve supply & return w/strainers & unions
E	Ball valve supply & manual circuit setter w/strainers & unions
F	Ball valve supply & auto circuit setter w/strainers & unions

Digit 30 Control Type

A	Fan Speed Switch
C	TUC
D	TUC w/Trane ICS
E	Tracer® ZN.010
F	Tracer® ZN.510
G	Tracer® ZN.520

Digit 31 Control Options

D	Unit mtd. fan mode switch (OHML)
K	Wall mtd. fan mode switch (OHML)
V	Unit mtd. zone sensor, w/SP rotary, & fan mode switch (OAHML),
W	Wall mtd. zone sensor w/ SP rotary, & fan mode switch (OAHML),
X	Unit mtd. fan mode switch, wall mtd. setpoint dial zone sensor

Digit 32-34 Future Control Options

Digit 35 Control Function 3

0	None
2	Condensate overflow detection

Digit 36 Control Function 4

0	None
2	Low temperature detection

Digits 37 & 38 Future Control Options

Digit 39 Recessed Options

0	None
A	Stand. 5/8" recessed panel
B	2" projection panel
C	2.5" projection panel
D	3" projection panel
E	3.5" projection panel
F	4" projection panel
G	4.5" projection panel
H	5" projection panel
J	5.5" projection panel
K	6" projection panel
L	2" falseback
M	3" falseback
N	4" falseback
P	5" falseback
Q	6" falseback
R	7" falseback
T	8" falseback

Digit 40 Main Auto Circuit Setter GPM

0	None	K	4.5
A	0.5	L	5.0
B	0.75	M	6.0
C	1.0	N	7.0
D	1.5	P	8.0
E	2.0	Q	9.0
F	2.5	R	10.0
G	3.0	T	11.0
H	3.5	U	12.0
J	4.0		

Digit 41 Auxiliary Auto Circuit Setter GPM

0	None	K	4.5
A	0.5	L	5.0
B	0.75	M	6.0
C	1.0	N	7.0
D	1.5	P	8.0
E	2.0	Q	9.0
F	2.5	R	10.0
G	3.0	T	11.0
H	3.5	U	12.0
J	4.0		

Digit 42 Subbase

0	None
A	2" height
B	3" height
C	4" height
D	5" height
E	6" height
F	7" height

Digit 43 Recessed Flange

0	None
A	Recessed flange

Digit 44 Wallbox

0	None
A	Anodized

Receiving and Handling

UniTrane® fan-coil and Force Flo™ cabinet heaters ship in individual cartons for maximum protection during shipment and for handling and storage ease. Each carton has tagging information such as the model number, sales order number, serial number, unit size, piping connections, and unit style to help properly locate the unit in the floor plan. If specified, the unit will ship with tagging designated by the customer.

Complete the following checklist before accepting delivery of units to detect any shipping damage.

☐ **1.** Inspect each piece of the shipment before accepting it. Check for rattles, bent carton corners, or other visible indications of shipping damage.

☐ **2.** If the carton appears damaged, open it immediately and inspect the contents before accepting. Do not refuse the shipment. Make specific notations concerning the damage on the freight bill. Check the unit casing, fan rotation, coils, condensate pan, filters, and all options or accessories.

☐ **3.** Inspect the unit for concealed damage and missing components soon after delivery and before storing. **Report concealed damage to the delivering carrier within the allotted time after delivery (check with the carrier on the allotted time to submit a claim).**

☐ **4.** Do not move damaged material from the receiving location if possible. It is the receiver's responsibility to provide reasonable evidence that concealed damage did not occur after delivery.

☐ **5.** Do not continue to unpack shipment if it appears damaged. Retain all internal packing, cartons, and crate. Take photos of the damaged material if possible.

☐ **6.** Notify the carrier's terminal of damage immediately by phone and mail. Request an immediate joint inspection of the damage by the carrier and consignee.

☐ **7.** Notify the Trane sales representative of the damage and arrange for repair. Have the carrier inspect the damage before beginning any repairs to the unit.

Jobsite Storage

This unit is intended for indoor use only. To protect the unit from damage due to the elements and prevent it from possibly becoming a contaminant source for IAQ problems, store the unit indoors. If indoor storage is not possible, the Trane Company makes the following provisions for outdoor storage:

1. Place the unit(s) on a dry surface or raised off the ground to assure adequate air circulation beneath unit and to assure that no portion of the unit contacts standing water at any time.

2. Cover the entire unit with a **canvas tarp** only. **Do not** use clear, black or plastic tarps as they may cause excessive moisture condensation and equipment damage.

Note: *Wet interior unit insulation can become an amplification site for microbial growth (mold), which may cause odors and health-related indoor air quality problems. If there is visable evidence of microbial growth (mold) on the interior insulation, remove and replace the insulation prior to operating the system. Refer to the "Inspecting and Cleaning the Internal Insulation" section on page 123 for more information.*

Installation Considerations

Complete the following checklist before installing the unit.

☐ **1. Clearances**

Allow adequate space for free air circulation, service clearances, piping and electrical connections, and any necessary ductwork. For specific unit dimensions, refer to the submittals. Allow clearances according to local and national electric codes. See the following section on "Service Access" and refer to Figure 3 on page 12 for recommended service and operating clearances. Provide removable panels for concealed units.

☐ **2. Structural Support**

The floor should be strong enough to adequately support floor mounted units. The installer is responsible to supply adequate support rods for installation of ceiling units.

☐ **3. Level**

If necessary, prepare the floor or ceiling to ensure the unit installation is level (zero tolerance) in both horizontal axis to allow proper operation.

Set the unit level using the chassis end panels as a reference point. Do not use the coil or drain pan as the reference point since the coil is pitched and the drain pan has an inherent positive slope to provide proper drainage.

☐ **4. Condensate Line**

A continuous pitch of 1 inch per 10 feet of condensate line run is necessary for adequate condensate drainage.

☐ **5. Wall and Ceiling Openings**

Recessed units only:
Refer to the submittal for specific dimensions of wall or ceiling openings before attempting to install the unit.

Horizontal concealed units only:
The installation of horizontal concealed units must meet the requirements of the National Fire Protection Association (N.F.P.A.) Standard 90A or 90B concerning the use of concealed ceiling spaces as return air plenums.

☐ **6. Exterior**

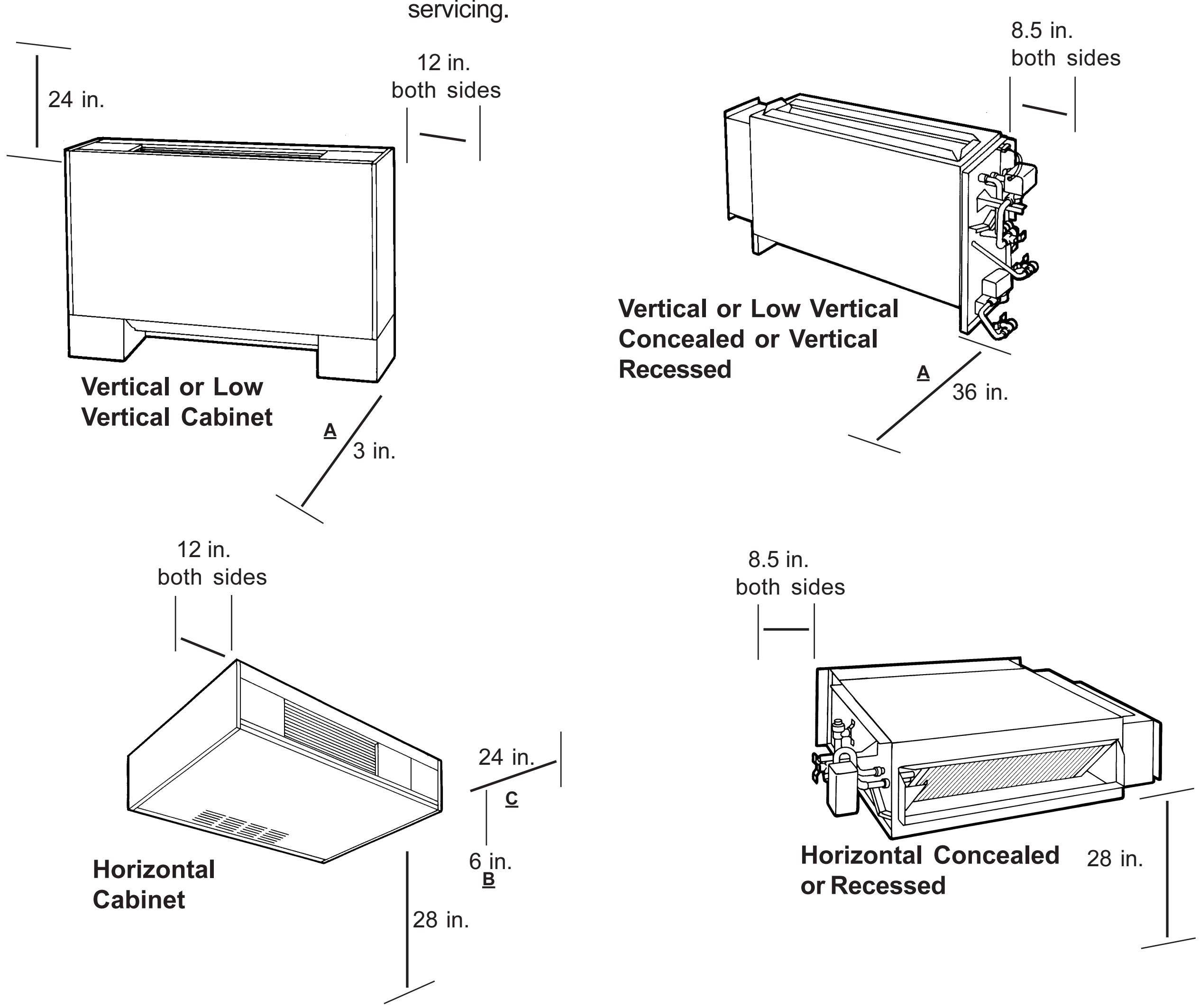
Touch up painted panels if necessary. If panels need paint, sanding is not necessary. However, clean the surface of any oil, grease, or dirt residue so the paint will adhere. Purchase factory approved touch up epoxy paint from your local Trane Service Parts Center and apply.

Service Access

Service access is available from the front on vertical units and from the bottom on horizontal units. Cabinet and recessed units have removable front or bottom panels to allow access into the unit. See Figure 3 for recommended service and operating clearances.

Units have either right or left hand piping. Reference piping locations by facing the front of the unit (airflow discharges from the front). The control panel is always on the end opposite the piping.

The unit has a modular fan board assembly that is easy to remove. Also, the main drain pan is easily removable for cleaning. See the “Maintenance” section beginning on page 88 for more details on servicing.



A- Front Access or Front Free Discharge   B- Control Access Door   C- Front Free Discharge   D- Back Louvered Return

Figure 3. Recommended Service and Operating Clearances

Installation Checklist

The following checklist is only an abbreviated guide to the detailed installation procedures given in this manual. Use this list to ensure all necessary procedures are complete. For more detailed information, refer to the appropriate sections in this manual.

WARNING: Allow rotating fan to stop before servicing equipment. Failure to do so may cause severe personal injury or death.

☐ **1.** Inspect the unit for shipping damage.

☐ **2.** Level installation location to support the unit weight adequately. Make all necessary wall or ceiling openings to allow adequate air flow and service clearances.

☐ **3.** Ensure the unit chassis is level.

CAUTION: The unit must be installed level (zero tolerance) in both horizontal axis for proper operation. Failure to do so may result in condensate management problems such as standing water inside the unit. Standing water and wet surfaces may result in microbial growth (mold) in the drain pan that may cause unpleasnt odors and serious health-related indoor air quality problems.

☐ **4.** Secure the unit and any accessory items properly to the wall or ceiling support rods.

☐ **5.** Complete piping connections correctly.

☐ **6.** Check field sweat connections for leaks and tighten the valve stem packing, if necessary.

☐ **7.** Install the auxiliary drain pan properly under piping package on fan-coil units.

☐ **8.** Pitch condensate drain line 1 inch drop per 10 feet of line run on fan-coil units.

- ☐ **9.** Complete condensate drain line connections on fan-coil units.

- ☐ **10.** Install automatic changeover sensor option on the supply water line.

- ☐ **11.** Install automatic electric heat lockout switch option on the supply water line.

- ☐ **12.** Install condensate overflow switch option correctly on the auxiliary drain pan.

- ☐ **13.** Install the low temperature detection device option correctly.

- ☐ **14.** Complete all necessary duct connections.

- ☐ **15.** Complete all interconnection wiring for the wall mounted fan mode switch or zone sensor per the wiring schematic and guidelines established in the “Wall Mounted Control Interconnection Wiring” section on page 35.

- ☐ **16.** Install the wall mounted fan mode switch, or zone sensor module options properly.

- ☐ **17.** Connect electrical supply power according to the NEC and unit wiring diagrams.

- ☐ **19.** Remove any miscellaneous debris, such as sheetrock, that may have infiltrated the unit during construction.

- ☐ **20.** Replace the air filter as required.

Installing the Unit

Before beginning installation, refer to Table 1 on page 17 for unit weights and Figure 3 on page 12 for service and operating clearances. In addition, refer to the unit submittal for installation details.

CAUTION: Do not allow electrical wire to fall between the unit and installation surface. Failure to comply may cause electrical shorts or difficulty in accessing wires.

Vertical Units

Install vertical units in an upright position using the 5/8 inch diameter double key slot hanger holes, located on the back of unit. The hanger holes allow a maximum shank size of 5/16 inch diameter threaded rods or lag screws (installer provides). Follow the installation procedure below.

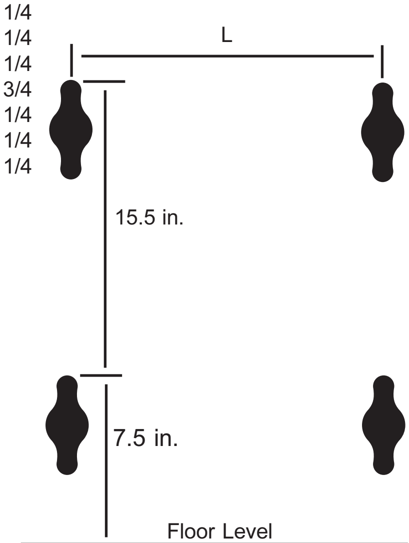
1. Prepare wall openings for recessed units. Reference unit submittal for each unit size dimensions.

2. If the unit has leveling legs, adjust them correctly to level unit.

3. Mark the position of the keyslot hanger holes on the wall according to the dimensions given in Figure 4 for each unit size. Align the hole locations evenly.

Cabinet & Concealed Units

Size	L (in.)
02	21 1/4
03	21 1/4
04	26 1/4
06	35 3/4
08	44 1/4
10	63 1/4
12	63 1/4



Low Vertical Cabinet & Concealed

Size	L (in.)
03	26 1/4
04	35 3/4
06	44 1/4

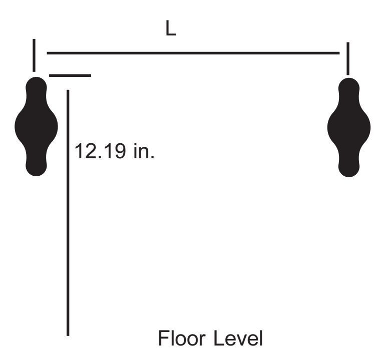


Figure 4. Keyslot Hanger Hole Locations

4. Insert the threaded rods or lag screws in the wall before setting the unit in place.

5. Remove the front panel (cabinet unit only) by lifting it upward.

6. Position the hanger holes, located on the back of the unit, over the rod or lag screw heads, pushing the unit downward to properly position.

7. Complete piping and wiring connections, in addition to any necessary ductwork to the unit as instructed in the following sections. Ensure that the auxiliary drain pan is in position on fan-coil units.

8. Install the front panel before starting the unit.

On cabinet units, replace the front panel by aligning the bottom tabs on the unit with the respective slots on the panel bottom. Align the top edge of the unit with the panel.

On recessed units, install the front panel by aligning and locking together the interlocking support channel of the panel and unit. While holding the panel against the unit, tighten the screws at the top of the panel until it fits tight against the unit's front. Do not over tighten the screws.

CAUTION: All unit panels and filters must be in place prior to unit start-up. Failure to have panels and filters in place may cause motor overload.

Horizontal Units

Install horizontal units suspended from the ceiling using the four 5/8 inch diameter double key slot hanger holes, located on the top of the unit. The hanger holes allow a maximum shank size of 5/16 inch diameter threaded rods or lag screws (installer provided). Follow the installation procedure below.

Note: *Follow the requirements of National Fire Protection Association (NFPA) Standard 90A or 90B, concerning the use of concealed ceiling spaces as return air plenums.*

1. Prepare the ceiling opening for recessed units. Reference the unit submittals for each unit size dimensions.

2. Position and install the suspension rods or a suspension device (supplied by installer) according to the unit size dimensions in Figure 4 on page 15. Also refer to the weight range chart given in Table 1.

3. On cabinet units, remove the bottom panel by using a 5/32 inch Allen wrench to unscrew fasteners. Swing the panel down and lift outward.

4. Level the unit by referencing the chassis end panels. Adjust the suspension device.

5. Complete piping and wiring connections, in addition to any neces sary ductwork as instructed in the following sections. Ensure that the auxiliary drain pan is in position on fan-coil units.

6. Install the bottom panel before starting the unit.

7. Ensure condensate drain line is pitched 1 inch per 10 feet of pipe away from fan-coil unit.

Table 1. Unit Operating Weights, pounds (kg)

Unit Size	Cabinet Models	Concealed Models	Recessed Models	Low Vertical Cabinet Models	Low Vertical Concealed Models
02	84 (38)	68 (31)	68 (31)	NA	NA
03	84 (38)	68 (31)	68 (31)	112 (51)	96 (44)
04	112 (51)	96 (44)	78 (35)	139 (63)	123 (56)
06	139 (63)	123 (56)	118 (54)	148 (67)	131 (59)
08	148 (67)	131 (59)	129 (59)	NA	NA
10	200 (91)	182 (83)	243 (110)	NA	NA
12	200 (91)	182 (83)	243 (110)	NA	NA

Note: *All weights are approximate. Individual weights may vary depending upon the unit's options.*

Cabinet units:
Install the bottom panel by placing the hinged end on the unit's hinged end (always at the return end of the unit). See Figure 4 on page 15 for keyslot hanger hole locations. Swing the panel upward into position. Tighten the panel to the unit with the fasteners provided. Do not over-tighten the fasteners.

Recessed units:
See Figure 5 on page 19 and follow the procedure below.

- Insert the mounting bolts through the panel brackets of the trim ring and secure to the hanger holes on the unit. Tighten the mounting bolts to pull the trim ring snug against the finished ceiling.

- Install the bottom panel by placing the hinged end on the trim ring hinged end (always at the unit's return end).

- Adjust the inner duct of the expansion collar (on units with a bottom return) to ensure a tight fit against the insulation located on the perimeter of the bottom panel's return louver.

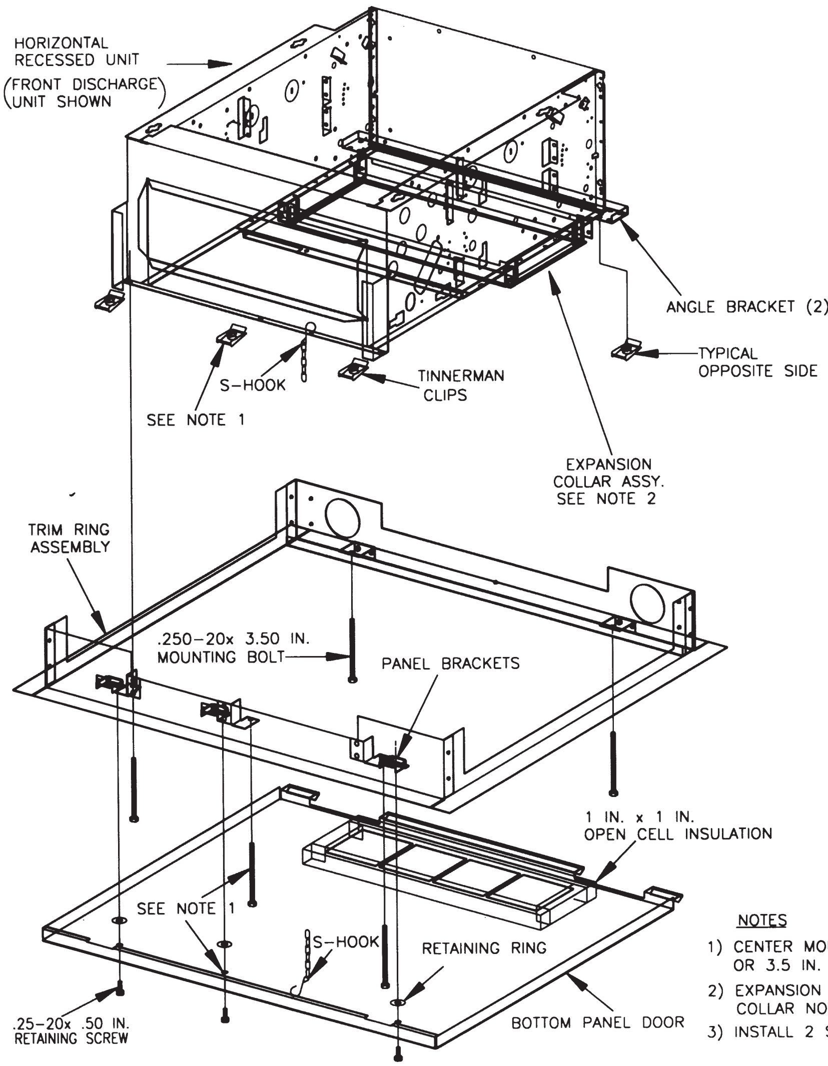
- Safety chain assembly: close s-hook on each end of chain. Insert s-hooks through holes in unit and door. Close s-hook on door.

- Insert retaining screws through bottom panel door and place retaining rings on screws.

- Swing the bottom panel upward into position. Hook the safety chain to the bottom panel and the unit. Tighten the panel to the unit with the fasteners provided. Do not over tighten the removable front access panel.

⚠ CAUTION: All unit panels and filters must be in place prior to unit start-up. Failure to have panels and filters in place may cause motor overload.

Note: *The trim ring assembly cannot accomodate unlevel ceilings.*



PARTS LIST		
PART DESCRIPTION	QTY.	
BOTTOM PANEL DOOR	1	
TRIM RING ASSEMBLY	1	
INSTALLATION DRAWING	1	
UNIT SIZE	02-06	08-12
.25-20 x .50 IN. RETAINING SCREW	2	3
RETAINING RING	2	3
SAFETY CHAIN ASSEMBLY	1	2
.25-20 x 3.50 IN. BOLT	4	5
.25-20 x 2.00 IN. BOLT	0	1
TINNERMAN CLIP	4	5

NOTES

1) CENTER MOUNTING POSITION FOR UNIT SIZE 08,10,12. USE EITHER 2.0 IN. OR 3.5 IN. BOLT, WHICHEVER IS BEST SUITED FOR THE INSTALLATION.
2) EXPANSION COLLAR IS FURNISHED WITH FAN COIL BOTTOM RETURN ONLY. COLLAR NOT REQUIRED WITH FORCE FLO CABINET HEATER.
3) INSTALL 2 SAFETY CHAIN ASSEMBLIES FOR 08,10,12 CFM UNITS.

Figure 5. Trim ring assembly installation.

Startup Checklist

☐ **1.** Ensure all panels are in place.

☐ **2**. Tighten unions adequately if unit has a factory deluxe piping package.

☐ **3.** Properly vent the hydronic coil to allow water flow through the unit.

☐ **4.** Set water flow to the unit properly if unit piping has the circuit setter valve.

☐ **5.** Check strainers (if supplied) for debris after applying system water.

☐ **6.** Install the auxiliary drain pan and route the main drain pan hoses to the auxiliary drain pan on vertical fan-coil units.

☐ **7.** Ensure all grille options are in place.

☐ **8.** Ensure the air filter is in place.

☐ **9.** Set the damper position to allow the fresh air requirement on units with a fresh air damper.

Note: *Some circumstances may require the unit to run before building construction is complete. These operating conditions may be beyond the design parameters of the unit and may adversely affect the unit.*

External Insulating Requirements

Insulate all cold surfaces to prevent condensation. Moisture mixed with accumulated dirt and organic matter may create an amplification site for microbial growth (mold) causing unpleasant odors and health-related indoor air quality (IAQ) problems.

The Trane Company recommends field-insulation of the following areas to prevent potential condensate and IAQ problems:

1. Supply and return water piping connections
2. Condensate drain lines and connections
3. Fresh air intake duct connections
4. Discharge duct connections
5. Wall boxes

Piping

Units with Hydronic Coil Connections Only

Piping Considerations

Before installing field piping to the coil, consider the following .

• All coil connections are 5/8 inch O.D. (or 1/2 inch nominal) female copper connections.

• The supply and return piping should not interfere with the auxiliary drain pan or condensate line. See "Connecting the Condensate Drain" section on page 25 for more detailed information.

• The installer must provide adequate piping system filtration and water treatment.

• Condensate may be an issue (fan-coils only) if field piping does not have a control valve.

Refer to Figure 6 for supply and return header locations.

CAUTION: When using a field supplied piping package in a fan-coil unit, allow sufficient room to install the auxiliary drain pan. In addition, piping package must not extend over edges of auxiliary drain pan.

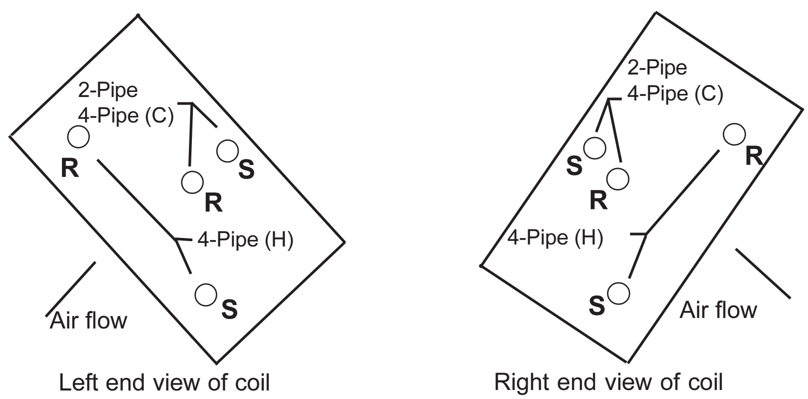


Figure 6. Supply and return header locations on the hydronic coil.

Connecting field piping to coil:

1. Slide a 1/2 inch sweat connection coupling (installer provided) onto the coil headers.

2. Remove the auxiliary drain pan, if it is in place, to prevent exposure to dripping solder or excessive temperatures.

Note: *For vertical fan-coil units, push the main condensate drain hose and overflow condensate drain hose through to the inside of the chassis end panel to prevent them from being burned when making sweat connections. Be sure to pull the hoses back through and route to the auxiliary drain pan when the end panel has cooled.*

3. Solder the joint using bridgit lead-free solder (ASTM B32-89) to provide a watertight connection. Avoid overheating factory soldered joints when soldering field connections to the coil to prevent leakage from occurring.

4. Insulate all piping to coil connections as necessary after connections are complete.

Note: *Maintain a minimum distance of one foot between the reduction fitting for the 1/2 inch diameter line and the fan-coil unit piping connections.*
Install the auxiliary drain pan, which ships in the accessory packet

Units with Steam Coils

CAUTION: In all steam coil installations, the condensate return connections must be at the low point of the coil to ensure condensate flows freely from the coil at all times. Failure to do so may cause physical coil damage from water hammer, unequal thermal stresses, freeze-up and/or corrosion.

1. Make piping connections to the steam coil as shown in Figure 7. Cap the unused connection.

2. The coil is already pitched within the unit to provide proper pitch to drain condensate out of the coil. Ensure that the unit has been properly leveled. Refer to page 13 for unit leveling instructions.

3. Install a 1/2 inch, 15-degree swing check vacuum breaker in the unused condensate return tapping as close as possible to the coil.

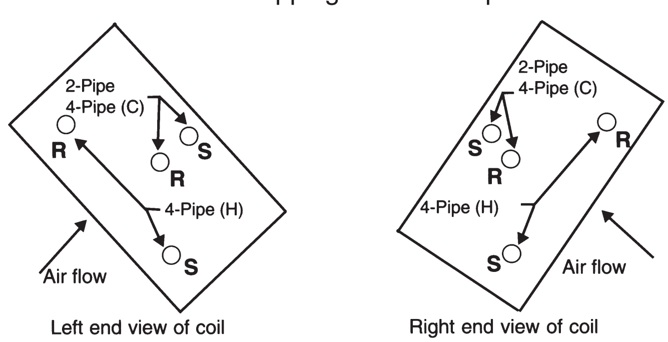


Figure 7. Steam coil header ports. The center port is the supply connection. The return port is below the supply. The top port must be closed off.

4. Vent the vacuum breaker line to atmosphere or connect it into the return main at the discharge side of the steam trap.

5. Pitch all steam supply and return mains down a minimum of 1 inch per 10 feet in the direction of flow.

6. Do not drain the steam mains or take-off through the coils. Drain the mains ahead of the coils through a steam trap to the return line.

7. Overhead returns require 1 psig of pressure at the steam trap discharge for each 2-foot elevation to ensure continuous condensate removal.

8. Proper steam trap selection and installation is necessary for satisfactory coil performance and service life. For installation, use the following steps:

a. Locate the steam trap discharge at least 12 inches below the condensate return connection. This provides sufficient hydrostatic head pressure to overcome trap losses and ensure complete condensate removal.

b. Trane Company recommends using flat and thermostatic traps because of gravity drain and continuous discharge operation.

c. Use float and thermostatic traps with atmospheric pressure gravity condensate return, with automatic controls or where the possibility of low pressure supply steam exists.

d. Always install strainers as close as possible to the trap inlet side.

Reference Figure 8 for an example of a properly piped steam coil.

ST = Strainer
FT = Float and thermostatic steam trap
MV = Manual air vent
GV= Gate valve
VB = Vacuum breaker, 15° swing check valve

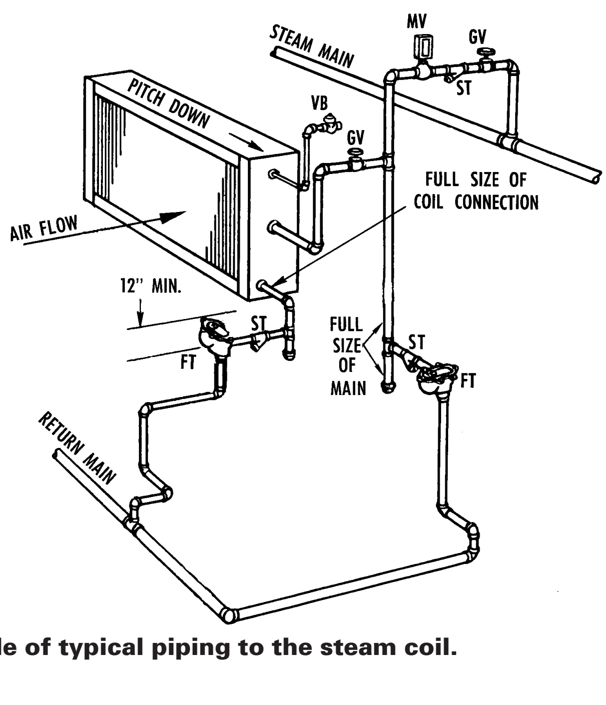


Figure 8. Example of typical piping to the steam coil.

Factory Piping Package Connections

Piping Considerations

Before installing water piping supply and return lines to factory piping package, note the following items.

- All piping connections are 5/8 inch O.D. (1/2 inch nominal) female copper connections.
- The fan-coil supply and return piping should not interfere with the auxiliary drain pan or condensate line. See “Connecting the Condensate Drain” section on page 25 for more information.
- The installer must provide adequate piping system filtration and water treatment.
- If the unit has a factory deluxe piping package, the piping includes a strainer with a 20 mesh size screen, which allows minimal protection from debris. Therefore, clean the strainer regularly.

NOTE: *Maintain a minimum distance of one foot between the reduction fitting for the 1/2 inch diameter line and the fan-coil piping connections.*

Connecting Water Piping to Factory Piping Package

1. The factory piping package ships with brackets to adequately support the piping during shipment. Remove these brackets before connecting water piping to the unit. See Figure 9.

2. Close the piping end valves to the fully open position to prevent damage to the valve seat during brazing.

3. Remove the auxiliary drain pan, if it is in place, to prevent exposure to dripping solder or excessive temperatures.

4. Solder water piping connections to supply and return end connections. Avoid overheating factory soldered joints to prevent the possibility of leakage.

5. Insulate fan-coil piping to auxiliary drain pan connections and any piping that is not above the auxiliary drain pan.

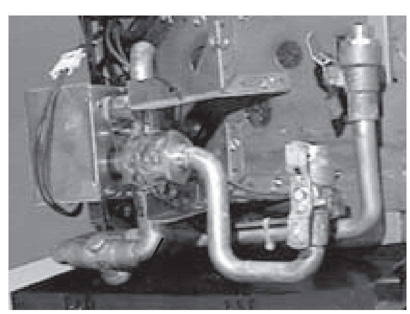


Figure 9. Remove the shipping brackets which support the factory piping package before connecting piping.

Installing the Auxiliary Drain Pan

The auxiliary drain pan ships loose with a fan-coil unit with factory piping. To install the auxiliary drain pan, insert the tabs, located on the side of the drain pan, into the slots located in the chassis end panel. Slide the pan into the narrow groove section to lock into place. See Figures 10 and 11. Make sure the auxiliary pan is pushed all the way into the fully locked position.

Note: *The function of the auxiliary drain pan is to collect condensate from the main drain pan and the factory installed piping package only*. *It also provides a convenient field connection for the condensate drain line for units without factory piping. Moreover, the auxiliary drain pan may not be adequate to collect condensate from a field-installed piping package. Apply additional insulation as needed.*

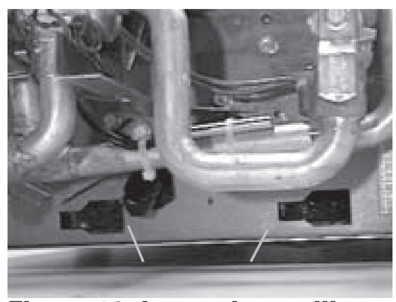


Figure 10. Insert the auxiliary drain pan tabs into these slots in the fan-coil chassis end panel.

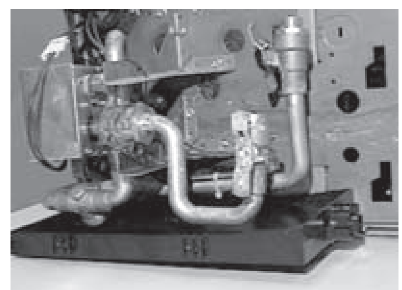


Figure 11. The horizontal auxiliary drain pan in its installed position.

Connecting the Condensate Drain

1. De-burr the pipe end before making the connection to the drain pan.

2. Connect a 7/8 inch O.D. copper pipe or tube, with a 0.20 inch wall thickness, to the auxiliary drain pan. This should be a mechanical connection that allows easy removal of the auxiliary drain pan when servicing the piping end pocket.

3. Slide the copper pipe over the drain pan nipple and tighten the collar on the pipe with a hose clamp (installer supplied).

Maintain a continuous drain line pitch of 1 inch per 10 feet of drain line run to provide adequate condensate drainage. Extend the drain line straight from the drain pan a minimum distance of 6 inches before making any turns. The installer must provide proper support for the drain line to prevent undue stress on the auxiliary drain pan.

Install a secondary overflow drain line if necessary by punching out the overflow drain nipple on the auxiliary drain pan. Next, place a 3/8 inch inside diameter flexible plastic tube over the nipple and secure with a field supplied hose clamp.

Note: *The installer is responsible for adequately insulating field piping. See the “External Insulating Requirements section on page 20 for more information.*

Condensate Overflow Detection Device

The condensate overflow detection device is an option on fan-coil units with either a Tracer® ZN.010, ZN.510, ZN.520 or TUC control. The float switch, mounting bracket, and coiled leads ship attached inside the piping end pocket of the unit. Install the switch by placing the hole or slot in the bracket over the condensate overflow drain (of the auxiliary drain pan) with the switch float extending over the pan. Secure the drain pan by attaching the pan’s bracket with the factory provided clip. See Figures 12 and 13.

Figure 12. Condensate overflow switch installed in a vertical auxiliary drain pan.

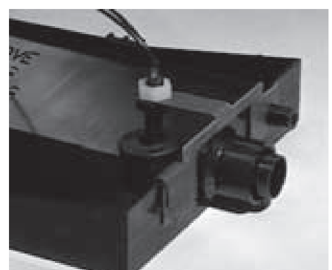


Figure 13. Condensate overflow switch installed in a horizontal auxiliary drain pan.

Automatic Changeover Sensor

Two-pipe changeover units with either the Tracer® ZN.010, ZN.510, ZN.520 or TUC control have an automatic changeover sensor that determines heating or cooling mode based on the supply water temperature. On units with a factory piping package, the factory straps the changeover sensor to the piping supply water pipe. See Figure 14 on page 27.

If the unit does not have a factory piping package, the factory attaches the sensor and coiled lead wires to the piping side end panel. The installer should attach the sensor parallel to and in direct contact with the supply water pipe.

Note: *The installer is responsible to ensure the changeover sensor is installed in a location that can sense active water temperature. Otherwise, the unit may fail to sense the correct operating mode and disable temperature control.*

When using field supplied 3-way valves, position the changeover sensor upstream of the valve on the supply water pipe.

Recommendation: When using field supplied 2-way control valves, attach the changeover sensor in a location that will detect an active water temperature. The unit must always be able to sense the correct system water temperature, regardless of the control valve position.

Note: *The maximum length of the automatic changeover wire cannot exceed 10 feet from the control panel. If the sensor extends beyond the unit chassis, use shielded conductors to eliminate radio frequency interference (RFI).*

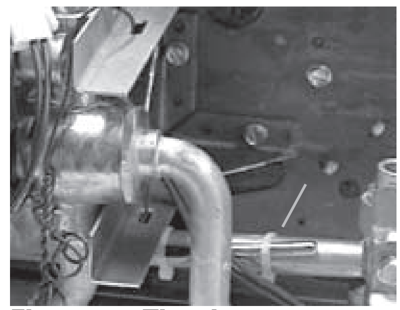


Figure 14. The changeover sensor strapped to the supply water pipe.

Automatic Electric Heat Lockout Switch (Fan-coil)

Two-pipe fan-coil units with auxiliary electric heat have an automatic electric heat lockout switch that disengages the electric heat when hydronic heat enables. If the unit has a factory piping package and electric heat, the factory attaches the switch to the supply water pipe. When the lockout switch detects the supply water temperature above 95° F, it disengages the electric heat. This eliminates electric heat and hydronic heat working simultaneously.

If the fan-coil unit does not have a factory piping package, the factory attaches the switch and coiled lead wires to the piping side end panel. The installer should position the lockout switch on the supply water line of the unit by sliding its spring connector over the pipe. See Figure 15.

Figure 15. Units with electric heat have an electric heat lockout switch on the supply water pipe.

Venting the Hydronic Coil

The hydronic coil contains a vent, either manual or automatic, to release air from the unit. This vent is not sufficient for venting the water piping system in the building.

Locate the coil air vent on the piping side, above the coil connections on the unit. Perform the following steps to vent the coil after installing the unit. See Figure 16.

1. Pressurize the building piping system with water and vent any trapped air at system vents.

2. For units with manual air vents, back the set screw out to expel air from the unit and then re-tighten the set screw.

The automatic air vent should require no adjustment for the coil to vent. However, if the coil does not vent immediately, unscrew the outer portion of the fitting to expel air from the port.

If debris has become trapped in the vent, completely remove the outer portion of the fitting and clean.

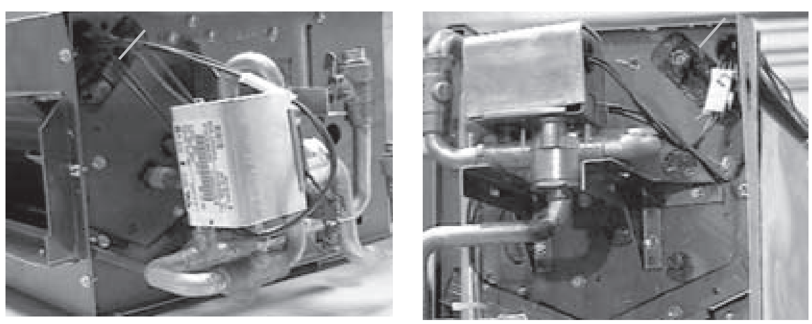


Figure 16. The hydronic coil air vent is above the coil connections. A horizontal unit is on the left and a vertical on the right.

Balancing The Manual Circuit Setter Valve

The manual circuit setter valve is an optional end valve supplied on the return pipe of the factory piping package. The valve allows the operator to regulate water flow through the hydronic coil, balance the water flow through the unit with other units in the piping system, and serves as a shutoff or end valve. See Figure 17.

Follow the procedure below to set maximum water flow through the coil.

1. Establish water flow through the coil. Perform an open override of the valve if the control valve is closed to the coil, either manually or by Tracer®.

If the piping package has 2-position, normally closed valves:
Drive open the valve using a 24V signal.

If the piping package has 2-position, normally open valves:
Manually drive open the valve by removing power to the valve.

If the piping package has modulating valves:
To manually drive the valve open, depress the button stem on top of the valve and push the lever located on the side of the valve to the full open position.

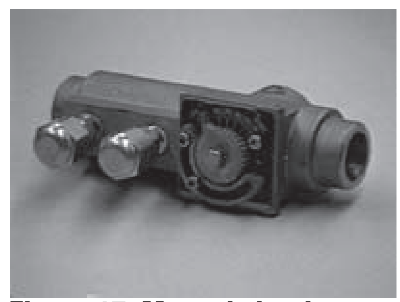


Figure 17. Manual circuit setter valve.

2. For presetting, use the appropriate valve curve shown in Figure 19 on page 30 to determine which setting is necessary to achieve the appropriate pressure drop.

3. Carefully remove the Schrader pressure port connection caps on the manual circuit setter, since they will be at the same temperature as the pipeline.

4. Bleed all air from the hoses and meter before reading the pressure drop. Refer to the gauge operating instructions.

5. Adjust the circuit setter valve by turning the valve stem until the appropriate pressure drop is achieved. See Figure 18 on page 30.

6. After achieving the proper setting, slightly loosen the two socket head cap screws and rotate the memory stop around until it touches the back side of the indicator. Then tighten the screws to securely set the open memory position. The memory stop indicates the last set open position.

7. If using a 3-way valve: close the control valve to the coil, with the differential pressure meter still connected. This will divert flow to the bypass side of a 3-way valve. Adjust the balancing fitting to obtain the same pressure drop across the circuit setter valve as in step 2 when the control valve was open to the coil.

Figure 18. Close-up view of manual circuit setter valve.

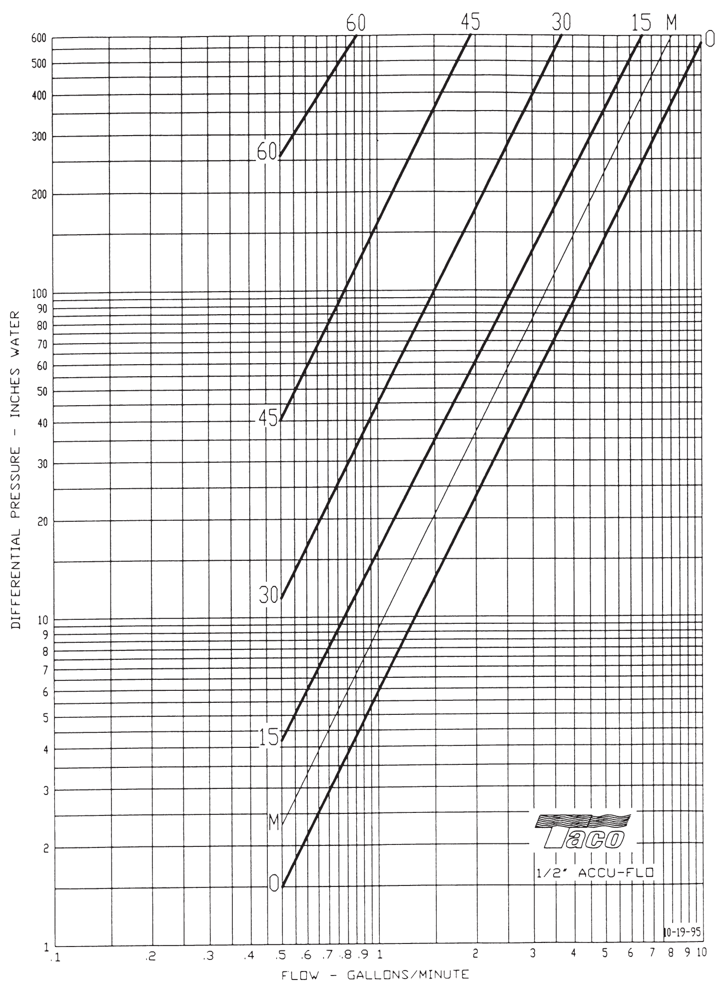


Figure 19. Setting the manual circuit setter valve, differential pressure vs. flow.

Balancing The Automatic Circuit Setter Valve

The automatic flow valve is an optional end valve on the return of the factory piping package. See Figure 20. The valve regulates water flow through the coil to a specific (gpm) flow rate, as ordered by the customer.

Figure 20. Automatic circuit setter valve.

The automatic flow valve controls to the specified flow rate, provided that the pressure drop across the valve is within a certain range. To verify that the valve is operating properly, remove the protective caps from the P/T ports and measure the pressure drop across the valve with a differential pressure meter. Carefully remove the P/T port connection caps, since they will be at the same temperature as the pipeline. The reading should be within the given ranges in Table 2. If the pressure drop is not within the ranges listed, the valve will not control water flow. If the valve orifice becomes clogged with debris, remove water from piping and then remove the cap of the valve body and push on the piston to dislodge any foreign matter. If this is not successful, remove the cartridge and clean.

Table 2. Automatic Circuit Setter Flow Rate Range.

Valve gpm	Pressure Drop Range (psig)
0.5 to 8.0	2 to 32
9 to 12	5 to 50

Replace the cartridge in the field without breaking the piping line to furnish a higher or lower gpm. To do this, remove the water from the system. Remove the cap assembly containing the plug from the valve body. Grasp the cartridge by the piston to remove. Install a different spring if the pressure drop range of the valve is being changed also.

Duct Connections

The unit's airflow configuration varies dependent on the model and options ordered. A one-inch duct collar is provided on units with a ducted return and/or discharge to attach ductwork to the unit.

The Trane Company recommends using galvanized sheet metal ductwork with fan-coil and cabinet heater units. Slide the sheetmetal duct over the duct collar flange of the unit, seal the joint and fasten with sheetmetal screws.

Note: *Do not run screws through the removable front panel on concealed units.*

Install all air ducts according to National Fire Protection Association standards for the Installation of Air Conditioning and Ventilating Systems (NFPA 90A and 90B).

Ductwork Recommendations

Follow the general recommendations listed below when installing ductwork for the unit.

- Discharge ductwork should run in a straight line, unchanged in size or direction, for a minimum equivalent distance of 3 fan diameters from the unit (approximately 20 inches).
- When making duct turns and transitions avoid sharp turns and use proportional splits, turning vanes, and air scoops when necessary.
- When possible, construct, and orient supply ductwork turns in the same direction as the fan rotation.

Electrical Connections

Supply Power Wiring

Refer to the unit nameplate to obtain the minimum circuit ampacity (MCA) and maximum fuse size (MFS) or maximum circuit breaker (MCB) to properly size field supply wiring and fuses or circuit breakers. See Figure 2 on page 6 to reference the nameplate location. Refer to the unit operating voltage listed on the unit wiring schematic, submittal, or nameplate. Reference the wiring schematic for specific wiring connections.

WARNING: Hazardous voltage! Disconnect all electric power including remote disconnects before servicing. Failure to do so may cause severe personal injury or death.

Wiring diagrams are attached to the unit in a plastic bag and can be be easily removed for reference. Wiring schematics are attached as follows:

- **Vertical cabinet & recessed units:**
Schematics are on the inside of the front panel. See Figure 21.

- **Vertical concealed & all horizontal units:**
Locate schematics on the fan and motor panel of unit. See Figure 22.

CAUTION: Use copper conductors only! Unit terminals are not designed to accept other types of conductors. Failure to do so may cause damage to the equipment.

Figure 21. Locate the wiring schematic on the inside of the front panel of vertical cabinet and recessed units.

Figure 22. Locate the wiring schematic on the fan and motor panel of vertical concealed and all horizontal units. (This unit is turned on it's side.)

All field wiring should conform to NEC and all applicable state and local code requirements.

The control panel box is always on the end opposite the piping connections. Access the control box by removing the two screws that secure the front cover. If the unit has a terminal unit control board (TUC), remove the screw in the top right corner of the panel. This will allow the panel to pivot downward to provide access to the electrical components. See Figure 23.

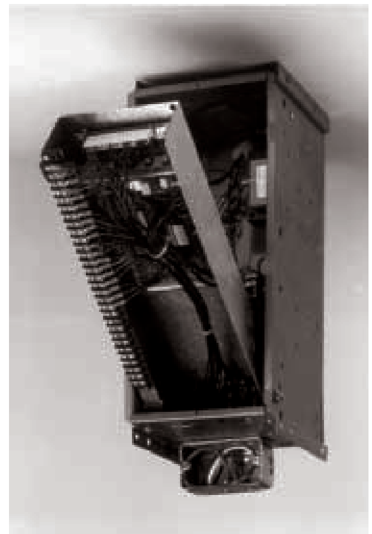


Figure 23. The terminal unit control (TUC) board pivots downward to provide service access.

WARNING: Insulate all power wire from sheetmetal ground. Failure to do so may cause electrical shorts resulting in personal injury or death.

Units have one of three different connection points, depending on the unit type and options.

1. Power & ground inside of control box:
If the unit has a fan mode switch, Tracer® ZN.010 or ZN.510 control without a disconnect switch, the power leads and capped ground wire are inside the control panel.

2. Power & ground inside the junction box:
If the unit has a TUC control without a disconnect switch, the power leads and capped ground wire are inside the junction box on the control panel.

3. Power wired to switch on junction box & ground inside of junction box:
If the unit has a disconnect switch, the power leads wire to the junction box switch on the control panel. Pull the capped ground wire into the junction box.

Electrical Grounding Restrictions

All sensor and input circuits are normally at or near ground (common) potential. When wiring sensors and other input devices to the Tracer® ZN.010, ZN.510, ZN.520 or TUC, avoid creating ground loops with grounded conductors external to the unit control circuit. Ground loops can affect the measurement accuracy of the controller.

CAUTION: Unit transformer IT1 provides power to fan-coil unit only. Field connections to the transformer IT1 may create immediate or premature unit component failure.

All input/output circuits (except isolated relay contacts and optically isolated inputs) assume a grounded source, either a ground wire at the supply transformer to control panel chassis, or an installer supplied ground.

Note: *Do not connect any sensor or input circuit to an external ground connection.*

Wall Mounted Control Interconnection Wiring

The installer must provide interconnection wiring to connect wall mounted devices such as a fan mode switch or zone sensor module. Refer to the unit wiring schematic for specific wiring details and point-to-point wiring connections. Dashed lines indicate field wiring on the unit wiring schematics. All interconnection wiring must conform to NEC Class 2 wiring requirements and any state and local requirements. Refer to Table 3 for the wire size range and maximum wiring distance for each device.

Recommendation: Do not bundle or run interconnection wiring in parallel with or in the same conduit with any high-voltage wires (110V or greater). Exposure of interconnection wiring to high voltage wiring, inductive loads, or RF transmitters may cause radio frequency interference (RFI). In addition, improper separation may cause electrical noise problems. Therefore, use shielded wire (Beldon 83559/83562 or equivalent) in applications that require a high degree of noise immunity. Connect the shield to the chassis ground and tape at the other end.

Table 3. Maximum Wiring Distances, ft (m)

Device	Wire Size Range	Max. Wiring Distance
Fan Mode Switch	14 - 22 AWG	500 (152.4)
Zone Sensor Module	16 - 22 AWG	200 (60.96)

Installing Wall Mounted Controls

Installing Wall Mounted Controls

Wall mounted controls, which include the fan mode switch and the zone sensor module, ship loose inside the unit accessory bag.

Position the controller on an inside wall 3 to 5 feet above the floor and and at least 18 inches from the nearest outside wall. Installing the controller at a lower height may give the advantage of monitoring the temperature closer to the zone, but it also exposes the controller to airflow obstructions. Ensure that air flows freely over the controller.

Avoid mounting the controller in an area subject to the following conditions:

- *Dead* spots such as behind doors or in corners that do not allow free air circulation.
- Air drafts from stairwells, outside doors, or unsectioned hollow walls.
- Radiant heat from the sun, fireplaces, appliances, etc.
- Airflow from adjacent zones or other units.
- Unheated or uncooled spaces behind the control, such as outside walls or unoccupied spaces.
- Concealed pipes, air ducts, or chimneys in partition spaces behind the controller.

Fan Mode Switch Installation

Figure 24. Fan Mode Switch

The fan mode switch ships loose inside the unit accessory bag. Follow the steps below to install the fan mode switch.

Items needed:
2 x 4 electrical junction box

1.Remove the brown wire if not using a field-supplied damper. Remove the terminals, cut and strip wires as required for installation.

2.Level and position a 2 x 4 electrical junction box. Follow the instructions given in the “Interconnection Wiring” section and route the wires as shown in the wiring diagram. Refer to the typical wiring diagram on page 101 or to the unit specific diagram on the unit.

3.Position the fan mode switch over the junction box with the two screws supplied.

Zone Sensor Installation

Follow the procedure below to install the zone sensor module. Reference Figure 25 on page 38 when installing the wall mounted zone sensor.

1. Note the position of the setpoint adjustment knob and gently pry the adjustment knob from the cover using the blade of a small screwdriver.

2. Insert the screwdriver blade behind the cover at the top of the module and carefully pry the cover away from the base.

3. To install the zone sensor module without a junction box (directly to the wall):

- **a.** Using the module base as a template, mark the the rectangular cutout for the control wiring and module installation holes. Ensure the base is level.
- **b.** Set the base aside and make the cutout. Then, drill two 3/16 inch diameter holes approximately 1 inch deep. Insert and fully seat the plastic anchors.
- **c.** Pull the control wires through the cutout and attach the module to the wall using the screws provided.

4. To install the zone sensor module to a standard junction box:

- **a.** Level and install a 2 inch x 4 inch junction box (installer supplied) vertically on the wall.
- **b.** Pull the control wires through the cutout. Attach the module to the wall using the screws provided.

5. Strip the insulation on the interconnection wires back 0.25 inch and connect to TB1. Screw down the terminal blocks.

6. Replace the zone sensor cover and adjustment knob.

Before beginning installation, follow the wiring instructions in the “Wall Mounted Control Interconnection Wiring” section on page 34. Also, refer to the unit wiring schematic for specific wiring details and point connections.

If installing a TUC zone sensor, see the TUC sections regarding communication wiring beginning on page 60 for more detailed information.

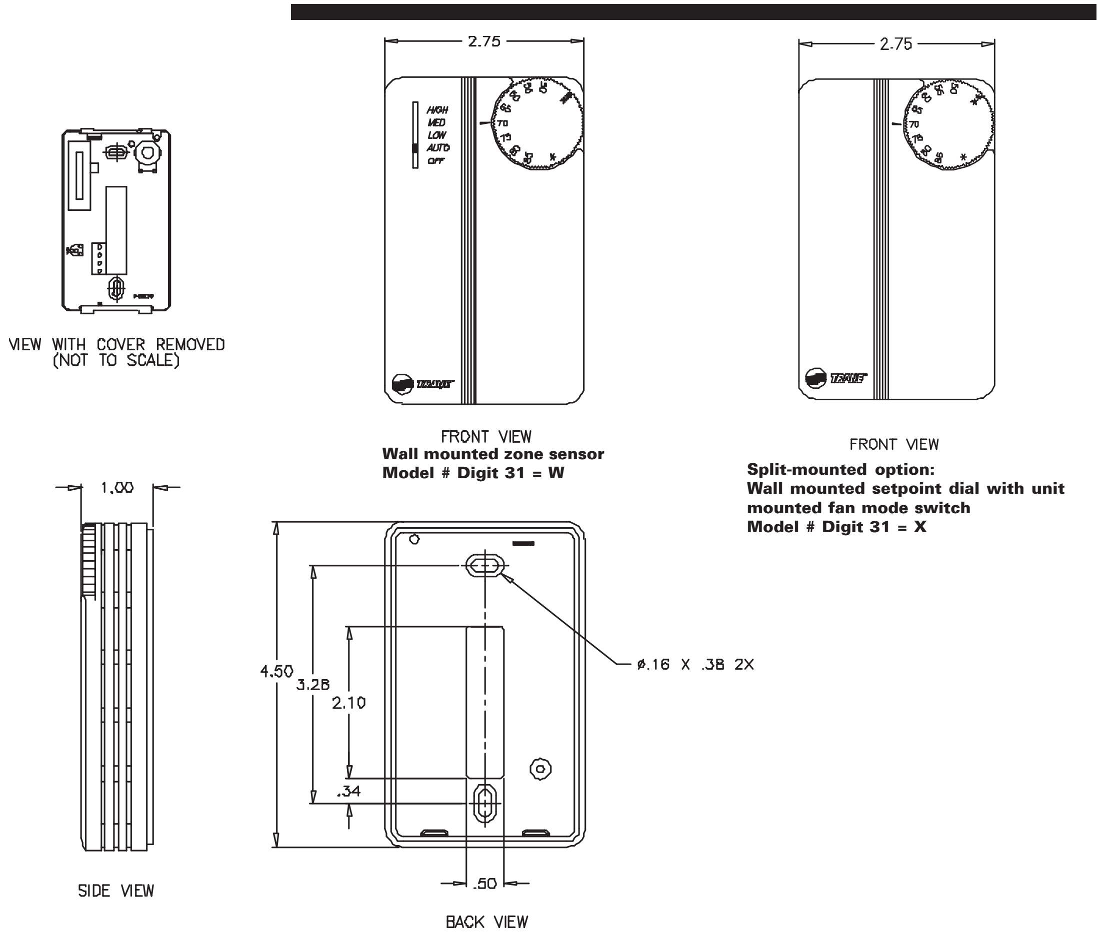


Figure 25. Wall mounted zone sensor dimensions.

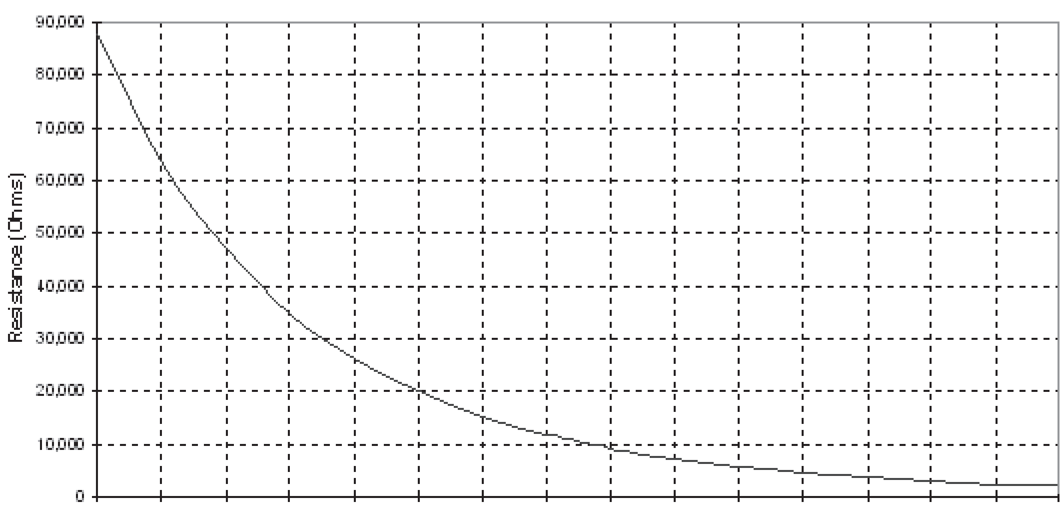


Figure 26. Resistance temperature curve for the zone sensor, entering water temperature sensor, and discharge air sensor.

Fan Mode Switch

Manual Fan Mode Switch
The manual fan mode switch is available for fan-coil units that do not have Trane factory-mounted control packages. This four-position switch (off-hi-med-lo) allows manual fan mode selection and is available unit or wall mounted.

The unit-mounted option (Digit 31 = D) operates on line voltage. The wall-mounted option (Digit 31 = K) is low-voltage and has three 24 volt relays using a factory-wired transformer and relays to control the fan motor.

Sequence of Operations

Off: Fan is turned off, two-position damper option spring-returns closed.
Hi, Med, Lo: Fan runs continuously at the selected speed. The two-position damper option opens to an adjustable mechanical stop-position.

Tracer® ZN.010 and ZN.510

The Tracer® ZN.010 is a stand-alone device that controls fan-coils and cabinet heaters. The Tracer® ZN.510 can be stand-alone or utilize peer-to-peer communications. The controller is easily accessible in the control end panel for service. The control end panel is on the end of the unit opposite the piping. Reference Figure 27.

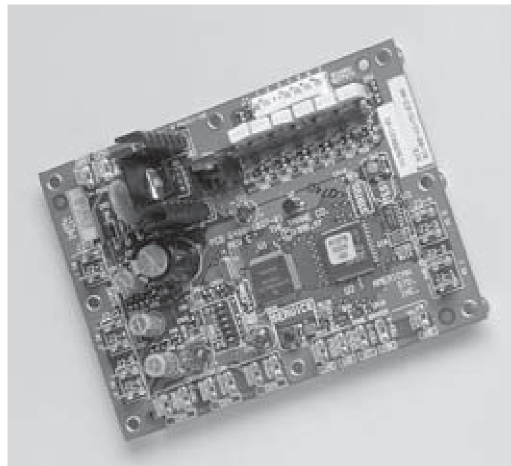


Figure 27. The Tracer ZN.010 board.

Sequence of Operations

Off: Fan is off; control valves and fresh air damper option close. Low air temperature detection option is still active.

Auto (Fan Cycling): Fan and fresh air damper cycle with control valve option to maintain setpoint temperature. In cooling mode, the fan cycles from off to medium and in heating mode it cycles from off to low. When no heating or cooling is required, the fan is off and the fresh air damper option closes.

Low/Med/High (Continuous Fan): Fan operates continuously while control valve option cycles to maintain setpoint temperature. Fresh air damper option is open.

Operating Information

Power-Up Sequence

When 24 VAC power is initially applied to the Tracer® ZN.010 or ZN.510, the following sequence occurs:
1. All outputs are controlled off.
2. Tracer® ZN.010 and ZN.510 reads all input values to detemine initial values.
3. The random start time (0-25 seconds) expires.
4. Normal operation begins.

Entering Water Temperature Sampling Function

Both Tracer® ZN.010 and ZN.510 use an entering water temperature sampling function to test for the correct water temperature for the unit operating mode. For all applications not involving changeover, the water temperature does not effect the unit operation.

The entering water temperature sampling function opens the main hydronic valve, waits no more than three minutes to allow the water temperature to stabilize, then measures the entering water temperature to see if the correct water temperature is available.

The entering water must be five degrees or more above the space temperature to allow hydronic heating and five degrees or more below the space temperature to allow hydronic cooling.

If the correct water temperature is available, the unit begins normal heating or cooling operation. If the measured entering water temperature is too low or high, the controller closes the valve and waits 60 minutes before attempting to sample the entering water. Reference Table 4.

Table 4. Unit Mode as Related to Water Temperature

Unit Type	EWT Sensor Required?	Coil Water Temperature
2-pipe changeover	Yes	• Can cool if: space temp - EWT $\geq$ 5 deg F • Can heat if: EWT - space temp $\geq$ 5 deg F
4-pipe changeover	Yes	• Can cool if: space temp - EWT $\geq$ 5 deg F • Can heat if: EWT - space temp $\geq$ 5 deg F
2-pipe heating only	No	Hot water assumed
2-pipe cooling only	No	Cold water assumed
4-pipe heat/cool	No	•Cold water assumed in main coil •Hot water assumed in aux. coil

Binary Inputs

BIP1: Low Temperature Detection Option

The factory hard wires the low temperature detection sensor to binary input #1 (BIP1) on the Tracer® ZN.010 and ZN.510. The sensor defaults normally closed (N.C.), and will trip off the unit on a low temperature diagnostic when detecting low temperature. In addition, the Tracer® ZN.010 and ZN.510 control unit devices as listed below:

Fan:	Off
Valves:	Open
Electric heat:	Off
Damper:	Closed

Note: See the "Diagnostics" section on page 50 for more information.

BIP2: Condensate Overflow Detection Option

The factory hard wires the condensate overflow sensor to binary input #2 (BIP2) on the Tracer® ZN.010 and ZN.510. The sensor defaults normally closed (N.C.), and will trip off the unit on a condensate overflow diagnostic if condensate reaches the trip point. In addition, the Tracer® ZN.010 and ZN.510 control unit devices as listed below:

Fan:	Off
Valves:	Closed
Electric heat:	Of

Reference Table 6 for the Tracer® ZN.010 and ZN.510's six binary outputs.

BIP3: Occupancy Sensor

Binary input #3 (BIP3) on Tracer® ZN.010 and ZN.510 is available for field- wiring an occupancy sensor, such as a binary switch or a timeclock, to detect occupancy. The sensor can be either normally open or normally closed. Reference Table 5 on page 43.

Table 5. Occupancy Sensor State Table

Sensor Type	Sensor Position	Unit Occupancy Mode
Normally Open	Open	Occupied
Normally Open	Closed	Unoccupied
Normally Closed	Open	Unoccupied
Normally Closed	Closed	Occupied

Binary Outputs

Table 6. Binary Outputs

Binary Output	Description	Pin
BOP1	Fan high speed	J1-1
BOP2	Fan medium speed	J1-2
BOP3	Fan low speed	J1-4
BOP4	Main valve	J1-5
BOP5	Auxiliary valve/electric heat	J1-6
BOP6	2-position fresh air damper	J1-7

Notes:

1. *In a four-pipe application, BOP4 is used for cooling and BOP5 is used for heating.*
2. *If no valves are ordered with the unit, the factory default for the Tracer® ZN.010 and ZN.510 controller are:*
   BOP4 configured as normally closed
   BOP5 configured as normally open
3. *If the fresh air damper option is not ordered on the unit, BOP6 will be configured as none.*

Analog Inputs

Both Tracer® ZN.010 and ZN.510 accept a maximum of five analog inputs. Reference Table 7.

Table 7. Analog Inputs Available

Analog Input	Description	Application
Zone	Space temperature	Space temperature detection
Set	Local setpoint	Thumbwheel setpoint
Fan	Fan mode input	Zone sensor fan switch
Analog input 1 (AI1)	Entering water temperature	Entering water temperature detection
Analog input 2 (AI2)	Discharge air temperature	Discharge air temperature detection

Notes:
1. The zone sensor, entering water temperature sensor, and the discharge air temperature sensor are 10KW thermistors. Figure 26 on page 38 provides the resistance-temperature curve for these thermistors.
2. Zone Sensor:
Wall mounted sensors include a thermistor soldered to the sensor's circuit board
Unit mounted sensors include a return air sensor in the unit's return air stream.
3. Changeover units include an entering water temperature sensor.

Zone Sensors

The zone sensors available with the Tracer® ZN.010 and ZN.510 provide up to three different inputs
1. Space temperature measurement (10K thermistor)
2. Local setpoint
3. Fan mode switch

Wall mounted zone sensors include a thermistor as a component of the internal printed circuit board. Unit mounted zone sensors use a sensor placed in the unit's return air stream.

Each zone sensor is equipped with a thumbwheel for setpoint adjustment.

Fan Mode Switch

The zone sensor may be equipped with a fan mode switch. The fan mode switch offers selections of off, low, medium, high, or auto. Reference Table 8 on page 45 for fan mode operation.

Supply Fan Operation

The Tracer® ZN.010 and ZN.510 will operate in either continuous fan or fan cycling mode. The fan cycles when the fan mode switch is placed in auto. The fan runs continuous when placed in the high, medium, or low position. Use Rover™, installation and service tool, to change the auto defaults.

Table 8. Fan Mode Operation

Heating Mode			Cooling Mode	
Fan Mode	**Occupied**	**Unoccupied**	**Occupied**	**Unoccupied**
Off	Off	Off	Off	Off
Low	Low	Off/high (3)	Low	Off/high (3)
Medium	Medium	Off/high (3)	Medium	Off/high (3)
High	High	Off/high (3)	High	Off/high (3)
Auto				
Continuous	Heat default	Off/high (3)	Cool default	Off/high (3)
Cycling	Off/heat default	Off/high (3)	Off/cool default	Off/high (3)

Notes:

1. During the transition from off to any fan speed but high, Tracer® ZN.010 and ZN.510 automatically starts the fan on high speed and runs for three seconds before transitioning to the selected speed (if it is other than high). This provides enough torque to start all fan motors from the off position.

2. When the heating output is controlled off, ZN.010 and ZN.510 automatically controls the fan on for an additional 30 seconds. This delay allows the fan to dissipate any residual heat from the heating source, such as electric heat.

3. Whenever two states are listed for the fan:
The first state (off) applies when there is not a call for heating or cooling.
The second state (varies) applies when there is a call for heating or cooling.
The heat default is factory configured for low fan speed, and the cool default is medium.

Table 9. Valid Operating Range and Factory Default Setpoints

Setpoint/Parameter	Default Setting	Valid Operating Range
Unoccupied cooling setpoint	85° F	40 to 115° F
Occupied cooling setpoint	74° F	40 to 115° F
Occupied Heating setpoint	71° F	40 to 115° F
Unoccupied heating setpoint	60° F	40 to 115° F
Cooling setpoint high limit	110° F	40 to 115° F
Cooling setpoint low limit	40° F	40 to 115° F
Heating setpoint high limit	105° F	40 to 115° F
Heating setpoint low limit	40° F	40 to 115° F
Power up control wait	0 sec	0 to 240 sec

Troubleshooting

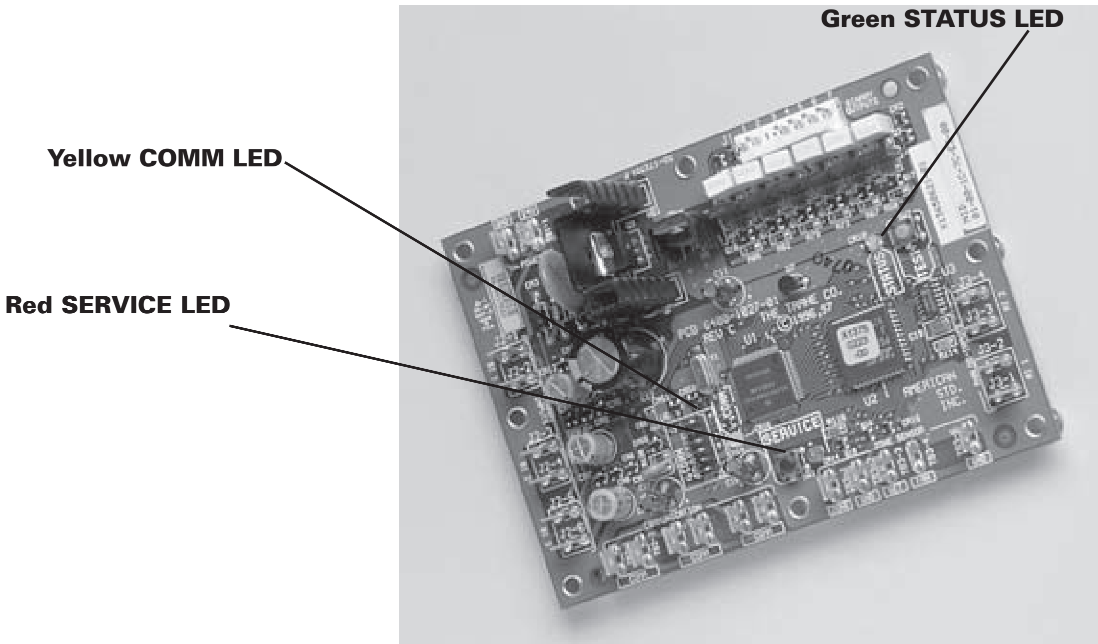


Figure 28. The Tracer ZN.010 board.

LED Activity

Red Service LED

Table 10. Red Service LED Activity

Red LED Blink Activity	Description
LED off continuously when power is applied to the controller	Normal operation
LED on continuously, even when power is applied to the controller	Someone is pressing the service button or the controller has failed.
LED flashes once every second	Use Rover™, Trane's service tool, to restore the unit to normal operation. Refer to the Rover™ product literature for more information.

Green STATUS LED

The green LED normally indicates whether the controller is powered on (24 VAC supplied). Reference Table 11.

Table 11. Green STATUS LED Activity

Green LED Blink Activity	Description
LED on continuously	Power on (normal operation)
LED blinks once	Manual output test mode
LED blinks twice	Manual output test mode, with one or more diagnostic present
LED blinks (1/4 second on, 1/4 second off for 10 seconds)	"Wink" mode
LED off	• Power off • Abnormal condition • Test button is pressed

***Note:** The "wink" feature allows the identification of a particular controller. When sending a request from a device, such as Rover™, the controller will "wink" to indicate it received the signal.*

Yellow COMM LED

Table 12. Yellow COMM LED Activity

Yellow LED Blink Activity	Description
LED off continuously	The controller is not detecting any communication. (Normal for units in standalone applications)
LED blinks	The controller detects communication.
LED on continuously	Abnormal condition

Manual Output Test

The purpose of the manual output test sequence is to verify output and end device operation. Use the manual output test to:

- Verify output wiring and operation without using Rover™, service tool.
- Force the water valve to open and balance the hydronic system.

Note: *The manual output test is not an automatic cycle. You must press the Test button to proceed through each step.*

The controller observes all diagnostics that occur during the test sequence. Although an automatic diagnostic reset sequence exists as part of the controller's normal operation, the automatic diagnostic reset feature is not active during the test sequence.

If left in an individual test step, the controller remains in test mode for 60 minutes and then exits to normal operation.

Many service calls are due to unit diagnostics. The test sequence resets unit diagnostics and attempts to restore normal unit operation prior to testing the outputs. If the diagnostics remain after a reset, the STATUS LED indicates the diagnostic condition is still present (two blinks). See the Green STATUS LED section in Table 11 on page 47.

Manual Output Test Procedure

Follow the procedure below to test the Tracer® ZN.010 and ZN.510 controller.

1. Press and hold the Test button for at least two seconds (not exceeding 5 seconds), and then release, to start the test mode.

2. The test sequence will turn off all outputs and then attempt to clear all diagnostics.

3. Press the Test button several more times (no more than once per second) to advance through the test sequence.

The outputs are not subject to minimum times during the test sequence. However, the test sequence only permits one step per second which limits minimum output time.

The green LED is turned off when the Test button is pressed. To begin the manual output test mode, press and hold the Test button (turning off the green LED) for at least two seconds.The green LED will begin to blink, indicating the controller is in test mode.

Table 13. Test Sequence for 1-Heat /1-Cool Configurations

Steps	Fan BOP1-3	Cool Output BOP4 (1)	Heat Output BOP5	Damper BOP6
1. Off	Off	Off	Off	Closed
2. Fan High	High	Off	Off	Closed
3. Fan Medium	Medium	Off	Off	Closed
4. Fan Low	Low	Off	Off	Closed
5. Cool	High	On	Off	Closed
6. Heat	High	Off	On	Closed
7. Fresh Air Damper *(3)*	High	Off	Off	Open
8. Exit	(2)			

Notes:

(1) At the beginning of step 2, the controller attempts to clear all diagnostics.

(2) For all 1-heat/1-cool applications including 2-pipe changeover, BOP4 energizes in the cooling test stage and BOP5 energizes in the heat test stage.This occurs even though during normal 2-pipe changeover operation BOP4 controls the unit valve for both cooling and heating.

(2) After the Fresh Air Damper step, the test sequence performs the Exit step.This initiates a reset and attempts to return the controller to normal operation.

(3) The fresh air damper (BOP6) only energizes during this step if binary output 6 has been configured as a fresh air damper.

Diagnostics

Table 14. Controller Diagnostics

Diagnostic	Latching Yes/No	Fan	Valves	Elect. Heat	Damper
Auxiliary temp. failure	No	Enabled	No action	No action	No action
Condensate overflow detection	Yes	Off	Closed	Off	Closed
Entering water temp. failure	No	Enabled	Enabled	Enabled	Enabled
Fan mode failure	No	Enabled	Enabled	Enabled	Enabled
Invalid unit configuration failure	Yes	Disabled	Disabled	Disabled	Disabled
Low temp. detection	Yes	Off	Open	Off	Closed
Maintenance required	Yes	Enabled	No action	No action	No action
Setpoint	No	Enabled	No action	No action	No action
Zone temp. failure	No	Off	Closed	Off	Closed

Notes:
Priority Level: *Diagnostics are listed in order from highest to lowest priority. The controller senses and records each diagnostic independently of other diagnostics. It is possible to have multiple diagnostics present simultaneously. The diagnostics affect unit operation according to priority level.*
Latching*: A latching diagnostic requires a manual reset of the controller; while a non-latching diagnostic automatically resets when the input is present and valid.*
Enabled*: End device is allowed to run if there is a call for it to run.*
Disabled*: End device is not allowed to run even if there is a call for it to run.*
No Action*: The diagnostic has no affect on the end device.*

Resetting Diagnostics

There are four ways in which diagnostics are reset:

1. Automatic reset by the controller
2. By initiating a manual output test at the controller
3. By cycling power to the controller
4. Through Rover™, Trane's service tool

Automatic Reset by the Controller

The controller includes an automatic diagnostic reset function which attempts to automatically restore the unit when a low temperature diagnostic occurs.

Note: The controller implements the automatic diagnostic reset function only once every 24 hours. For the controller to increment the 24 hour timer, you must maintain power to the controller. Cycling power resets all timers and counters.

After the controller detects the first special diagnostic, the unit waits 30 minutes before invoking the automatic diagnostic reset function. The automatic diagnostic reset function clears the special diagnostic and attempts to restore the controller to normal operation. The controller resumes normal operation until another diagnostic occurs.

Note: *The automatic diagnostic reset function does not operate during the manual output test sequence.*

If a special diagnostic occurs within 24 hours after an automatic diagnostic reset, the controller must be manually reset. Other possible methods of resetting diagnostics are described in the sections that follow.

Manual Output Test

Use the controller's Test button during installation or for troubleshooting to verify proper end device operation. Press the Test button to exercise all outputs in a predefined sequence, the first of which will attempt to reset the controller diagnostics if any are present. See Table 13 on page 49 for more information about the manual output test.

Cycling Power to the Controller

After removing and reapplying the 24 VAC power from the board, the unit cycles through a power-up sequence. By default, the controller attempts to reset all diagnostics at power-up. Diagnostics present at power-up and those that occur after power-up are handled according to Table 14 on page 50.

Trane's Service Tool, Rover™

Rover™, Trane's service tool, can reset diagnostics present in the controller. For complete information about Rover™, refer to Trane publication **EMTX-IOP-2** *Rover Installation, Operation and Programming Guide*.

Alarm Reset

Any device that can communicate alarm reset information can reset diagnostics present in the controller.

Troubleshooting

Table 15. Fan Outputs do not Energize

Probable Cause	Explanation
Random start observed	After power-up, the controller always observes a random start that varies between 0 and 25 seconds. The controller remains off until the random start time expires.
Power-up control wait	When power-up control wait is enabled (non-zero time), the controller remains off until one of two conditions occurs: 1. The controller exits power-up control wait once it receives communicated information. 2. The controller exits power-up control wait once the power-up control wait time expires.
Cycling fan operation	When the fan mode switch is in the auto postion, the unit fan cycles off when there is no call for heating or cooling. The heating/cooling sources cycle on or off periodically with the unit fan to match the capacity according to pulse-width-modulation (PWM) logic.
Unoccupied operation	The fan cycles with capacity when the unit is in unoccupied mode. This occurs even if the unit is in continuous fan operation. While unoccupied, the fan cycles on or off with heating/cooling to provide varying amounts of heating or cooling to the space. to match the capacity according to pulse-width-modulation (PWM) logic.
Fan mode off	When using the local fan mode switch to determine the fan operation, the off position controls the unit fan to off.
Requested mode: off	It is possible to communicate the operating mode (such as off, heat, and cool) to the controller. When “off” is communicated to the controller, the unit controls the fan to off. The unit is not capable of heating or cooling when the controller is in this mode.
Diagnostic present	A specific list of diagnostics effects fan operation. For more information, see the “Diagnostics” section on page 50.
No power to the controller	If the controller does not have power, the unit fan will not operate. For the controller to operate normally, it must have an input voltage of 24 VAC. When the green LED is off continuously, the controller does not have sufficient power or the controller has failed.
Manual output test	The controller includes a manual output test sequence to verify binary output operation and the associated wiring. However, based on the current step in the test sequence, the unit fan may not be powered on. Refer to the “Manual Output Test” section on page 51.
Unit wiring	The wiring between the controller outputs and the fan relays and contacts must be present and correct for normal fan operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Table 16. Valves Stay Closed

Probable Cause	Explanation
Normal operation	The controller opens and closes the valves to meet the unit capacity requirements.
Requested mode: off	It is possible to communicate the operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan to off. The unit is not capable of heating or cooling when the controller is in this mode.
Valve override	The controller can communicate a valve override request. This request effects the valve operation.
Manual output test	The controller includes a manual output test sequence to verify analog and binary output operation and the associated wiring. However, based on the current step in the test sequence, the valves may not be open. Refer to the "Manual Output Test" section on page 51.
Diagnostic present	A specific list of diagnostics affects valve operation. For more information, see the "Diagnostics" section on page 50.
Sampling logic	The controller includes entering water temperature sampling logic that automatically invokes during 2-pipe or 4-pipe changeover. It determines when the entering water temperature is either too cool or too hot for the desired heating or cooling mode. Refer to the "Entering Water Temperature Sampling" section on page 41.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end device, the valves may not work correctly.
No power to the controller	If the controller does not have power, the valves do not operate. For the controller to operate normally, it must have an input voltage of 24 VAC. When the green LED is off continuously, the controller does not have sufficient power, or the controller has failed.
Unit wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Table 17. Valves Stay Open

Probable Cause	Explanation
Normal operation	The controller opens and closes the valves to meet the unit capacity requirements.
Valve override	The controller can communicate a valve override request to affect the valve operation.
Manual output test	The controller includes a manual output test sequence that verifies analog and binary output operation and the associated wiring. However, based on the current step in the test sequence, the valves may be open. Refer to the "Manual Output Test" section on page 51.
Diagnostic present	A specific list of diagnostics affects valve operation. For more information, see the "Diagnostics" section on page 50.
Sampling logic	The controller includes entering water temperature sampling logic that automati cally invokes during 2-pipe or 4-pipe changeover to determine if the entering water temperature is correct for the unit operating mode. Refer to the "Entering Water Temperature Sampling" section on page 41.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end device, the valves may not work correctly.
Unit wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Table 18. Electric Heat Not Operating

Probable Cause	Explanation
Normal operation	The controller cycles electric heat on and off to meet the unit capacity requirements.
Requested mode: off	It is possible to communicate the operating mode (such as off, heat, cool) to the controller. When off is communicated to the controller, the units shuts off the electric heat.
Communicated disable	Numerous communicated requests may disable electric heat, including an auxiliary heat enable input and the heat/cool mode input. Depending on the state of the communicated request, the unit may disable electric heat.
Manual output test	The controller includes a manual output test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current step in the test sequence, the electric heat may not be on. Refer to the “Manual Output Test” section on page 51.
Diagnostic present	A specific list of diagnostics affects electric heat operation. For more information, see the “Diagnostics” section on page 50.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end device, the electric heat may not work properly.
No power to the controller	If the controller does not have power, electric heat does not operate. For the controller to operate normally, a 24VAC input voltage must be applied. When the green LED is off continuously, the controller does not have sufficient power or has failed.
Unit Wiring	The wiring between the controller outputs and the electric heat contacts must be present and correct for normal electric heat operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Table 19. Fresh Air Damper Stays Closed

Probable Cause	Explanation
Normal operation	The controller opens and closes the fresh air damper based on the controller's occupancy mode and fan status. Normally, the fresh air damper is open during occupied mode when the fan is running and closed during unoccupied mode.
Warmup and cooldown	The controller includes both a warmup and cooldown sequence to keep the fresh air damper closed during the transition from unoccupied to occupied. This is an attempt to bring the space under control as quickly as possible.
Requested mode: off	It is possible to communicate the operating mode (such as off, heat, cool) to the controller. When off is communicated to the controller, the unit closes the fresh air damper.
Manual output test	The controller includes a manual output test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current step in the test sequence, the fresh air damper may not be open. Refer to the "Manual Output Test" section on Page 51.
Diagnostic present	A specific list of diagnostics effects fresh air damper operation. For more information, see the "Diagnostics" section on page 50.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end device, the damper may not work correctly.
No power to the controller	If the controller does not have power, the fresh air damper does not operate. For the controller to operate normally, a 24 VAC input voltage must be applied. When the green LED is off continuously, the controller does not have sufficient power or has failed.
Unit wiring	The wiring between the controller outputs and the fresh air damper must be present and correct for normal damper operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Table 20. Fresh Air Damper Stays Open

Probable Cause	Explanation
Normal Operation	The controller opens and closes the fresh air damper based on the controller's occupancy mode and fan status. Normally, the fresh air damper is open during occupied mode when the fan is running and closed during unoccupied mode.
Manual Output Test	The controller includes a manual output test sequence that verifies analog and binary output operation and associated wiring. However, based on the current step in the test sequence, the fresh air damper may be open. Refer to the "Manual Output Test" section on page 51.
Unit Configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end device, the damper may not work correctly.
Unit Wiring	The wiring between the controller outputs and the fresh air damper must be present and correct for normal damper operation. Refer to the typical unit wiring diagrams in the Appendix of this manual.

Tracer® ZN.520

Tracer® ZN.520 is a communicating or standalone device. It is easily accessible in the control end panel for service. The control end panel is on the end opposite the piping.

Sequence of Operations

OFF: Fan is off; control valve options and fresh air damper options close. The low air temperature detection option is still active.

Auto: Fan speed control in the auto setting allows the modulating (3-wire floating point) or 2–position control valve option and three-speed fan to work cooperatively to meet precise capacity requirement, while minimizing fan speed (motor/energy/acoustics) and valve position (pump energy, chilled water reset). As the capacity requirement increases at low fan speed, the water valve opens. When the low fan speed capacity switch point is reached, the fan switches to medium speed and the water valve repositions to maintain an equivalent capacity. The reverse sequence takes place with a decrease in required capacity.

Low/Med/High: The fan will run continuously at the selected speed and the valve option will cycle to meet setpoint.

Tracer Summit® Communication Wiring

For Tracer® ZN.520 controlled units that will interface with the Trane Tracer Summit® building management system, terminate the communication wiring in the control box at the designated terminals on the board. Reference the unit wiring diagram or submittals.

Ground shields at each Tracer® ZN.520, taping the opposite end of each shield to prevent any connection between the shield and anther ground. Refer to Trane publication, *CNT-IOP-2 Installation, Operation and Programming Guide*, for the communication wiring diagram.

Communication wire must conform to the following specification:
1) Shielded twisted pair 18 AWG
2) Capacitance 23 (21-25) picofarads (pF) per foot
3) Listing/Rating – 300V 150C NEC 725-2 (b) Class 2 Type CL2P
4) Trane Part No. 400-20-28 or equivalent, available through Trane BAS Buying Group Accessories catalog.

Follow these general guidelines when installing communication wiring:

1) Maintain a maximum 5000 ft. aggregate run
2) Install all communication wiring in accordance with the NEC and all local codes.
3) Solder the conductors and insulate (tape) the joint sufficiently when splicing communication wire. Do not use wire nuts to make the splice.
4) Do not pass communication wiring between buildings be cause the unit will assume different ground potentials.
5) Do not run power in the same conduit or wire bundle with communication link wiring.

Service Communication Wiring

Establish service communication using Rover™ service software connected to the Tracer® ZN.520 using a twisted wire pair to one of the following connection points.

1) Remote zone sensor module
2) Connections on the board

This allows the technician to view and edit the Tracer® ZN.520 configuration and troubleshoot the unit. However, control options ordered and the wiring practice followed in the field may limit the communication ability.

Wall Mounted Zone Sensor Module

Route interconnecting wiring from the Tracer® ZN.520 to provide service communication at the wall-mounted zone sensor module. Install wiring by referencing the unit wiring diagram and Table 3 on page 35 for appropriate wire sizes. After wiring is complete, connect the communication cable (provided with the Rover service tool) to the telephone style RJ11 connection on the zone sensor module. Attach the other end of the cable to a laptop computer running Trane Rover software to establish communication.

Zone Sensors Without Interconnecting Wiring

Establish service communication to the Tracer® ZN.520 by wiring directly to the board inside the control box. Reference the unit-wiring diagram for the appropriate communication terminals on the board. Once wiring is complete, Use Trane Rover software to communicate to the Tracer® ZN.520.

Tracer® ZN.520 Unit Start-Up

Refer to the Trane publication, *CNT-IOP-2 Installation Operation and Programming Guide*, to operate the Tracer® ZN.520 with Trane Integrated Comfort™ System (ICS). The factory pre-programs the Tracer® ZN.520 with default values to control the temperature and unit airflow. Use Tracer Summit® building automation system or Rover™ software to change the default values.

Follow the procedure below to operate the Tracer® ZN.520 in a stand-alone operation:

1) Turn power on at the disconnect switch option.
2) Position the fan mode switch to either high, medium, low, or the auto position.
3) Rotate the setpoint dial on the zone sensor module to 55 F for cooling or 85 F for heating.

The appropriate control valve will actuate assuming the following conditions:

1) Room temperature should be greater than 55 deg. F and less than 85 deg. F
2) For a 2-pipe fan-coil unit with an automatic changeover sensor, the water temperature input is appropriate for the demand placed on the unit.For example, cooling operation is requested and cold water (5 degrees lower than room tem perature) flows into the unit.
4) Select the correct temperature setpoint.

Note: Select and enable zone sensor temperature settings to prevent freeze damage to unit.

Tracer® Communications

Tracer® ZN.520 is a Comm 5 controller. There is no need to set an address. Each individual board has its own unique Neuron I.D. number that takes the place of dip switches.

Tracer® ZN.520 Sequence of Operation

The Tracer® ZN.520 operates the fan in the following modes:

1) occupied
2) unoccupied
3) occupied standby
4) occupied bypass
5) Tracer Summit with supply fan control

Occupied

When the controller is in the occupied mode, the unit attempts to maintain the space temperature at the active occupied heating or cooling setpoint, based on the measured space temperature, the discharge air temperature, the active setpoint, and the proportional/ integral control algorithm. The modulating control algorithm used when occupied or in occupied standby is described in the following sections. Additional information related to the handling of the controller setpoints can be found in the previous Setpoint operation section.

Unoccupied Mode

When the controller is in the unoccupied mode, the controller attempts to maintain the space temperature at the stored unoccupied heating or cooling setpoint, based on the measured space temperature, the active setpoint and the control algorithm, regardless of the presence of a hardwired or communicated setpoint. Similar to other configuration properties of the controller, the locally stored unoccupied setpoints can be modified using Rover™ service tool.
In unoccupied mode, a simplified zone control algorithm is run. During the cooling mode, when the space temperature is above the cool setpoint, the primary cooling capacity operates at 100%. If more capacity is needed, the supplementary cooling capacity turns on (or opens to 100%). During the heating mode, when the space temperature is below the heat setpoint, the primary heating capacity turns on. All capacity is turned off when the space temperature is between the unoccupied cooling and heating setpoints. Note that primary heating or cooling capacity is defined by unit type and whether heating or cooling is enabled or disabled. For example, if the economizer is enabled and possible, it will be the primary cooling capacity. If hydronic heating is possible, it will be the primary heating capacity.

Occupied Standby Mode

The controller can be placed into the occupied standby mode when a communicated occupancy request is combined with the local (hardwired) occupancy binary input signal. When the communicated occupancy request is unoccupied, the occupancy binary input (if present) does not affect the controller's occupancy. When the communicated occupancy request is occupied, the controller uses the local occupancy binary input to switch between the occupied and occupied standby modes.

During occupied standby mode, the controller's economizer damper position goes to the economizer standby minimum position. The economizer standby minimum position can be changed using Rover service tool.

In the occupied standby mode, the controller uses the occupied standby cooling and heating setpoints. Because the occupied standby setpoints typically cover a wider range than the occupied setpoints, the Tracer® ZN.520 controller reduces the demand for heating and cooling the space. Also, the outdoor air economizer damper uses the economizer standby minimum position to reduce the heating and cooling demands.

When no occupancy request is communicated, the occupancy binary input switches the controller's operating mode between occupied and unoccupied. When no communicated occupancy request exists, the unit cannot switch to occupied standby mode.

Occupied Bypass Mode

The controller can be placed in occupied bypass mode by either communicating an occupancy request of Bypass to the controller or by using the timed override On button on the Trane zone sensor. When the controller is in unoccupied mode, you can press the On button on the zone sensor to place the controller into occupied bypass mode for the duration of the bypass time (typically 120 minutes).

Occupancy Sources

There are four ways to control the controller's occupancy:

- Communicated request (usually provided by the building automation system or peer device)
- By pressing the zone sensor's timed override On button
- Occupancy binary input
- Default operation of the controller (occupied mode)

A communicated request from a building automation system or another peer controller can change the controller's occupancy. However, if communication is lost, the controller reverts to the default operating mode (occupied) after 15 minutes (configurable, specified by the "receive heartbeat time"), if no local hardwired occupancy signal exists.

A communicated request can be provided to control the occupancy of the controller. Typically, the occupancy of the controller is determined by using time-of-day scheduling of the building automation system. The result of the time-of-day schedule can then be communicated to the unit controller.

For complete information about the setup for Tracer Summit® applications of this controller, see the Tracer Summit® product literature. For more information on the setup of another building automation system,

Tracer Summit® With Supply Fan Control

refer to the product-specific literature from that manufacturer.
If the unit is communicating with Tracer Summit and the supply fan control programming point is configured for Tracer (the factory configures as local), then Tracer Summit will control the fan regardless of the fan mode switch position.
All Tracer® ZN.520 lockouts (latching diagnostics) are manually reset whenever the fan mode switch is set to the off position or when power is restored to the unit. The last diagnostic to occur is retained until the unit power is disconnected. Refer to Trane publication, CNT-IOP-2 Tracer® ZN.520 Installation Operation and Programming Guide, for specific instructions regarding the procedure for running the Tracer® ZN.520.

Cooling Operation

The heating and cooling setpoint high and low limits are always applied to the occupied and occupied standby setpoints.
During the cooling mode, the Tracer® ZN.520 controller attempts to maintain the space temperature at the active cooling setpoint. Based on the controller's occupancy mode, the active cooling setpoint is one of the following:

- Occupied cooling setpoint
- Occupied standby cooling setpoint
- Unoccupied cooling setpoint

The controller uses the measured space temperature, the active cooling setpoint, and discharge air temperature along with the control algorithm to determine the requested cooling capacity of the unit (0-100%). The outputs are controlled based on the unit configuration and the required cooling capacity. To maintain space temperature control, the Tracer® ZN.520 cooling outputs (modulating hydronic valve, 2-position hydronic valve, or outdoor air economizer damper) are controlled based on the cooling capacity output.

The cooling output is controlled based on the cooling capacity. At 0% capacity, all cooling capacities are off and the damper is at minimum position. Between 0 and 100% capacity, the cooling outputs are controlled according to modulating valve logic (modulating valves) or cycled on (2-position valves). As the load increases, modulating outputs open further and binary outputs are energized longer. At 100% capacity, the cooling valve or damper is fully open (modulating valves) or on continuously (and 2-position valves).

Unit diagnostics can affect fan operation, causing occupied and occupied standby fan operation to be defined as abnormal. Refer to the Troubleshooting section for more information about abnormal fan operation.

The Tracer® ZN.520 controller operates the supply fan continuously when the controller is in the occupied and occupied standby modes, for either heating or cooling. The controller only cycles the fan off with heating and cooling capacity in the unoccupied mode.

The economizer is used for cooling purposes whenever the outdoor temperature is below the economizer enable setpoint and there is a need for cooling. The economizer is used first to meet the space demand, and other forms of cooling are used if the economizer cannot meet the demand alone. See modulating outdoor air damper operation for additional information.

Discharge Air Tempering

Cascade cooling control initiates a discharge air tempering function if the discharge air temperature falls below the discharge air temperature control low limit, all cooling capacity is at minimum, and the discharge control loop determines a need to raise the discharge air temperature. The controller then provides heating capacity to raise the discharge air temperature to its low limit.

The discharge air tempering function enables when cold outdoor air is brought in through the outdoor air damper, causing the discharge air to fall below the discharge air temperature control low limit. The controller exits the discharge air tempering function when heat capacity has been at 0% for five minutes.

Heating Operation

During heating mode, the Tracer® ZN.520 controller attempts to maintain the space temperature at the active heating setpoint. Based on the occupancy mode of the controller, the active heating setpoint is one of the following:
- Occupied heating
- Occupied standby heating
- Unoccupied heating

During dehumidification in the heating mode, the controller adjusts the heating setpoint up to the cooling setpoint. This reduces the relative humidity in the space with a minimum of energy usage.
The controller uses the measured space temperature, the active heating setpoint, and discharge air temperature, along with the control algorithm, to determine the requested heating capacity of the unit (0-100%). The outputs are controlled based on the unit configuration and the required heating capacity.

Unit diagnostics can affect the Tracer® ZN.520 controller operation, causing unit operation to be defined as abnormal. Refer to the Troubleshooting section for more information about abnormal unit operation.

The heating output is controlled based on the heating capacity. At 0% capacity, the heating output is off continuously. Between 0 and 100% capacity, the heating output is controlled according to modulating valve logic (modulating valves) or cycled on (2-position valves). As the load increases, modulating outputs open further and binary outputs are energized longer. At 100% capacity, the heating valve is fully open (modulating valves) or on continuously (2-position valves).

The Tracer® ZN.520 fan output(s) normally run continuously during the occupied and occupied standby modes, but cycle between high and off speeds with heating/cooling during the unoccupied mode. When in the occupied mode or occupied standby mode and the fan speed is set at the high, medium, or low position, the fan runs continuously at the selected speed. Refer to the Troubleshooting section for more information on abnormal fan operation.

When the unit's supply fan is set to auto, the controller's configuration determines the fan speed when in the occupied mode or occupied standby mode. The fan runs continuously at the configured heating fan speed or cooling fan speed. For all fan speed selections except off, the fan cycles off during unoccupied mode.

The economizer outdoor air damper is never used as a source of heating. Instead, the economizer damper (when present) is only used for ventilation; therefore, the damper is at the occupied minimum position in the occupied mode. The damper control is primarily associated with occupied fan operation.

Fan Mode Operation

For multiple fan speed applications, the Tracer® ZN.520 controller offers additional fan configuration flexibility. Separate default fan speeds for heating and cooling modes can be configured. The fan runs continuously for requested speeds (off, high, medium, or low). When the fan mode switch is in the Auto position or a hardwired fan mode input does not exist, the fan operates at the default configured speed. See Table 21 on page 67 for default fan configuration for heat and cool mode. During unoccupied mode, the fan cycles between high speed and off with heating and cooling fan modes. If the requested speed is off, the fan always remains off.
During dehumidification, when the fan is on Auto, the fan speed can

switch depending on the error. Fan speed increases as the space temperature rises above the active cooling setpoint.

Table 21. Fan Configuration

Auto fan operation	Fan speed default
Heating Continuous	Off
Low	
Medium	
High	
CoolingContinuous	Off
Low	
Medium	
High	

Additional flexibility built into the controller allows you to enable or disable the local fan switch input. The fan mode request can be either hardwired or communicated to the controller. When both are present, the communicated request has priority over the hardwired input. See the following tables.

Table 22. Local fan switch disabled or not present

Communicated fan speed input	Fan operation
Off	Off
Low	Low
Medium	Medium
High	High
Auto (or not present)	
Auto (fan runs at the default speed)	

Table 23. Local fan switch enabled

Communicated fan speed input	Fan switch (local)	Fan operation
Off	Ignored	Off
Low	Ignored	Low
Medium	Ignored	Medium
High	Ignored	High
Auto	Off	
Low		
Medium		
High		
Auto	Off	
Low		
Medium		
High		
Auto (configured default, determined by heat/cool mode)		

Table 24. Fan operation in heating and cooling modes

	Heating		Cooling	
Fan mode	**Occ.**	**Unocc.**	**Occ.**	**Unocc.**
Off	Off	Off	Off	Off
Low	Low	Off/High	Low	Off/High
Medium	Med	Off/High	Med	Off/High
High	High	Off/High	High	Off/High
Auto (continuous)	Default fan sp.	Off/High	Default fan sp.	Off/High

Continuous Fan Operation

During occupied and occupied standby modes, the fan normally is on. For multiple speed fan applications, the fan normally operates at the selected or default speed (off, high, medium, or low). When fan mode is auto, the fan operates at the default fan speed.

During unoccupied mode, the controller controls the fan off. While unoccupied, the controller heats and cools to maintain the unoccupied heating and cooling setpoints. In unoccupied mode, the fan is controlled on high speed only with heating or cooling.

The unit fan is always off during occupied, occupied standby, and unoccupied modes when the unit is off due to a diagnostic or when the unit is in the off mode due to the local zone sensor module, a communicated request, or the default fan speed (off).

If both a zone sensor module and communicated request exist, the communicated request has priority.

Fan Cycling Operation

Tracer® ZN.520 does not support fan cycling in occupied mode. The fan cycles between high speed and off in the unoccupied mode only. The controller's cascade control algorithm requires continuous fan operation in the occupied mode.

Fan Off Delay

When a heating output is controlled off, the Tracer® ZN.520 controller automatically holds the fan on for an additional 30 seconds. This 30-second delay gives the fan time to blow off any residual heat from the heating source, such as a steam coil. When the unit is heating, the fan off delay is normally applied to control the fan; otherwise, the fan off delay does not apply.

Fan Start on High Speed

On a transition from off to any other fan speed, the Tracer® ZN.520 controller automatically starts the fan on high speed and runs the fan at high speed for 0.5 seconds. This provides the ample torque required to start all fan motors from the off position.

Entering Water Temperature Sampling Function

Tracer® ZN.520 can sample the entering water temperature for all hydronic main coil changeover units.Hydronic heating/cooling changeover operation requires central plant operation, and the unit controller must use an entering water temperature sensor to verify delivery of the desired water temperature from the central plant.

When three-way valves are ordered with a Tracer® ZN.520 control, the controller is factory-configured to disable the entering water temperature sampling function, and the entering water sensor is mounted in the proper location. Disabling entering water temperature sampling eliminates unnecessary water flow through the main coil when three-way valves are used.

The Tracer® ZN.520 controller offers a control solution for two-way valve applications that does not require special unit considerations, such as those required by bleed lines. The controller includes an entering water temperature sampling function that periodically opens the two-way valve to allow temporary water flow, producing reliable entering water temperature measurement.
.
Only units using the main hydronic coil for both heating and cooling (2-pipe changeover and 4-pipe changeover units) use the entering water temperature sampling function. Two-pipe changeover and 4-pipe changeover applications allow the main coil to be used for heating and for cooling; therefore, these applications require an entering water temperature sensor.

Heating or Cooling Required

The entering water temperature value is useful to the unit controller only when heating or cooling is required. The entering water temperature must be five degrees above the space temperature for hydronic heating and five degrees below the space temperature for hydronic cooling. When water flows normally and frequently through the coil, the controller does not invoke the sampling function because the water temperature is satisfactory for the desired heating or cooling. The controller invokes entering water temperature sampling only when the measured entering water temperature is too cool to heat or too warm to cool. Entering water is cold enough to cool when it is five degrees below the measured space temperature. Entering water is warm enough to heat when it is five degrees above the measured space temperature.

When the controller invokes the entering water temperature sampling function, the unit opens the main hydronic valve for no more than three minutes before considering the measured entering water temperature. An initial stabilization period is allowed to flush the coil. This period is equal to 30 seconds plus ½ the valve stroke time. Once this temperature stabilization period has expired, the controller compares the entering water temperature against the effective space temperature (either hardwired or communicated) to determine whether the entering water can be used for the desired heating or cooling. If the water temperature is not usable for the desired mode, the controller continues to compare the entering water temperature against the effective space temperature for a maximum of three minutes.

The controller automatically disables the entering water temperature sampling and closes the main hydronic valve when the measured entering water exceeds the high entering water temperature limit (110 F). When the entering water temperature is warmer than 110 F, the controller assumes the entering water temperature is hot because it is unlikely the coil would drift to a high temperature unless the actual loop temperature was very high.

If the entering water temperature is unusable — too cool to heat or too warm to cool — the controller closes the hydronic valve and waits 60 minutes before initializing another sampling. If the controller determines the entering water temperature is valid for heating or cooling, it resumes normal heating/cooling control and effectively disables entering water temperature sampling until it is required.

Electric Heat Operation

The Tracer® ZN.520 controller supports 1- or 2-stage electric heat operation for heating. To control the space temperature, electric heat is cycled to control the discharge air temperature. The rate of cycling is dependent upon the load in the space and the temperature of the incoming fresh air from the economizer (if any).Two-pipe changeover units with electric heat use the electric heat only when hot water is not available.

Fresh Air Damper Options

Manual

Units with the manual fresh air damper option ship with the damper in the closed position, which is adjustable from zero to 100 percent in 25 percent increments. To adjust the position, first remove the air filter to expose the damper stop screw on the control panel end. Relocate the stop screw to the appropriate position. Then loosen the stop screw wingnut and adjust the linkage.

Economizer Damper

With a valid outdoor air temperature (either hardwired or communicated), Tracer® ZN.520 uses the modulating economizer damper as the highest priority source of cooling. Economizer operation is only possible through the use of a modulating damper.
Economizing is possible during the occupied, occupied standby, unoccupied, and occupied bypass modes.

The controller initiates the economizer function if the outdoor air temperature is cold enough to be used as free cooling capacity. If the outdoor air temperature is less than the economizer enable setpoint (absolute dry bulb), the controller modulates the outdoor air damper (between the active minimum damper position and 100%) to control the amount of outdoor air cooling capacity. When the outdoor air temperature rises 5 F above the economizer enable point, the controller disables economizing and moves the outdoor air damper back to its predetermined minimum position based on the current occupancy mode or communicated minimum damper position.

Table 25. Relationship Between Outdoor Temperature Sensors and Damper Position

Outdoor Air Temp.	Modulating Outdoor Air Damper		
	Occ. or Occ. bypass	**Occ. standby**	**Unocc.**
None or invalid	Open to occ. min.pos.	Open to occ. standby min. pos.	Closed
Failed	Open to occ. min.pos.	Open to occ. standby min. pos.	Closed
Present and econ. feasible	Economizing: min pos.-100%	Economizing: between occ. standby min. pos.-100%	Open and econ. only when unit operating, closed otherwise
Present and econ. not feasible	Open to occ. min. pos.	Open to occ. standby min. pos.	Closed

Dehumidification

Dehumidification is possible when mechanical cooling is available, the heating capacity is located in the reheat position, and the space relative humidity setpoint is valid.The controller starts dehumidifying the space when the space humidity exceeds the humidity setpoint. The controller continues to dehumidify until the sensed humidity falls below the setpoint minus the relative humidity offset.The controller uses the cooling and reheat capacities simultaneously to dehumidify the space. While dehumidifying, the discharge air temperature is controlled to maintain the space temperature at the current setpoint. A typical scenario involves high humidity and high temperature load of the space.The controller sets the cooling capacity to 100% and uses the reheat capacity to warm the discharge air to maintain space temperature control.Dehumidification may be disabled via Tracer or configuration.

Note: *If the unit is in the unoccupied mode, the dehumidification routine will not operate.*

Data Sharing

Because this controller utilizes LonWorks™ technology, the controller can send or receive data (setpoint, heat/cool mode, fan request, space temperature, etc.) to and from other controllers on the communication link, with or without the existence of a building automation system. This applies to applications where multiple unit controllers share a single space temperature sensor (for rooms with multiple units but only one zone sensor) for both standalone (with communication wiring between units) and building automation system applications. For this application you will need to use the Rover service tool. For more information on setup, refer to the Trane publication *EMTX-IOP-2.*

Binary Inputs

The Tracer® ZN.520 controller has four available binary inputs. Normally, these inputs are factory-configured for the following functions:
- Binary input 1: Low temperature detection (freezestat)
- Binary input 2: Condensate overflow
- Binary input 3: Occupancy/ Generic
- Binary input 4: Fan status

Note: *The generic binary input can be used with a Tracer Summit® building automation system only.*

Each binary input default configuration (including normally open/ closed) is set at the factory.However, you can configure each of the four binary inputs as normally open or normally closed. The controller will be set properly for each factory-supplied binary input end-device. When no device is connected to the input, configure the controller's

Table 26. Binary Input Configurations

Binary Input	Description	Configuration	Controller operation Contact closed	Contact open
BI 1	Low temperature detection (Note 1)	Normally closed	Normal	Diagnostic (note 5)
BI 2	Condensate overflow (Note 1)	Normally closed	Normal	Diagnostic (note 5)
BI 3	Occupancy	Normally open	Unoccupied	Occupied
BI 3	Generic binary input	Normally open	Normal (Note 3)	Normal (Note 3)
BI 4	Fan status (Note 1)	Normally open	Normal	Diagnostic (Note 4)

Note 1: *During low temperature, condensate overflow, and fan status diagnostics, the Tracer® ZN.520 control disables all normal unit operation of the fan, valves, and damper.*
Note 2: *The occupancy binary input is for standalone unit controllers as an occupied/unoccupied input. However, when the controller receives a communicated occupied/unoccupied request, the communicated request has priority over the hardwired input.*
Note 3: *The generic binary input does not affect unit operation. A building automation system reads this input as a generic binary input*
Note 4: *If the fan mode input is in the off position or the controller is in the unoccupied mode with the fan off, the fan status input will be open. A diagnostic will not be generated when the controller commands the fan off. A diagnostic will only be generated if the fan status input does not close after one minute from energizing a fan output or any time the input is open for one minute. The controller waits up to one minute after energizing a fan output to allow the differential pressure to build up across the fan.*
Note 5: *The table below shows the controller's response to low temperature detection, condensate overflow, and fan status diagnostics.*
input as not used.

BIP	Description	Fan	Valve	Electric heat	Damper
BI 1	Low temperature detection	Off	Open	Off	Closed
BI 2	Condensate overflow	Off	Closed	Off	Closed
BI 4	Fan status	Off	Closed	Off	Closed

Binary Outputs

Binary outputs are configured to support the following:
• Three fan stages (when one or two fan stages are present, medium fan speed can be configured as exhaust fan)
• One hydronic cooling stage
• One hydronic heating stage (dehumidification requires this to be in the reheat position)
• One DX cooling stage
• One- or two-stage electric heat (dehumidification requires this to be in the reheat position)
• Face and bypass damper
• Modulating outdoor air damper
• One baseboard heat stage

Table 27. Binary Output Configuration

Binary Output	Configuration
J1-1	Fan high
J1-2	Fan medium
J1-3	Fan low
J1-4	(Key)
J1-5	Cool valve – open, or 2 position valve, (Note 1)
J1-6	Cool valve – close (Note 1)
J1-9	Heat valve – open, or 2 position valve, or 1st Electric heat stage (Note 1)
J1-10	Heat valve – close or 2nd Electric heat stage (Note 1)
J1-11	Fresh air damper - open
J1-12	Fresh air damper - close
TB4-1	Generic / Bbaseboard heat output
TB4-2	24VAC

Note 1: *For Tracer® ZN.520 units configured and applied as 2-pipe hydronic heat/cool changeover, terminals J1-5 and J1-6 are used to control the primary valve for both heating and cooling. For Tracer® ZN.520 units configured and applied as 2-pipe hydronic heat/cool changeover with electric heat, terminals J1-5 and J1-6 are used to control the primary valve (for both cooling and heating), and terminals J1-9 and J1-10 are used only for the electric heat stage. For those 2-pipe changeover units, electric heat will not be energized while the hydronic supply is hot (5 or more degrees above the space temperature).*

Analog Inputs

Table 28. Analog Inputs

Description	Terminals	Function	Range
Zone	TB3-1	Space temperature input	5° to 122°F (-15° to 50°C)
Ground	TB3-2	Analog ground	NA
Set	TB3-3	Setpoint input	40° to 115°F (4.4° to 46.1°C)
Fan	TB3-4	Fan switch input	4821 to 4919 W (Off) 2297 to 2342 W (Auto) 10593 to 10807 W (Low) 13177 to 13443 W (Medium) 15137 to 16463 W (High)
Ground	TB3-6	Analog ground	NA
Analog Input 1	J3-1	Entering water temperature	-40° to 212°F (-40° to 100°C)
	J3-2	Analog ground	NA
Analog Input 2	J3-3	Discharge air temperature	-40° to 212°F (-40° to 100°C)
	J3-4	Analog ground	NA
Analog Input 3	J3-5	Fresh air temp/Generic temp	-40° to 212°F (-40° to 100°C)
	J3-6	Analog ground	NA
Analog Input 4	J3-7	Universal Input Generic 4-20ma Humidity CO2	0 – 100% 0 – 100% 0 – 2000ppm
	J3-8	Analog ground	NA
Ground	J3-9	Analog ground	NA

Notes:

1) The zone sensor, entering water temperature sensor, discharge air sensor, and the outside air temperature sensor are 10KW thermistors.

2) Zone sensor:

Wall mounted sensors include a thermistor soldered to the sensor's circuit board.

Unit mounted sensors include a return air sensor in the units return air stream.

3) Changeover units include an entering water temperature sensor.

Zone Sensor

The Tracer® ZN.520 controller accepts the following zone sensor module inputs:

- Space temperature measurement (10kW thermistor)
- Local setpoint (either internal or external on the zone sensor module)
- Fan switch
- Timed override (On) and Cancel timed override
- Communication jack

Space Temperature Measurement

Trane zone sensors use a 10kW thermistor to measure the space temperature. Typically, zone sensors are wall-mounted in the room and include a space temperature thermistor. As an option, the zone sensor can be unit-mounted with a separate space temperature thermistor located in the unit's return air stream. If both a hardwired and communicated space temperature value exist, the controller ignores the hardwired space temperature input and uses the communicated value.

External Setpoint Adjustment

Zone sensors with an external setpoint adjustment (1kW) provide the Tracer® ZN.520 controller with a local setpoint (50 to 85 F or 10 to 29.4 C). The external setpoint is exposed on the zone sensor's front cover.

When the hardwired setpoint adjustment is used to determine the setpoints, all unit setpoints are calculated based on the hardwired setpoint value, the configured setpoints, and the active mode of the controller. The hardwired setpoint is used with the controller's occupancy mode (occupied, occupied standby, or unoccupied), the heating or cooling mode, the temperature deadband values, and the heating and cooling setpoints (high and low limits) to determine the controller's active setpoint.

When a building automation system or other controller communicates a setpoint to the controller, the controller ignores the hardwired setpoint input and uses the communicated value. The exception is the unoccupied mode, when the controller always uses the stored default unoccupied setpoints. After the controller completes all setpoint calculations, based on the requested setpoint, the occupancy mode, the heating and cooling mode, and other factors, the calculated setpoint is validated against the following setpoint limits:

- Heating setpoint high limit
- Heating setpoint low limit
- Cooling setpoint high limit
- Cooling setpoint low limit

These setpoint limits only apply to the occupied and occupied standby heating and cooling setpoints. These setpoint limits do not apply to the unoccupied heating and cooling setpoints stored in the controller's configuration.

When the controller is in unoccupied mode, it always uses the stored unoccupied heating and cooling setpoints.The unit can also be configured to enable or disable the local (hardwired) setpoint. This parameter provides additional flexibility to allow you to apply communicated, hardwired, or default setpoints without making physical changes to the unit.

Similar to hardwired setpoints, the effective setpoint value for a communicated setpoint is determined based on the stored default setpoints (which determines the occupied and occupied standby temperature deadbands) and the controller's occupancy mode.

Fan Switch

The zone sensor fan switch provides the controller with an occupied (and occupied standby) fan request signal (Off, Low, Medium, High, Auto). If the fan control request is communicated to the controller, the controller ignores the hardwired fan switch input and uses the communicated value. The zone sensor fan switch input can be enabled or disabled through configuration using the Rover service tool. If the zone sensor switch is disabled, the controller resorts to its stored configuration default fan speeds for heating and cooling, unless the controller receives a communicated fan input.

When the fan switch is in the off position, the controller does not control any unit capacity. The unit remains powered and all outputs drive to the closed position.Upon a loss of signal on the fan speed input, the controller reports a diagnostic and reverts to using the default fan speed.

On/Cancel Buttons

Momentarily pressing the on button during unoccupied mode places the controller in occupied bypass mode for 120 minutes. You can adjust the number of minutes in the unit controller configuration using Rover service tool. The controller remains in occupied bypass mode until the override time expires or until you press the Cancel button.
Communication jack

Use the RJ-11 communication as the connection point from Rover™ service tool to the communication link—when the communication jack is wired to the communication link at the controller. By accessing the communication jack via Rover™, you gain access to any controller on the link.

Table 29. Zone sensor wiring connections

TB1	Description
1	Space temperature
2	Common
3	Setpoint
4	Fan mode
5	Communications
6	Communications

Communications

The Tracer® ZN.520 controller communicates via Trane's Comm5 protocol. Typically, a communication link is applied between unit controllers and a building automation system. Communication also is possible via Rover, Trane's service tool. Peer-to-peer communication across controllers is possible even when a building automation system is not present. You do not need to observe polarity for Comm5 communication links.

The controller provides six 0.25-inch quick-connect terminals for the Comm5 communication link connections, as follows:
- Two terminals for communication to the board
- Two terminals for communication from the board to the next unit (daisy chain)
- Two terminals for a connection from the zone sensor back to the controller

Diagnostics

Table 30. Tracer® ZN.520 Diagnostics

Diagnostic	Fan	Other Outputs (Note 1)
Condensate overflow	Off	Valves Closed, Fresh air damper Closed, electric heat Off, Baseboard heat Off
Low temperature detection	Off	Valves Open, Fresh air damper Closed, electric heat Off, Baseboard heat Off
Low air flow - fan failure	Off	Valves Closed, Fresh air damper Closed, electric heat Off, Baseboard heat Off
Space temperature failure	Off	Valves Closed, Fresh air damper Closed, electric heat Off, Baseboard heat Off
Entering water temp failure	On	Valves Enabled (Note 2), Fresh air damper Enabled (Note 2), electric heat Enabled (Note 2), Baseboard heat Off
Discharge air temp low limit	Off	Valves Open, Fresh air damper Closed, electric heat Off, Baseboard heat Off
Discharge air temp failure	Off	Valves Closed, Fresh air damper Closed, electric heat Off, Baseboard heat Off,
Fresh air temp failure	On	Valves Enabled, Fresh air damper Minimum position[3], electric heat Enabled, Baseboard heat Enabled
Relative humidity failure	On	Valves Enabled, Fresh air damper Enabled, electric heat Enabled, Baseboard heat Enabled
Generic 4-20ma failure	On	Valves Enabled, Fresh air damper Enabled, electric heat Enabled, Baseboard heat Enabled
CO_2 Input failure	On	Valves Enabled, Fresh air damper Enabled, electric heat Enabled, Baseboard heat Enabled
Maintenance required	On	Valves Enabled, Fresh air damper Enabled, electric heat Enabled, Baseboard heat Enabled
Local fan mode failure	On	Valves Enabled, Fresh air damper Enabled, Electric Heat Enabled, Baseboard heat Enabled
Local setpoint failure	On	Valves Enabled, Fresh air damper Enabled, electric heat Enabled, Baseboard heat Enabled
Invalid unit configuration	Off	Valves Disabled, Fresh air damper Disabled, electric heat Disabled, Baseboard heat Disabled
Normal – power up	On	Valves Enabled, Fresh air damper Enabled, Electric heat Enabled

Note 1: *The generic binary output (TB4-1, TB4-2) state is unaffected by all unit diagnostics.*
Note 2: *When the entering water temperature is required but not present, the Tracer® ZN.520 controller generates a diagnostic to indicate the sensor loss condition. The controller automatically clears the diagnostic once a valid entering water temperature value is present (non-latching diagnostic). When the entering water temperature sensor fails, the controller prohibits all hydronic cooling operation, but allows the delivery of heat when heating is required. In the Cool mode, all cooling is locked-out, but normal fan and outdoor air damper operation is permitted.*

Note 3: *When the outdoor air temperature sensor has failed or is not present, the Tracer® ZN.520 controller generates a diagnostic to indicate the sensor loss condition. The controller automatically clears the diagnostic once a valid outdoor air temperature value is present (non-latching diagnostic). When the outdoor air temperature sensor fails or is not present, the controller prohibits economizer operation.*

Translating Multiple Diagnostics

The controller senses and records each diagnostic independently of other diagnostics. It is possible to have multiple diagnostics present simultaneously. The diagnostics are reported in the order they occur.

Possible diagnostics include:
- Low Temperature Detection
- Low Air Flow - Fan Status
- Space Temperature Failure[1]
- Discharge Air Temp Failure[1]
- Local Setpoint Failure[1]
- CO2 Sensor Failure[1]
- Humidity Input Failure[1]
- Maintenance Required
- Generic temperature failure
- Condensate Overflow
- Discharge Air Temp Limit
- Entering Water Temp Failure[1]
- Outdoor Air Temp Failure[1]
- Local Fan Mode Failure[1]
- Generic AIP Failure[1]
- Defrosting Compressor Lockout[1]
- Invalid Unit Configuration
- Discharge air low limit

[1] Non-latching diagnostics automatically reset when the input is present and valid.

Resetting Diagnostics

There are six ways to reset unit diagnostics:
- Automatically by the controller
- By initiating a manual output test at the controller
- By cycling power to the controller
- By using a building automation system
- By using the Rover service tool
- By using any other communicating device able to access the controller's diagnositc reset input
- By cycling the fan switch from off to any speed setting

Automatically: The Tracer® ZN.520 controller includes an automatic diagnostic reset function.This function attempts to automatically recover a unit when the Low Temperature Detection diagnostic occurs.When this diagnostic occurs, the controller responds as defined in the Diagnostics table in the previous Summary section. After the controller detects the Low Temperature Detection diagnostic, the unit waits 30 minutes before invoking the automatic diagnostic reset function.The automatic diagnostic reset function clears the Low Temperature Detection diagnostic and attempts to restore the controller to normal operation.The controller resumes normal operation until another diagnostic occurs.

If a Low Temperature Detection diagnostic recurs within 24 hours after an automatic diagnostic reset, you must manually reset the diagnostic. See other possible methods for resetting diagnostics in this section.

Manual output test: You can use the Test button on the controller either during installation to verify proper end device operation or during troubleshooting.When you press the Test button, the controller exercises all outputs in a predefined sequence. The first and last outputs of the sequence reset the controller diagnostics. See the previous section for more information about the manual output test. Cycling power: When someone turns off the controller's 24 VAC power, then re-applies power, the unit cycles through a power up sequence.By default, the controller attempts to reset all diagnostics at power up.Diagnostics present at power up and those that occur after power up are handled according to the defined unit diagnostics sequences (see previous Diagnostics table).

Building automation system: Some building automation systems can reset diagnostics in the Tracer® ZN.520 controller.For more complete information, refer to the product literature for the building automation system.

Rover™ service tool: Rover service tool can reset diagnostics in the Tracer® ZN.520 controller. For more complete information, refer to the *Rover™ Installation, Operation, and Programming* manual.

Diagnostic reset: Any device that can communicate the network variable nviRequest (enumeration "clear_alarm") can reset diagnostics in the Tracer® ZN.520 controller.The controller also attempts to reset diagnostics whenever power is cycled.

Cycling the fan switch: If the user cycles the fan speed switch from off to any speed, the controller resets all diagnostics.Diagnostics may recur immediately if the problem still exists.
The green LED normally indicates whether or not the controller is powered on (24 VAC).

LED Operation

Red Service LED

Table 31. Red Service LED Activity

LED Activity	Description
Off continuously after power is applied to the controller.	Normal operation
On continuously, even when power is first applied to the controller.	Someone is pressing the Service button or the controller has failed.
LED flashes about once every sec.	Uninstall (normal controller mode). Use Rover™ service tool to restore normal unit operation.
Black Service push button	Use the Service button to install the Tracer® ZN.520 controller in a communication network.

Caution: If the Service push button is held down for more than 15 seconds, the Tracer® ZN.520 controller will uninstall itself from the ICS™ communication network and shut down all unit operation. This mode is indicated by the red Service LED flashing once every second. See the Red Service LED section. Use Rover™ service tool to restore the unit to normal operation. Refer to the Rover™ product literature for more information.

Troubleshooting

Green Status LED

Table 32. Green Status LED activity

Green LED activity	Description
On continuously	Power on (normal operation)
Blinks (one blink)	The controller is in manual output test mode. No diagnostics present.
Blinks (2 blinks)	The controller is in manual output test mode. One or more diagnostics are present.
LED blinks (1/4 sec. on, 1/4 sec., off for 10 sec)	Wink mode (Note 1).
LED off	Power is off. Controller failure. Test button is pressed.

Note 1: *The Wink feature allows you to identify a controller. By sending a request from Rover service tool, you can request the controller to wink (blink on and off as a notification that the controller received the signal). The green LED blinks (1/4 second on, 1/4 second off for 10 seconds) during Wink mode.*

Yellow Comm LED

The yellow Comm LED blinks at the rate the controller receives communication. The yellow LED does not blink when the controller is transmitting communication data.

Table 33. Yellow Comm LED Activity

LED activity	Description
Off continuously	The controller is not detecting any communication. (Normal for standalone applications.)
LED blinks or flickers	The controller detects communica tion. (Normal for communicating applications, including data shar ing.)
LED on continuously	Abnormal condition or extremely high traffic on the link.

The test sequence verifies output and end device operation. Use the manual output test to verify output wiring and actuator operation without using Rover™ service tool.

If the diagnostics remain after an attempt to clear diagnostics, the status LED indicates the diagnostic condition is still present and may affect the manual output test.See the Green Status LED section. Advancing completely through the test sequence terminates manual test. The controller will time out if the unit remains in a single step for one hour.

Manual Output Test

Test Sequence

The procedure for testing is:

1.Press and hold the Test button for at least two seconds, then release the button to start the test mode. When manual output test mode begins, the controller turns off all outputs and calibrates modulating end devices closed.

2. Press the Test button (no more than once per second) to advance through the test sequence. Alternatively, the manual output test can be controlled over the communications network by using Rover™.

Table 34. Test Sequence

Step	Fan			Main valve		Electric heat or aux. valve		Fresh air damper		Generic/ baseboard heat
	J1-1	J1-2	J1-3	J1-5	J1-6	J1-9	J1-10	J1-11	J1-12	TB4-1
1: Off [1]	Off	Off	Off	Off	On	Off	aux: on EH: off	Off	On	Off
2: Fan High [2]	High	Off	Off	Off	Off	Off	Off	Off	Off	Off
3: Fan Med	Off	Med	Off	Off	Off	Off	Off	Off	Off	Off
4: Fan low	Off	Off	Low	Off	Off	Off	Off	Off	Off	Off
5: Main open	High	Off	Off	On	Off	Off	Off	Off	Off	Off
6: Main close, EH1 on	High	Off	Off	Off	On	On	Off	Off	Off	Off
7: Aux open, EH1 on	High	Exh	Off	Off	Off	On	Off	Off	Off	Off
8: Aux close, EH1 off, EH2 on, damper open	High	Off	Off	Off	Off	Off	On	On	Off	Off
9: Damper close	High	Off	Off	Off	Off	Off	Off	Off	On	Off
10: Generic/ baseboard heat energized	High	Off	Off	Off	Off	Off	Off	Off	Off	On
11: Exit [6]	Exit									

[1]Upon entering manual output test mode, the controller turns off all fan and electric heat outputs and drives

LED Operation

The green status LED is off when you press the Test button.To begin the manual output test mode, press and hold the Test button (which causes the green LED to go off) for at least two seconds, then release the button.The green LED blinks, indicating the controller is in manual test mode.

Troubleshooting

Table 35. Fan outputs do not energize

Probable Cause	Explanation
Random start observed	After power up, the controller always observes a random start from zero to 25 seconds.The controller remains off until the random start time expires.
Power up control wait	When power up control wait is enabled (non-zero time), the controller remains off until one of two conditions occur:The controller exits power up control wait once it receives communicated information.The controller exits power up control wait once the power up control wait time expires.
Cycling fan operation	The controller operates the fan continuously when in the occupied, occupied standby, or occupied bypass mode. When the controller is in the unoccupied mode, the fan is cycled between high speed and off with capacity.
Unoccupied operation	When the controller is in the unoccupied mode, the fan is cycled between high speed and off with capacity to maintain zone temperature control.
Fan mode off `	When a local fan mode switch (provided on the Trane zone sensor) determines the fan operation, the off position controls the unit off.
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling.
Diagnostic present	A specific list of diagnostics affects fan operation. For more information, see the Diagnostics section.
No power to the controller	If the controller does not have power, the unit fan does not operate. For the Tracer® ZN.520 controller to operate normally, it must have an input voltage of 24 VAC. When the green LED is off continuously, the control ler does not have sufficient power or has failed.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the valves may not work correctly.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the unit fan may not be on. Refer to the Manual Output Test section.
Unit wiring	The wiring between the controller outputs and the fan relays and con tacts must be present and correct for normal fan operation.

Table 36. Valves Stay Closed

Probable Cause	Explanation
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling (valves are closed).
Power up control wait	When power up control wait is enabled (non-zero time), the controller remains off until one of two conditions occurs:The controller exits power up control wait once it receives communicated information.The controller exits power up control wait once the power up control wait time expires.
Manual output test	The controller includes a manual output test sequence you can use to verify output operation and associated output wiring. However, based on the current step in the test sequence, the valve(s) may not be open. Refer to the Manual Output Test section.
Fan mode off	When a local fan mode switch (provided on the Trane zone sensor) determines the fan operation, the off position controls the unit off and valves to close.
Sampling logic	The controller includes entering water temperature sampling logic which is automatically invoked during 2-pipe and 4-pipe changeover when the entering water temperature is either too cool or too hot for the desired heating or cooling.Refer to the Entering Water Temperature Sampling section.
Diagnostic present	A specific list of diagnostic affects valve operation. For more information, see the Diagnostics section.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configuration does not match the actual end devices, the valves may not work correctly.Example: A 2-pipe heat/cool changeover unit will not cool if the entering water tempera ture is too warm for cooling or if the entering water sensor is not present. The unit will not heat if the entering water temperature is too cool for heating.
Unit wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation.
Random start observed	After power up, the controller always observes a random start from 0 to 25 seconds. The controller remains off until the random start time expires.

The TUC is capable of operating in either a standalone application or interfacing with a Trane Tracer® system. In addition, Trane EveryWare™ software is available to edit the configuration of the TUC.

The TUC board is easily accessible on an isolation panel in the control panel. The TUC board will pivot down in the control panel box after removing the screw on the top right corner of the panel. See Figure 29.

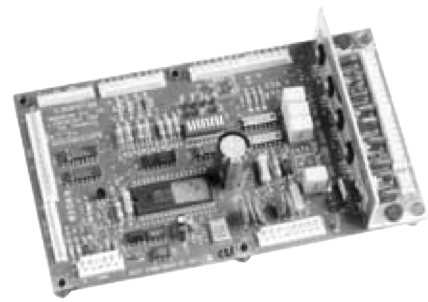


Figure 29. The TUC module board.

TUC Sequence of Operations

Off: Fan is off; control valve options and fresh air damper options close. The low air temperature detection option is still active.

Auto*:* Fan speed control in the auto setting allows the modulating (three-wire floating point) control valve option and three-speed fan to work cooperatively to meet precise capacity requirements, while minimizing fan speed (motor/energy/acoustics) and valve position (pump energy/chilled water reset). As the capacity requirement increases at low fan speed, the water valve opens. When the low fan speed capacity switch point is reached, the fan switches to medium speed and the water valve repositions to maintain an equivalent capacity. The reverse sequence takes place with a decrease in required capacity.

Low/Med/High: The fan will run continuously at the selected speed and the valve option will cycle to meet setpoint.

Tracer® Communication Wiring

For TUC controlled units that will interface with the Trane Tracer® system or Tracer Summit® building management system, terminate the communication wiring in the control box at the designated terminals on the low voltage terminal strip. Reference the unit wiring schematic or submittals.

Take care to maintain the correct polarity throughout the communication wiring circuit.

Ground shields at each TUC, taping the opposite end of each shield to prevent any connection between the shield and another ground. Refer to Trane publication, **EMTX-IOP-1** *Installation Operation and Programming Guide,* for the communication wiring diagram.

Communication wire must conform to the following specification:

- Shielded twisted pair 18 AWG
- Capacitance 23 (21-25) picofarads (pF) per foot
- Listing/Rating - 300V 150C NEC 725-2 (b) Class 2 Type CL2P
- Trane Part No. 400-20-28 or equivalent, available through Trane BAS Buying Group Accessories catalog

Follow these general guidelines when installing communication wiring:

- Maintain a maximum 5000 ft. aggregate run
- Install all communication wiring in accordance with the NEC and all local codes.
- Solder the conductors and insulate (tape) the joint sufficiently when splicing communication wire. Do not use wire nuts to make the splice.
- Do not pass communication wiring between buildings because the unit will assume different ground potentials.
- Do not run power in the same conduit or wire bundle with communication link wiring.

Service Communication Wiring

Establish service communication to the TUC by connecting a twisted wire pair to one of the following connection points.

- Remote zone sensor module
- Low voltage terminal strip inside the control panel

This will allow the technician to view and edit the TUC configuration and troubleshoot the unit. However, control options ordered and the wiring practice followed in the field may limit the communication ability.

Wall-Mounted Zone Sensor Module

Route interconnection wiring from the TUC to provide service communication at the wall-mounted zone sensor module. Install wiring by referencing the unit wiring schematic and Table 3 on page 35 for appropriate wire sizes. After wiring is complete, connect the comm4 port on the zone sensor module with a telephone style RJ 11 connector (Western Electric #616 or equivalent). Run the telephone style connector to a laptop computer running Trane EveryWare™ software to establish communication.

Zone sensors without interconnecting wiring:
Establish service communication to the TUC by wiring to the low voltage terminal strip inside the control box. Reference the unit wiring schematic for the appropriate communication terminals on the low voltage terminal strip. Maintain the correct polarity throughout the communication wiring circuit.

Once wiring is complete, use Trane EveryWare™ software to communicate to the TUC. The comm4 connection can be made by the telephone style RJ 11 connector (Western Electric #616 or equivalent) on the zone sensor module and the computer using EveryWare™ .

Terminal Unit Controller Start-Up

Refer to Trane publication, **EMTX-IOP-1** *Installation Operation Programming Guide*, to operate the TUC with Trane Integrated Comfort℠ System (ICS). The factory pre-programs the TUC with default values to control the temperature and unit air flow. Use Tracer® building automation system or EveryWare™ software to change the default values.
Follow the procedure below to operate the TUC in a stand-alone operation.

1. Turn power on at the disconnect switch option.

2. Position the fan mode switch to either high, medium, low, or the auto position.

3. Rotate the setpoint dial on the zone sensor module to 55° F for cooling or 85° F for heating.
The appropriate control valve will actuate assuming the following conditions:

- Room temperature should be greater than 55° F and less than 85° F
- For a 2-pipe fan-coil unit with an automatic changeover sensor, the water temperature input is appropriate for the demand placed on the unit, e.g. cooling operation is requested and cold water (5° F lower than room temperature for a TUC) flows into the unit.

4. Select the correct temperature setpoint.

Note: *Select and enable zone sensor temperature settings to prevent freeze damage to unit.*

TUC Human Interface

TUCs connected to a Tracer® comm 4 communication link requires a unique address. Use the TUC's eight DIP switches to set the ICS address. The address must be in the valid range of 33 to 96. See Table 21 on page 63 for address settings.

Setting the ICS Address for Tracer Communications

To set the ICS address, perform the following steps:
1. Set the DIP switches to the correct address. ON implies that the DIP switch is pressed towards the DIP switch number. OFF implies that the DIP switch is pressed towards the OPEN position.
2. Short and hold the test input (J11 and J12) until all LEDs are illuminated. Remove the jumper from the test input. This sets the address in the TUC EEPROM.

Note: *Cycling power to the TUC forces the TUC to read the DIP switch settings (Rev 12 TUC or higher). The TUC firmware version can be read from either Tracer or Everyware. Additionally, the last two digits of the part number printed on the sticker on the TUC 1U1 microprocessor indicate the TUC firmware version, ie: 6200-0028-13.*
The TUC operates the fan in the following modes:

Table 37. Valid TUC Addresses

	DIP Switch Position									DIP Switch Position							
Address	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Address**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
33			X					X	65		X						X
34			X				X		66		X					X	
35			X				X	X	67		X					X	X
36			X			X			68		X				X		
37			X			X		X	69		X				X		X
38			X			X	X		70		X				X	X	
39			X			X	X	X	71		X				X	X	X
40			X		X				72		X			X			
41			X		X			X	73		X			X			X
42			X		X		X		74		X			X		X	
43			X		X		X	X	75		X			X		X	X
44			X		X	X			76		X			X	X		
45			X		X	X		X	77		X			X	X		X
46			X		X	X	X		78		X			X	X	X	
47			X		X	X	X	X	79		X			X	X	X	X
48			X	X					80		X		X				
49			X	X				X	81		X		X				X
50			X	X			X		82		X		X			X	
51			X	X			X	X	83		X		X			X	X
52			X	X		X			84		X		X		X		
53			X	X		X		X	85		X		X		X		X
54			X	X		X	X		86		X		X		X	X	
55			X	X		X	X	X	87		X		X		X	X	X
56			X	X	X				88		X		X		X		
57			X	X	X			X	89		X		X	X			X
58			X	X	X		X		90		X		X	X		X	
59			X	X	X		X	X	91		X		X	X		X	X
60			X	X	X	X			92		X		X	X	X		
61			X	X	X	X		X	93		X		X	X	X	X	
62			X	X	X	X	X		94		X		X	X	X	X	
63			X	X	X	X	X	X	95		X		X	X	X	X	X
64		X							96		X	X					

TUC Sequence of Operation

- Occupied
- Unoccupied
- Tracer® with supply fan control

Occupied
In the occupied mode, the factory configures the TUC for continuous occupied fan cycle. With the fan control set to auto, the fan operates at the required speed to meet the cooling or heating capacity. However, the fan will run at one set speed continuously if set in the high, medium, or low position.

Unoccupied
In the unoccupied mode, the TUC cycles the fan between off and high speed to satisfy the unoccupied setpoint. However, if the occupied preheat damper position is closed and the room setpoint is 3° F above (cool down) or 3° F below (warm-up) setpoint, the fan runs at high speed when exiting the unoccupied mode to occupied mode. Also, if the occupied preheat damper position is configured as closed, the fan will run in high speed any time the room temperature falls 3° F or below room setpoint in occupied heating mode.

Tracer® with supply fan control
If the unit is communicating with Tracer® and the *supply fan control* programming point is configured for Tracer® (the factory configures as local), then Tracer® will control the fan regardless of the fan mode switch position.

All TUC lockouts (latching diagnostics) are manually reset whenever the fan mode switch is set to the off position or when power is restored to the unit. The last diagnostic to occur is retained until the unit power is disconnected. Refer to Trane publication, **EMTX-IOP-1** *TUC Installation Operation and Programming Guide*, for specific instructions regarding the procedure for running the TUC.

Cooling and Heating Operation

Setpoint Control

Adjust the cooling setpoint by using either the setpoint adjustment knob, resetting the TUC default values, or Tracer® downloaded values. The factory configures the o*ccupied heat or cool setpoint source* for local mode. The local mode allows the local setpoint knob to determine the cooling setpoint If using Tracer® to define the heat or cool setpoint source, the TUC uses the Tracer® setpoints. If Tracer® is not communicating, the TUC will attempt to obtain the heating and cooling setpoint from a local source. If there is no input from a local source, the TUC will resort to its default values.
The TUC limits the parameters of the cooling setpoint input (adjustable from either the setpoint knob or Tracer®) to prevent excessively

high or low temperatures. In addition, the TUC calculates the heating setpoint equal to the cooling setpoint minus an adjustable heating offset. Furthermore, the heating setpoint cannot exceed a value less than or equal to the cooling setpoint. The TUC is in the cooling mode when the space temperature rises 1° F above the cooling setpoint. The TUC is in the heating mode when the space temperature drops 1° F below the heating setpoint. The unoccupied setpoints are typically widened to account for night setback and are adjustable with either Tracer® or EveryWare™ software.

Fan Mode Operation

Off Position
On a stand-alone TUC with the fan mode switch in the off position, all normal cooling and heating functions cease. (e.g. The fan does not run, the fresh air damper option closes, and the unoccupied mode disables.)

High, Medium, or Low Postion
With the fan mode switch in the high, medium, or low position; the fresh air damper option and the control valve(s) operate to maintain setpoint.

Auto Position
As the capacity requirement increases at low fan speed, the control valve gradually opens. The fan speed increases to medium after reaching the low speed capacity switch point. This causes the control valve to reposition to maintain capacity, gradually opening as demand increases. The fan speed increases to high after reaching the medium speed capacity switch point. This causes the control valve to reposition to maintain output capacity, gradually opening as demand increases. As capacity decreases, the control valve closes until reaching the fan switch point. After reaching the fan switch point, the fan speed decreases to medium with the control valve repositioning to maintain constant capacity. As capacity decreases, the control valve closes until reaching the fan switch point. After reaching the fan switch point, the fan speed decreases to low with the control valve repositioning to maintain constant capacity. At low speed, the control valve closes incrementally as demand decreases.

Entering Water Temperature Sampling Function

The entering water temperature sampling function allows water to circulate in an attempt to sense water cold enough to provide cooling. The function uses a timer to permit the controller and the valve to fully open while the water circulates for 3 minutes. The fan continues to run at the selected speed. If the changeover sensor does not sense the correct water temperature within this 3 minute cycle, the valve closes and the entering water temperature sampling function will cease until 57 minutes elapse. After this time lapse, the water circulates again through the unit to determine if the entering water temperature indicates a call for cooling or heating.

Note: *The entering water temperature sampling function is for units with 2-way valves. This function is not necessary for units with 3-way valves since water flows continuously through this piping configuration.*

Table 38. Unit Mode as Related to Water Temperature

Unit Type	EWT Sensor Required?	Coil Water Temperature
2-pipe changeover	Yes	• Can cool if: space temp - EWT ≥ 5 deg F • Can heat if: EWT - space temp ≥ 5 deg F
4-pipe changeover	Yes	• Can cool if: space temp - EWT ≥ 5 deg F • Can heat if: EWT - space temp ≥ 5 deg F
2-pipe heating only	No	Hot water assumed
2-pipe cooling only	No	Cold water assumed
4-pipe heat/cool	No	• Cold water assumed in main coil • Hot water assumed in aux. coil

2-Pipe with Auxiliary Electric Heat (Fan-coils)

The auxiliary electric heat option allows heating when the occupied space requires heating but the unit still has chilled system water flowing through it. The electric heat is also sufficient for use as the sole source of heat for the unit.

The TUC utilizes a heating only output to energize electric heat if hydronic heat is insufficient to meet the heating requirements. This output responds to a demand for heat as long as the entering water temperature is lower than 95° F. However, if the water temperature reaches 95° F or higher, the electric heat lockout switch (on the supply water pipe) disengages the electric heat. Electric heat becomes available again when the entering water temperature falls to 65° F or lower (± 5° F).

Note: The auxiliary electric heat option is not available with a four-pipe fan-coil unit.

Fresh Air Damper Options

Manual

Units with manual fresh air dampers ship with the damper in the closed position, which is adjustable from zero to 100 percent in 25 percent increments. To adjust the position, first remove the air filter to expose the damper stop screw on the control panel end. Relocate the stop screw to the appropriate position. Then loosen the stop screw wingnut and adjust the linkage. See Figure 30.

Figure 30. Re-locate the damper stop screw to adjust the damper position. The factory positions the stop screw in the 25% open position.

Auto 2-Position

Units with an auto 2-position fresh air damper ship with a stop screw in the 25 percent reference position. The auto damper is adjustable to open from zero to 50 percent in 25 percent increments. To adjust the damper position, remove the air filter to expose the damper stop screw on the control panel end. Then relocate the stop screw to the appropriate position. See Figure 30.

***Note:** The open position of the damper does not correspond to the amount of fresh air. It is the installer's responsibility to ensure that the building's minimum fresh air requirements are met while taking necessary precautions to protect the unit during freeze conditions.*

Economizer

The economizer damper option contains a modulating, 3-wire floating point actuator and a damper assembly. The factory sets the damper at a minimum 25 percent open position by configuring the TUC. This setting is adjustable and can be changed in the field with EveryWare™ software or Tracer®. The minimum open position is adjustable from zero to 100 percent in one percent increments.

The economizer fresh air damper is controlled to the minimum position, which the factory configures. During the occupied mode, economizing is enabled and the fresh air temperature is measured while economizing.

Economizing is enabled within the TUC configuration based on an editable temperature differential between the fresh air temperature and the zone temperature. The unit will go into economizing mode when the outside air temperature falls to 10° F or more below the zone temperature. The TUC will control the damper to a position to produce optimal cooling during economizing. If power is interrupted or the TUC is turned off, the damper will spring back to the closed position.

If the occupied preheat damper position is configured as closed (the factory configures as open), the fresh air damper remains closed during the transition from unoccupied mode to occupied mode until the zone temperature is within 2° F of the heating setpoint (warm-up sequence), or cooling setpoint (cool-down sequence). During the warm-up sequence, the damper fully closes, the fan operates on high speed, and the heating valve drives fully open to until the zone temperature approaches the occupied heating setpoint. If the zone temperature falls 3° F or more below the heating setpoint during the occupied mode, the TUC reinitiates the warm-up sequence until the zone temperature is within 2° F of the heating setpoint.

If during the occupied heating mode, the TUC determines that no heating capacity is present and the zone temperature drops 3° F below the heating setpoint, the TUC closes the fresh air damper regardless of the occupied preheat damper position. The cool-down sequence has a maximum duration of one hour and cannot be reinitiated once the unit is in occupied mode.

All units ship from the factory with the damper in the closed position.

Note: *The open position of the damper does not correspond to the amount of fresh air provided to the unit. It is the installer's responsibility to ensure that the building's minimum fresh air requirements are met while taking the necessary freeze conditon precautions to protect the unit.*

BIP4: Low Temperature Detection Option

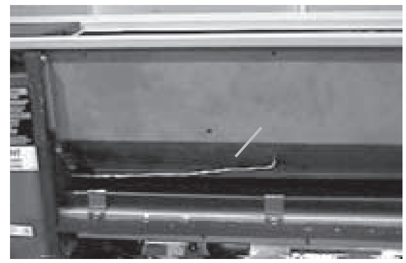


Figure 31. The low temperature sensor is a capillary tube inserted into the coil to detect freezing conditions.

The low temperature detection option protects the unit from freezing conditions by using a capillary line in the coil fins to detect freezing conditions. The TUC uses the low temperature sensor with a normally open valve. When the sensor detects temperatures below 36° F, a binary input turns the fan off, closes the fresh air damper, disables the electric heat, and opens the control valve. This creates a shutdown latching diagnostic that requires a reset to resume normal operation. However, normal operation cannot resume until the water temperature rises to 44° F. See Figure 31.Low temperature detection is active even when the unit is off, but the TUC must remain powered for it to be functional.

The factory configures the 24V dry contact input as normally closed to indicate alarm. However, it also can be normally open if using the correct switch.

***Note:** While the low temperature detection sensor can help minimize the risk of coil freeze-up, it cannot prevent this from occurring in all circumstances. The user is responsible to adequately protect the unit from freeze conditions.*

***Note:** The capillary line of the low temperature detection sensor is in the section of the hydronic coil above the fan, nearest the control panel box. Locate the outside air wall box or ductwork so fresh air has a direct path into the fan. This allows the sensor to detect an accurate fresh air temperature and proper operation of a dual fan unit. Failure to do this could cause the low temperature detection sensor to incorrectly detect a potential freezing coil.*

BIP3: Condensate Overflow Detection Device

The condensate overflow detection device protects the unit from condensate water overflow. The switch is a float-type device located in the fan-coil unit's auxiliary drain pan. See the "Condensate Overflow Switch" section and Figures 12 and 13 on page 26.

When there is a danger of condensate water overflow from the auxiliary pan, the float rises with the water level in the pan. When the float rises to over 50 percent of its travel, the control valve closes. Also, a binary input causes the fan to turn off, the fresh air damper to close, and the electric heat to disable. This creates an immediate shutdown latching diagnostic, which requires a manual or Tracer® reset to resume normal operation.

However, normal operation cannot resume until the water level recedes to an acceptable level. The switch will close after the water level recedes, and the active temperature control of the unit will resume by an automatic reset. Since both the condensate overflow detection and occupied/unoccupied status occupy BIP3 on the TUC board, only one option can be in use. The factory configures the 24V dry contact input as normally closed to indicate an alarm. However, it also can be normally open if using the correct switch.

BIP4: Smoke Input

The smoke input is a binary input on the TUC that is used with a smoke detector switch (installer supplied) to signal an alarm. Configure the input to either send an alarm to Tracer® or as a shutdown latching diagnostic. If the input is configured as a shutdown latching diagnostic, the TUC closes the control valve(s), shuts the fan off, closes the fresh air damper, and disables electric heat.

If the input is configured to send an alarm, Tracer will issue a system wide shutdown for the building. The unit will continue to run, and no diagnostic will register within the TUC. The factory configures the 24V dry contact input as normally closed. However, it can also be normally open if using the correct switch.

BIP3: Occupied/ Unoccupied Mode

The unit can operate in the occupied/unoccupied mode when a binary signal is input from an external source such as a time clock or Tracer®. Reference the "TUC Fan Mode Operation" section on page 65 for the sequence of operations. This option is only available if the condensate overflow input is not in use (if not using Tracer®), since both inputs occupy the same point on the TUC board. The factory configures the 24V dry contact input as normally closed. However, it can also be normally open if using the correct switch. A closed signal indicates occupied mode.

BIP1: External Interlock

The external interlock input allows the unit to be remotely stopped when a binary signal is input to the TUC from an external source or from Tracer®. Since both external interlock and condensate overflow input to the same point (if not using Tracer®) on the TUC board, only one input can be in use. The factory configures the 24V dry contact input as normally closed, but it can also be open if using the correct switch.

BIP2: Motion Detection

The motion detection input when used with a motion detection switch (installer supplied) detects the absence of motion in the space during the occupied mode. If no motion is detected, the TUC controls the space to alternate heating and cooling setpoints while also controling the economizer damper option to the minimum position. The factory configures the 24V dry contact input as normally closed. However, it can also be normally open if using the correct switch. A closed signal indicates alarm.

Autocycle Test

The autocycle test is an operating mode that activates the TUC outputs in a defined series of steps. This function allows the technician to to manually exercise each TUC output by sequentially stepping through the 16 stages of the autocycle test

Note: *Do not leave unit unattended while in test mode because the unit safety shutdowns are not functional.*

Note: *During the autocycle test, the TUC ignores all unit safety diagnostics. Take precautions to ensure the hydronic coil is not subject to freezing conditions.*

CAUTION: If the TUC is left in the autocycle test mode, it will automatically return to normal unit operation after 60 minutes.

To place the TUC in the autocycle test mode, perform the following steps. Refer to Table 23 onpge 72 for details on the staging.

1. Read and record the initial TUC address.

2. Set the TUC DIP switch #7 to ON (address = 2). All other switches should be off.

3. To automatically cycle through the stages, short and hold the TUC test input (short J11 and J12 together). Continue holding the test input and the unit will cycle to each subsequent stage every 30 seconds.

4. To manually step between stages, momentarily short the test input to advance to the next test stage.

5. When the autocycle test is complete, return the DIP switches to the initial positions recorded in step 1. Short the test inputs to set the address in the TUC EEPROM.

Table 39. Autocycle Test Staging

Stage	LEDs (1) 1	2	3	4	Fan-Coil Output Exercised
0					Off
1				●	Fan low speed
2			●		Fan medium speed
3			●	●	Fan high speed
4	○	●			Economizer/damper
5	○	●	○	●	Cooling valve
6	○	●	●	○	Heating valve
7	○	●	●	●	Electric heat stage 1
8	●	○	○	○	Electric heat stage 2
9	●	○	○	●	Not used
10	●	○	●	○	Reheat
11	●	○	●	●	Not used
12	●	●	○	○	Not used
13	●	●	○	●	Not used
14	●	●	●	○	Not used
15					Not used

(1) ● = the LED is illuminated
○ = the LED is off

Reading Diagnostics

Use the TUC human interface to read the current unit diagnostic. If no diagnostics are present, the last diagnostic appears.

Perform the following steps. Refer to Table 23 on page 72 for staging details.

1. Read and record the initial TUC address.
2. Set the TUC DIP switch #5 to ON (address = 8).
3. Short and hold the test input.
4. The LEDs will blink to define a diagnostic code. The diagnostic information will be displayed in a series of three blink sequences.
   Sequence 1: When the test input is shorted continuously, all LEDs go off for one second.
   Sequence 2: LED #5 will light to indicate that sequence 2 is currently being displayed. LEDs one through four will display the first part of the diagnostic code.
   Sequence 3: LED #6 will light to indicate that sequence 3 is currently being displayed. LEDs one through four will display the second part of the diagnostic code.
5. Refer to Table 24 on page 74 to interpret the blink sequences' corresponding diagnostic code.
6. Read and record the current diagnostic. Then return the DIP switches to the initial positions recorded in step 1. Short the test inputs to set the address in the TUC EEPROM.

Example: Diagnostic blink sequences for condensate overflow (8B)

Sequence 1 Sequence 2 Sequence 3

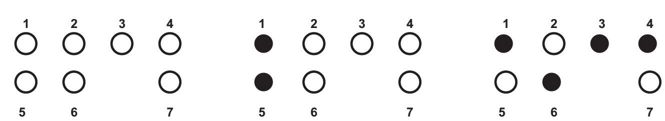


Table 40. Blink Sequence Corresponding Diagnostic Codes

Sequence 1				Sequence 2				Sequence 3						
1	2	3	4	1	2	3	4	1	2	3	4	Code	Diagnostic	Latch
												None	Power failure	None
												None	Controller failure	None
○	○	○	○	○	○	○	○	○	○	○	○	00	None	N/A
○	○	○	○	●	○	○	○	●	○	●	●	8B	Condensate overflow	Yes
○	○	○	○	●	○	○	●	●	○	●	●	9B	Leaving water temp sensor 1 failure	No
○	○	○	○	●	○	●	○	○	○	○	○	A0	Zone and supply temp sensor failure	No
○	○	○	○	●	●	○	○	●	○	○	○	C8	High EWT	No
○	○	○	○	●	●	○	○	●	○	●	●	CB	Low EWT	No
○	○	○	○	●	●	○	○	●	●	●	●	CF	Low temp. detect. or condensate overflow	Yes
○	○	○	○	●	●	○	●	○	○	●	●	D3	Low discharge air temp	Yes
○	○	○	○	●	●	○	●	○	●	○	○	D4	Smoke alarm	Yes/No
○	○	○	○	●	●	○	●	○	●	○	●	D5	High dischg air temp	Yes/No
○	○	○	○	●	●	○	●	●	●	○	●	DD	Low fresh air temp	No
○	○	○	○	●	●	●	●	●	○	○	○	F8	Bad configuration	No
○	○	○	○	●	●	●	●	●	●	●	○	FE	Return air high limit	Yes

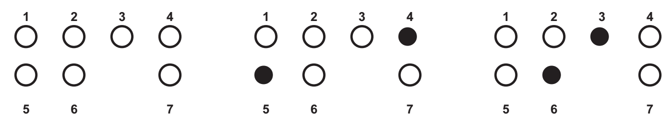
Reading the Operating Machine State

Use the human interface to read the unit operating machine state.

1. Read and record the initial TUC address.
2. Set the TUC DIP switch #5 and #8 to ON (address = 9). The remaining switches will be off.
3. Short and hold the test input.
4. The LEDs will blink to define an operating machine state. The operating machine state information will be displayed in a series of three blink sequences.
   Sequence 1: When the test input is shorted continuously all LEDs go off for one second.
   Sequence 2: LED #5 will light to indicate that sequence 2 is currently being displayed. LEDs one through four will display the first part of the operating machine state.
   Sequence 3: LED #6 will light to indicate that sequence 3 is currently being displayed. LEDs one through four will display the second part of the operating machine state.
5. Reference Table 25 on page 75 to interpret the operating machine state derived from the blink sequences.

6. Read and record the operating machine state. Return the DIP switches to the initial positions recorded in step 1. Short the test inputs to set the address in the TUC EEPROM.

Example: Operating Machine State for Standby Mode



Example: Operating control mode for purge mode

Table 41. Operating Machine State LED Sequences and Codes

Sequence 1				Sequence 2				Sequence 3					
1	2	3	4	1	2	3	4	1	2	3	4	Code	Machine State
○	○	○	○	○	○	○	○	○	○	○	○	00	Manufacturing Test
○	○	○	○	○	○	○	○	○	○	●		2	Bad Configuration
○	○	○	○	○	○	○	○	○	●	○	○	4	Auto Cycle Test
○	○	○	○	○	○	○	○	○	●	●	○	6	Disable
○	○	○	○	○	○	○	○	●	○	○	○	8	Stop
○	○	○	○	○	○	○	○	●	○	●	○	10	Calibration
○	○	○	○	○	○	○	○	●	●	○	○	12	Latching Diagnostic
○	○	○	○	○	○	○	○	●	●	●	○	14	Freeze Shutdown
○	○	○	○	○	○	○	●	○	○	○	○	16	Soft Reset
○	○	○	○	○	○	○	●	○	○	○	○	18	Standby
○	○	○	○	○	○	○	●	○	●	○	○	20	Cooling
○	○	○	○	○	○	○	●	○	●	●	○	22	Heating

Reading the Operating Control Mode

Using the human interface, read the operating control mode.

1. Read and record the initial TUC address.
2. Set the TUC DIP switch #5 and #7 to ON (address = 10). The remaining switches will be off.
3. Short and hold the test input.
4. The LEDs will blink to define an operating control mode. The operating control mode information will be displayed in a series of three blink sequences.
   Sequence 1: With the test input shorted continuously, all LEDs go off for one second.
   Sequence 2: LED #5 will light to indicate that sequence 2 is currently displayed. LEDs one through four will display the first part of the operating control mode.
   Sequence 3: LED #6 will light to indicate that sequence 3 is currently being displayed. LEDs one through four will display the second part of the operating control mode.
5. Refer to Table 26 on page 77 to interpret the operating control mode derived from the blink sequences.
6. After reading and recording the operating control mode, return the DIP switches to the positions recorded in step 1. Short the test inputs to set the address in the TUC EEPROM.

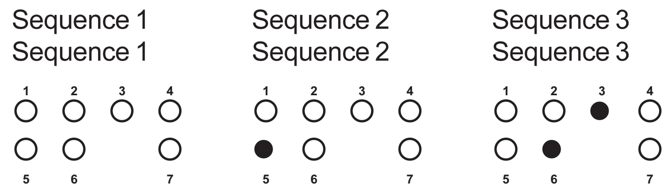


Table 42. Operating Control Mode LED Sequences and Codes

Sequence 1				Sequence 2				Sequence 3				Code	Control Mode	Definition
1	2	3	4	1	2	3	4	1	2	3	4			
○	○	○	○	○	○	○	○	○	○	○	○	0	Stop	Diagnostic, user switch, Tracer® command or interlock has stopped the unit
○	○	○	○	○	○	○	○	○	○	●	○	2	Purge	Incorrect entering water temp. The TUC cannot meet the demand. There is no other capacity available.
○	○	○	○	○	○	○	○	○	●	○	○	4	Tracer® Override	The TUC received a Tracer® verride. Follow Tracer® output commands.
○	○	○	○	○	○	○	○	●	○	○	○	8	Precool	Unoccupied cooling with economizer, or water; occupied cooling feasibility check.
○	○	○	○	○	○	○	○	●	○	●	○	10	Precool	Unoccupied cooling with EWT economizer while purging for sampling cold water.
○	○	○	○	○	○	○	○	●	●	○	○	12	Precool	Unoccupied cooling with 100% cool economizer with water or compressor augmentation.
○	○	○	○	○	○	○	○	●	●	●	○	14	Econo-mizer	Occupied cooling with econo-mizer
○	○	○	○	○	○	○	●	○	○	○	○	16	Econo-mizer EWT sampling	Occupied cooling with econo-mizer while sampling for cold water.

Table 42—Continued. Operating Control Mode LED Sequences and Codes

Sequence 1 1 2 3 4	Sequence 2 1 2 3 4	Sequence 3 1 2 3 4	Code	Control Mode	Definition
○ ○ ○ ○	○ ○ ○ ●	○ ○ ● ○	18	Cool	Occupied cooling with the water coil
○ ○ ○ ○	○ ○ ○ ●	○ ● ○ ○	20	Cool econo-mize	Occupied cooling with water and 100% economizer
○ ○ ○ ○	○ ○ ○ ●	○ ● ● ○	22	Preheat	Unoccupied heating with hot water (main or auxiliary), or electric heat.
○ ○ ○ ○	○ ○ ○ ●	● ○ ○ ○	24	Preheat EWT sampling	Two-pipe only, unoccupied heating with electric heat while sampling for hot water.
○ ○ ○ ○	○ ○ ○ ●	● ○ ● ○	26	Preheat electric heat	Unoccupied heating with 100% hot water (main or auxiliary) or with electric heat augmentation. Or, unoccupied heating with 100% main coil hot water with auxiliary coil hot water augmentation.
○ ○ ○ ○	○ ○ ○ ●	● ● ○ ○	28	Heat	Occupied heating with hot water (main or auxiliary coil)
○ ○ ○ ○	○ ○ ○ ●	● ● ● ○	30	Electric heat	Occupied heating with electric heat
○ ○ ○ ○	○ ○ ● ○	○ ○ ○ ○	32	Heat electric heat	Electric heat available: occupied heating with 100% hot water (main or auxiliary)
○ ○ ○ ○	○ ○ ● ○	○ ○ ● ○	34	Electric heat EWT	Two-pipe only, occupied heating with electric heat while purging for hot water. sampling

Electric heat not available: Occupied heating with 100% main coil hot water with auxiliary coil hot water augmentation.

Diagnostics

Table 43. TUC Controller Diagnostics

Diagnostic	Latching?	Fan	Valves	Elect. Heat	Damper
Dirty filter	Yes	No Action	No Action	No Action	No Action
Condensate overflow	Yes	Off	Closed	Off	Closed
Supply fan failure (if configured as alarm = yes)	Yes	Off	Closed	Off	Closed
Supply fan failure (if configured as alarm = no)	Yes	No Action	No Action	No Action	No Action
Low coil entering air temp	Yes	Off	Open	Off	Closed

Notes:

1. Use a normally open hot water valve with the low coil entering air temperature sensor.

2. Use a normally closed chilled water valve with the condensate overflow sensor.

Resetting Diagnostics

There are five ways in which diagnostics are reset:

1. Using the zone sensor
2. Using Everyware™, Trane's TUC service tool
3. By cycling power to the TUC
4. Through Tracer 100i™ or 100L™
5. Through Tracer Summit®

Using the Zone Sensor

Using the zone sensor's fan mode switch to reset diagnostics, slide the fan mode switch to the off position. Then return the switch back to any position except off.

Using Everyware™ Software

Connect to the communications terminal with a laptop computer loaded with Everyware™ software. Log on and reset the diagnostics from the diagnostic page of the TUC configuration screens. To view the diagnostics prior to resetting, press the ENTER key while in the status section of the service summary screens.

Cycling Power to the TUC

Remove the 24 VAC power from the board and then reapply it to cycle the unit through a power-up sequence. By default, the controller attempts to reset all diagnostics at power-up.

Using Tracer 100i™ or 100L™

The TUC editor's reset failure point allows the user to reset controller diagnostics. Also, Tracer® versions 14.4 and higher provide a "+ enter" option from the TUC service summary screens that allow latching diagnostic reset.

Using Tracer Summit®

When using a Tracer Summit® system, reset the unit diagnostics with the reset diagnostics button on the TUC editor screen.

Unit Mode Listed as Standby

The unit's operating machine state is in standby when one of the following conditions occurs:

1. Tracer® override is present.

2. During the power-up sequence or any time when the TUC is calibrating its end devices.

3. When the TUC is in the unoccupied mode and there is no call for heating or cooling.

4. In the occupied mode when the desired capacity is unavailable. ie: the TUC requests a 2-pipe unit to heat, yet no hot water or electric heat is available. The TUC will list the unit as being in standby mode.

Troubleshooting

More detailed information about programming and operating the TUC board can be found in Trane publication, **EMTX-IOP-1** *TUC Installation Operation and Programming Guide.*

Table 44. TUC Does Not Communicate

Probable Cause	Explanation
TUC is not addressed correctly	Verify the ICS address according to Table 21 on page 63. Each TUC on the link requires a unique address in the range of 33 to 96. Set or modify the DIP switches, then short the TUC test input momentarily.
Incorrect comm 4 wiring	Verify that the link is twisted pair Trane part # 400-20-28 or equivalent. TUC (comm 4) wiring is polarity sensitive throughout the communication link. If possible, isolate the TUC from the rest of the ICS link to determine if the problem exists in the comm wiring or in the TUC board.
Defective TUC board	If the previous solutions do not fix the problem, it may be necessary to replace the TUC board.

Table 45. Fan Outputs not Energizing

Probable Cause	Explanation
Random start enabled	When enabled, the random start feature delays the unit start-up for 3 to 32 seconds (configurable) after power-up.
Power-up control wait	When enabled, the power-up control wait feature delays the TUC startup for two minutes after power-up. This delay allows the Tracer® system ample time to communicate its fan control request.
Cycling fan operation	When configured to cycle with capacity, the unit fan cycles off when there is no call for heating or cooling. The heating/cooling sources cycle on or off periodically with the unit fan to match the capacity according to pulse-width-modulation (PWM) logic.
Unoccupied operation	The fan cycles with capacity when the unit is in unoccupied mode. This occurs even if the unit is configured for continuous fan operation. While unoccupied, the fan cycles on or off with heating/cooling to match the capacity according to pulse-width-modulation (PWM) logic. The TUC can be placed in unoccupied mode either through a Tracer® system or through BIP3 if it has been configured as occupied/unoccupied.
Latching diagnostic present	A specific list of diagnostics effects fan operation. For more information, see the “Diagnostics” section on page 73. Latching diagnostics require a manual reset to restore normal unit operation.
Unit disabled	The Tracer® system can disable the unit via a shutdown input or BIP1 can be configured as external interlock.
Local fan switch: off	Using the local fan mode switch to determine fan operation, the “off” position on the switch controls the unit fan to off.

Table 45—Continued. Fan Outputs not Energizing

Probable Cause	Explanation
No power to the TUC	The TUC requires 24 VAC power for the unit to operate properly.
Autocycle test	The controller includes an auto cycle test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current stage in the test sequence, supply fan may be off. Refer to the "Autocycle Test" section on page 71.
Wiring	The wiring between the controller outputs and the fan relays and contacts must be present and correct for normal fan operation. Refer to the typical unit wiring diagrams on pages 105-106.

Table 46. Valves Closed

Probable Cause	Explanation
Normal operation unit disabled	The valves open and close to meet unit capacity requirements. • The TUC may be disabled via the shutdown mode on a Tracer® system or if BIP1 is configured as external interlock. • During the stop modes, the valves remain closed unless freeze avoidance is enabled and the fresh air temperature falls below the freeze avoidance setpoint (configurable). • If the fresh air temperature falls below the freeze avoidance setpoint, the valves open. The TUC enables freeze avoidance whenever the freeze avoidance setpoint is not zero.
Override present	The valves may be overridden to the closed position by either the Tracer® system or by Everyware™ software. Whenever any override is active, the TUC drives the valves closed unless they are concurrently overridden open.
Latching diagnostic presen	A specific list of diagnostics effects valve operation. For more information, see the "Diagnostics" section on page 73. Latching diagnostics require a manual reset to restore normal unit operation.
Autocycle test	The controller includes an autocycle test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current stage in the test sequence, the valve(s) may be closed. Refer to the "Human Interface" section on page 62.
Maximum heating/cooling capacity of zero	The Tracer® may limit the maximum heating/cooling capacity of the TUC from zero to 100%. When the maximum cooling capacity is zero, the cooling valve remains closed. When the maximum heating capacity is zero, the heating valve remains closed.

Table 46—Continued. Valves Closed

Probable Cause	Explanation
Unit Configuration	The TUC cannot control any valve outputs if the unit is configured for no valves. Also, if the valve type is incorrectly configured (on/off, modulating analog, or 3-wire floating point), the valve(s) may not operate properly.
No Power to the TUC	The TUC requires a 24 VAC power for the unit to operate properly.
Wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation. Refer to the typical unit wiring diagrams on pages 105-106.

Table 47. Valves Open

Probable Cause	Explanation
Normal Operation	The valves open and close to meet unit capacity requirements.
Override Present	The valves may be overridden to the open position by either the Tracer® system or by Everyware™ software. Whenever any override is active, the TUC drives the valves closed unless they are concurrently overridden open.
Autocycle Test	The controller includes an autocycle test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current stage in the test sequence, the valve(s) may be open. Refer to the “Autocycle Test” section on page 71.
Unit Configuration	The TUC cannot control any valve outputs if the unit is configured for no valves. Also, if the valve type is incorrectly configured (on/off, modulating analog, or 3-wire floating point), the valve(s) may not operate properly.
Freeze Avoidance	When freeze avoidance is enabled (active only during stop modes) the TUC controls the valve(s) open whenever the fresh air temperature is less than the freeze avoidance setpoint (configurable). If the freeze avoidance setpoint is zero, this feature is disabled.
Wiring	The wiring between the controller outputs and the valve(s) must be present and correct for normal valve operation. Refer to the typical unit wiring diagrams on pages 105-106.

Table 48. Electric Heat Not Operating

Probable Cause	Explanation
Normal Operation	The controller cycles electric heat on and off to meet the unit capacity requirements.
Unit Disabled	The TUC may be disabled via the shutdown mode on a Tracer® system or if BIP1 is configured as external interlock.
Electric Heat Control: Disable	The electric heat may be disabled with the Tracer® system. To enable the electric heat, the TUC electric heat control must be set to the auto postion.
Maximum heating capacity of zero	The Tracer® may limit the maximum heating/cooling capacity of the TUC from zero to 100%. When the maximum heating capacity is zero, the electric heat is disabled.
Latching Diagnostic Present	A specific list of diagnostics affects electric heat operation. For more information, see the "Diagnostics" section on page 73. Latching diagnostics require a manual reset to restore normal unit operation.
Autocycle Test	The controller includes an autocycle test sequence that verifies analog and binary output operation and associated output wiring. However, based on the current stage in the test sequence, the electric heat may be disabled. Refer to the "Autocycle Test" section on page 71.
Unit Configuration	The TUC cannot control the electric heat output if the unit is configured for no electric heat. Also, if the electric heat type is incorrectly configured (1 or 2 stage), the electric heat may not operate properly.
No Power to the TUC	The TUC requires 24 VAC power for the unit to operate properly.
Wiring	The wiring between the controller outputs and the electric heat must be present and correct for normal electric heat operation. Refer to the typical unit wiring diagrams on pages 105-106.

Table 49. Fresh Air Damper Closed

Probable Cause	Explanation
Normal Operation	• The two-position fresh air damper opens under normal unit operation during occupied mode and closes during unoccupied mode. • Modulating analog and 3-wire floating point economizers open to the minimum position (configurable) when the unit is occupied and modulate to meet unit capacity requirements. • If the minimum damper position is zero, the damper may close for extended periods. During the unoccupied mode, the normal fresh air damper position is closed.
Unit Disabled	•Tracer® may disable via the shutdown mode on a system or if BIP1 is configured as external interlock. • During the stop modes, the fresh air damper remains closed.
Override Present	The fresh air damper may be overridden closed by either the Tracer® system or by Everyware™ software. Whenever any override is active, the TUC drives the fresh air damper closed, unless the damper is concurrently overridden open.
Latching Diagnostic Present	Specific diagnostics affect damper operation. For more information, see the “Diagnostics” section on page 73. Latching diagnostics require a manual reset to restore normal unit operation.
Autocycle Test	The controller includes an autocycle test sequence that verifies analog and binary output operation and associated output wiring. However, the current test sequence stage may require the damper to close. Refer to the “Autocycle Test” section on page 71.
Unit Configuration	The TUC cannot control fresh air damper outputs if the unit is configured for no fresh air damper. Also, if the fresh air damper is incorrectly configured (on/off, modulating analog, or 3-wire floating point), it may not operate properly.
Warm-Up Mode	When the occupied preheat damper position is closed, the unit closes the fresh air damper whenever the zone temperature falls 3° F or more below the active heating setpoint. The fresh air damper remains closed until the zone temperature is within 2° F of the active heating setpoint.
Local Fan Switch: Off	Using the local fan mode switch to determine the fan operation, the off position will control the unit fan off close the fresh air damper.
No Power to the TUC	The TUC requires 24 VAC power for proper operation. Wiring The wiring between the controller outputs and the fresh air damper must be present and correct for normal damper operation. Refer to typical unit wiring diagrams on pages 105-106.
Motion Detection Feature	If motion detection is enabled and no motion is detected in the space (by a motion sensor wired to BIP2), the TUC will apply an alternate fresh air minimum damper position.

Table 50. Fresh Air Damper Open

Probable Cause	Explanation
Normal Operation	• The two-position fresh air damper opens under normal unit opera tion during occupied mode and closes during unoccupied mode. • Modulating analog and 3-wire floating point economizers open to the minimum position (configurable) when the unit is occupied and modulate to meet unit capacity requirements. • If the minimum damper position is zero, the damper may close for extended periods. During the unoccupied mode, the normal fresh air damper position is closed.
Override Present	The fresh air damper may be overridden open by either the Tracer® system or Everyware™ software. Whenever any override is active, the TUC drives the fresh air damper closed, unless the damper is concurrently overridden open.
Autocycle Test	The controller includes an autocycle test sequence that verifies analog and binary output operation and associated output wiring. However, the current test stage sequence may require the fresh air damper may be open. Refer to the “Autocycle Test” section on page 71.
Unit Configuration	The TUC cannot control fresh air damper outputs if the unit is configured for no fresh air damper. Also, if the fresh air damper type is incorrectly configured (on/off, modulating analog, or 3-wire floating point), it may not operate properly.
Wiring	The wiring between the controller outputs and the fresh air damper must be present and correct for normal damper operation. Refer to the typical unit wiring diagrams on pages 105-106.

Table 51. Zone Temperature Too Warm

Probable Cause	Explanation
Active heating/cooling setpoints	Verify that the active heating/cooling setpoints are reasonable. It is possible for either the zone sensor or for the Tracer® system to send heating and cooling setpoints to the TUC. Use the Tracer® system or Everyware™ software to determine which source is sending the setpoint.
Wiring	Verify the wiring of all end devices, such as valves and dampers. Use the manual overrides or the autocycle test to verify the end device operation.
Manual heat mode sent by Tracer®	If the Tracer® system places the TUC in manual heat mode, the TUC cannot switch to cool mode and therefore cannot provide cooling to the zone.
Zone sensor location	Locate the zone sensor in an area where the temperature is representative of the average zone temperature.

Table 52. Zone Temperature Too Cool

Probable Cause	Explanation
Active Heating/Cooling Setpoints	Verify that the active heating/cooling setpoints are reasonable. It is possible for either the zone sensor or for the Tracer® system to send heating and cooling setpoints to the TUC. Use the Tracer® system or Everyware™ software to determine which source is sending the setpoint.
Wiring	Verify the wiring of all end devices, such as valves and dampers. Use the manual overrides or the autocycle test to verify the operation of these end devices.
Manual Cool Mode Sent by Tracer®	If the Tracer® system places the TUC in manual cool mode, the TUC cannot switch to heat mode and therefore cannot provide heating to the zone.
Location of the Zone Sensor	Locate the zone sensor in an area where the temperature is representative of the average zone temperature.

Maintenance

Periodic Maintenance Checklist

Listed below are the recommended maintenance schedules. Instructions for specific maintenance procedures are given in the sections following the checklist.

WARNING: Allow rotating fan to stop before servicing equipment. Failure to do so may cause severe personal injury or death.

Monthly
1. Inspect the unit air filters. Clean or replace dirty filters.

Note: *Building conditions may require filter change more or less frequently.*

2. Check the main and auxiliary drain pans on fan-coil units to be sure the pans are clean and do not impede the condensate flow through the drain line.

Yearly
1. Inspect the unit cabinetry for chips or corrosion. Clean or repair to provide unit protection.

2. Inspect the fan wheel and housing for damage. Rotate the fan wheel manually to be sure movement is not blocked by obstructions.

3. Inspect the coil fins for excessive dirt or damage. Remove dirt and straighten fins.

4. Clean and tighten all electrical connections.

5. Inspect the strainer option for debris trapped in the filter screen.

Maintenance Procedures

Filters

Change or clean air filters at least twice a year. Filters require more frequent care under high load or dirty air conditions since a clogged filter reduces airflow. Table 37 on page 89 lists filter sizes for units. Throwaway and pleated media filters are available for all units. Follow the instructions below to replace the disposable filters.

1. All models except vertical cabinets
Remove the front panel of the vertical recessed unit and open the bottom panel door of the horizontal cabinet and horizontal recessed unit to access the filter. The front panel of the vertical cabinet unit does not require removal to change the filter.

Note: *Vertical recessed, horizontal cabinet, & horizontal recessed units with a bottom return have filter guides to secure the filter in position. Also, if these unit types have a fresh air opening, they require an additional filter for the fresh air opening.*

2. Pull the two plunger spring pins inward on the filter access door and rotate door downward.

3. Remove the dirty filter(s) and replace or clean.

CAUTION: All unit panels and filters must be in place prior to unit start-up. Failure to have panels and filters in place may cause motor overload.

4. Replace the front/bottom panel of the unit for cabinet and recessed units.

Table 53. Filter Sizes, in. (cm)

Unit size	Main Filter	Fresh Air Filter (models D, E, H with bottom return & OA only)
02	1 x 8.875 x 19.125 (2.54 x 23 x 49)	1 x 5.5 x 19.13 (2.54 x 13.97 x 48.59)
03	1 x 8.875 x 19.125 (2.54 x 23 x 49)	1 x 5.5 x 19.13 (2.54 x 13.97 x 48.59)
Low Vertical	1 x 8.875 x 24.125 (2.54 x 23 x 61)	
04	1 x 8.875 x 24.125 (2.54 x 23 x 61)	1 x 5.5 x 24.13 (2.54 x 13.97 x 61.29)
Low Vertical	1 x 8.875 x 33.625 (2.54 x 23 x 85)	
06	1 x 8.875 x 33.625 (2.54 x 23 x 85)	1 x 5.5 x 33.63 (2.54 x 13.97 x 85.42)
Low Vertical	1 x 8.875 x 42.125 (2.54 x 23 x 107)	
08	1 x 8.875 x 42.125 (2.54 x 23 x 107)	1 x 5.5 x 42.13 (2.54 x 13.97 x 107.0)
10	1 x 8.875 x 61.125 (2.54 x 23 x 155)	1 x 5.5 x 61.38 (2.54 x 13.97 x 155.91)
12	1 x 8.875 x 61.125 (2.54 x 23 x 155)	1 x 5.5 x 61.38 (2.54 x 13.97 x 155.91)

Inspecting and Cleaning Drain Pans

Clean the fan-coil unit's main and auxiliary drain pans to ensure the unit drains condensate properly.

Check the condensate drain pan and drain line to assure the condensate drains properly at least every six months or as dictated by operating experience.

If evidence of standing water or condensate overflow exists, immediately identify and remedy the cause. Refer to Table 40 on page 99 for possible causes and solutions. If the drain pan contains microbial growth, clean and remove it immediately.

Clean drain pans using the following procedure:

1. Disconnect all electrical power to the unit.

2. Don the appropriate personal protective equipment (PPE).

3. Remove all standing water.

4. Use a scraper or other tool to loosen any solid matter. Remove solid matter with a vacuum device that utilizes high efficiency particulate arrestance (HEPA) filters with a minimum efficiency of 99.97% at 0.3 micron particle size.

5. Thoroughly clean the contaminated area(s) with a mild bleach and water solution or an EPA-approved sanitizer specifically designed for HVAC use. Carefully follow the sanitizer manufacturer's instructions regarding the use of the product.

6. Immediately rinse the drain pan thoroughly with fresh water to prevent potential corrosion from the cleaning solution of the drain pan and drain line components.

7. Allow the unit to dry thoroughly before putting the system back into service.

8. Determine and correct the cause of the microbial contamination.

9. Be careful that the contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Note: *Standing water in drain pans can promote microbial growth (mold) which may cause unpleasant odors and health-related indoor air quality problems.* ***If microbial growth (mold) is found, remove it immediately by cleaning and santizing the unit properly.***

Auxiliary Drain Pan

1. To remove the auxiliary drain pan, loosen the hose clamp (installer supplied) around the drain connection collar and disconnect the drain line.

2. Remove the overflow drain line to the auxiliary drain pan if it was installed.

3. Remove the condensate overflow switch option from the auxiliary drain pan.

4. Slide the pan horizontally towards the end of the large groove of the mounting slots in the chassis end panel and remove pan from unit. See Figure 31.

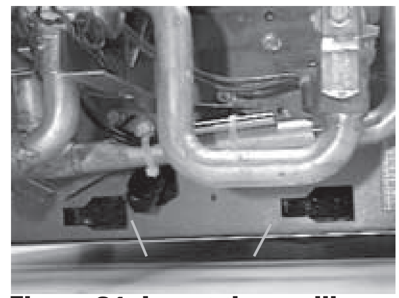


Figure 31. Insert the auxiliary drain pan tabs into these slots in the fan-coil's chassis end panel. A horizontal unit is pictured.

CAUTION: Exercise extreme care when removing auxiliary drain pan. Failure to do so may cause plastic mounting tabs to break.

Main Drain Pan

Note: *When replacing the main drain pan, install it correctly under the z-bar as pictured in Figure 32.*

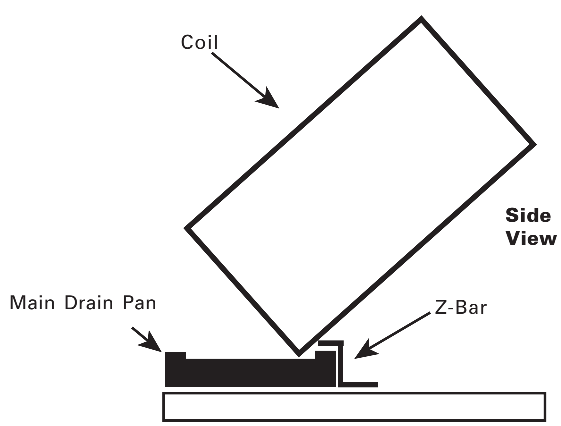


Figure 32. When replacing the fan-coil's main drain pan, install it correctly under the z-bar.

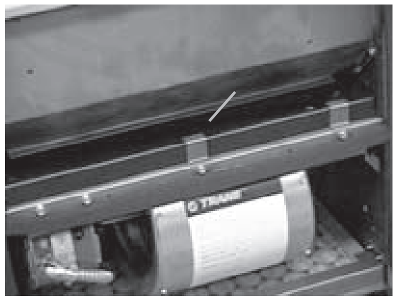


Figure 33. To remove the main drain pan on vertical fan-coil units, disconnect the clips holding the pan to the fanboard.

Vertical units:
To remove the main drain pan on vertical fan-coil units, disconnect the clips holding the pan to the fanboard. Disconnect the main and overflow drain hoses and slide pan forward to remove. See Figure 33.

Horizontal units:
To remove the main drain pan on a horizontal fan-coil unit, peel the insulation from the edges of the pan's underside to access the mounting screws. Remove the screws and lower the end of the drain pan closest to the control box. Remove the drain spout by pulling it from the hole in the chassis end panel. See Figure 34.

Figure 34. To remove the main drain pan on horizontal fan-coil units, peel the insulation from the edges of the pan's underside to access the mounting screws.

Note: *Do not operate the fan-coil unit without the main and auxiliary drain pans in place to prevent condensate leakage.*

Winterizing the Coil

Make provisions to ensure adequate protection against coil freeze-up. If the fan-coil units are not in operation, the coil/s should be vented at the factory vent/s and drained at the piping system drain port/s. See Table 38 on page 94 for approximate piping package volumes for piping systems using ethylene glycol. Table 39 on page 94 lists approximate hydronic coil volumes.

It is necessary to properly prepare the units for cold weather. If a coil is not in use and is subject to temperatures below 32° F, drain the coil to prevent coil freezeup. Locate the drain (installer supplied) in the field piping system.

Inspecting and Cleaning Coils

Coils become externally fouled as a result of normal operation. Dirt on the coil surface reduces it's heat transfer ability that can result in comfort problems, increased airflow resistance, and thus increased operating energy costs. If the coil surface dirt becomes wet, which commonly occurs with cooling coils, microbial growth (mold) may result and potentially cause unpleasant odors and health-related indoor air quality problems.

Inspect coils at least every six months or more frequently as dictated by operating experience. Required cleaning frequency depends on the system operating hours, filter maintenance and efficiency, and dirt load. The Trane Company recommends the following method of cleaning coils:

Steam and Water Coils

1. Disconnect all electrical power to the unit.

2. Don the appropriate personal protective equipment (PPE).

3. Gain access to the both sides of the unit coil section.

4. Use a soft brush to remove loose debris from both sides of the coil.

5. Use a steam cleaning machine, starting from the top of the coil and working downward. Clean the leaving air side of the coil first, then the entering air side. Use a block-off to prevent steam from blowing through the coil and into a dry section of the unit.

6. Repeat step 5 as necessary. Confirm that the drain line is open following completion of the cleaning process.

7. Allow the unit to dry thoroughly before putting the system back into service.

8. Straighten any coil fins that may have been damaged during the cleaning process with a fin rake.

9. Replace all panels and parts and restore electrical power to the unit.

10. Use caution to assure that any contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Table 54. Factory Piping Package Volumes, oz. (mL)

Piping Package	Volume
Main coil	6 (178)
Auxiliary coil	12 (355)

Table 55. Hydronic Coil Volumes/Heating & Cooling, gal.

Unit Size	Total # Rows	Volume
02	1	.05
	2	.10
	3	.14
	4	.20
03	1	.06
	2	.12
	3	.18
	4	.24
04	1	.08
	2	.15
	3	.23
	4	.30
06	1	.11
	2	.22
	3	.33
	4	.44
08	1	.14
	2	.28
	3	.42
	4	.56
10	1	.18
	2	.35
	3	.53
	4	.71
12	1	.21
	2	.42
	3	.62
	4	.83

Note: *1-row coil refers only to the 1-row heating coil in some 4-pipe configurations.*

Inspecting and Cleaning the Internal Insulation on Fan-Coils

The process of cooling and dehumidification produces condensate (water) which must be continuously removed from the air handling unit. The entering air side of the cooling coil to the leaving edge of the drain pan is considered to be the “wet” section of the unit. Other potentially “wet” sections are immediately downstream of a humidifier and/or an fresh air intake section.

It is common for the “wet” section components, including the internal insulation, to become wet during normal operation. Therefore, inspect the internal insulation in these areas periodically to assure it is clean and free of dirt or microbial growth (mold). Inspect units every six months or more frequently if operating experience dictates. Accumulated dirt and other organic matter exposed to water or extended periods of high relative humidity (60% or higher) may support microbial growth. Clean the insulation to prevent the unit from becoming an IAQ contaminant source.

Also, inspect internal insulation in the “dry” areas of the unit periodically to ensure the insulation is clean and dry. Wet insulation in an area that is normally considered to be “dry” may indicate an operational problem. Refer to Table 40 on page 99 for further information. Inspect the equipment a minimum of every six months or more frequently if operating experience dictates. When accumulated dirt and other organic matter is exposed to water or extended periods of high relative humidity (60% or higher) may support microbial growth, an indoor air quality contaminant source.

If evidence of contamination exists in either the wet or dry sections, take immediate action to determine and eliminate the cause. Remove the contamination and sanitize the affected area. See Tabale 40 on page 99 for assistance in identifying the cause. Remove and clean any microbial growth on a non-porous insulating surface (e.g. closed-cell insulation or sheet metal surface).

The Trane Company recommends the following procedure for proper cleaning the fan-coil internal insulation and sheet metal:

1. Disconnect all electrical power to the unit.

2. Don the appropriate personal protective equipment (PPE).

3. Thoroughly clean the contaminated area(s) with an EPA-approved sanitizer specifically designed for HVAC use. Use a brush for sheet metal surfaces or a soft sponge on closed-cell foam surface to mechanically remove the microbial growth. Be careful not to damage the non-porous surface of the insulation. Carefully follow the sanitizer manufacturers instructions regarding personal protection and ventilation.

4. Rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of the drain pan and drain line.

5. Ensure the drain line remains open following the cleaning process.

6. Replace all panels and parts and restore electrical power to the unit.

7. Allow the unit to dry completely before putting it back into service.

8. Do not allow any contaminated material to contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

Inspecting and Cleaning the Fan

Inspect the fan at least every six months or more frequently if operating experience dictates. Clean accumulated dirt and organic matter on the interior fan surface immediately.

The Trane Company recommends the following procedure for cleaning fan surfaces:

1. Disconnect all electrical power to the unit.

2. Don the appropriate personal protective equipment (PPE).

3. Use a portable vacuum with HEPA filtration to remove loose dirt and organic matter. The filter should be 99.97% efficient at 0.3 micron particle size.

4. If no microbial growth (mold) exists, thoroughly clean the fan and associated components with an industrial cleaning solution. Carefully follow the cleaning solution manufacturer's instructions regarding personal protection and ventilation when using their product.

5. If microbial growth (mold) is present, remove the contamination (Step 2) and thoroughly clean the affected area with an EPA-approved sanitizer specifically designed for HVAC use. Carefully follow the sanitizer manufacturer's instructions regarding the use of the product.

6. Rinse the affected surfaces thoroughly with fresh water and a fresh sponge to prevent potential corrosion of metal surfaces.

7. Allow the unit to dry completely before putting it back into service.

8. Do not allow any contaminated material to contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solution.

If microbial growth (mold) is present, determine the cause of the contamination and take action to prevent reoccurance.

Fan Board Assembly Removal

Follow the procedure below when replacing the coil or making repairs to the fan or motor.

WARNING: Allow rotating fan to stop before servicing equipment. Failure to do so may cause severe personal injury or death.

Vertical Units

1. Remove the front panel of cabinet and recessed units.

2. Pull the main and overflow drain hoses of the main drain pan into the inside of the fan-coil chassis end panel.

3. Remove the two fanboard mounting screws shown in Figure 35.

4. Slide the fanboard out horizontally to remove.

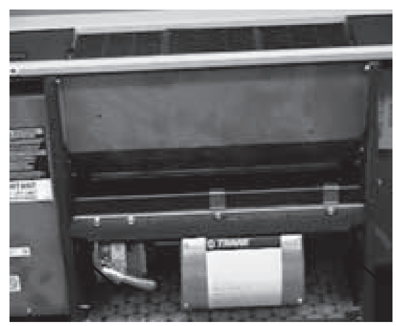


Figure 35. Remove the two mounting screws located under the fanboard to slide it out.

Horizontal Units

1. Open the bottom panel of cabinet and recessed models.

2. Remove the main drain pan following the instructions given under the drain pan section above for horizontal fan-coil units.

3. While supporting the fanboard in place, remove the two fanboard mounting screws which secure the fanboard to the unit.

CAUTION: Support the fanboard when removing it from the unit. Failure to do so may cause personal injury.

Replacing the Motor

The capacitor for all unit motors can be replaced should it fail. Contact the local Trane service department to replace the motor capacitor in the event it fails. However, the motor itself cannot be repaired or rewound. If the motor fails, record the model number from the unit nameplate and present to the local Trane Service Parts Center to purchase a replacement. The motor bearings are permanently lubricated and do not require any further oiling.

After removing the fanboard assembly from the unit, disconnect the fan wheel/wheels from the motor shaft by loosening the Allen head setscrew on the fan wheel hub collar. Next, remove the mounting bolts holding the fan motor plate to the mounting bracket of the fanboard. Then remove the motor by sliding the fan shaft from the fan wheel hub.

During re-assembly, make certain the fan wheel(s) is/are properly centered in the fan housing to prevent the fan wheel from contacting the housing on either side. After the unit has been re-assembled, verify that no unusual noise or vibration is present at startup.

Control Device Replacement

To order control components such as relays, contactors, transformers, low temperature detection devices, condensate overflow detection devices, differential pressure switches, sensors, control valves and actuators, contact the local Trane Service Parts Center. To order, the Trane parts center will need the unit model number (which can be found on the unit nameplate), the serial number, and the part name or ID.

Table 56. Trouble Shooting

Problem	Possible Cause	Remedy
Drain pan is overflowing	Plugged drain line	Clean drain line
	Unit not level	Level unit
Standing water in drain pan	Unit not level	Level unit
	Plugged drain line	Clean drain line
Wet interior insulation	Coil face velocity too high	Reduce fan speed
	Drain pan leaks/overflowing	Repair leaks
	Condensation on surfaces	Insulate surfaces
Excess dirt in unit	Missing filters	Replace filters
	Filter bypass	Reduce filter bypass
Microbial growth (mold)	Moisture problems	See "External Insulating Requirements" section on page 20.
	Standing water in drain pan	See "Inspecting and cleaning the drain pan" section on page 90.

Appendix

Factory Piping Packages

<table>
<tr><th>Digits 27,28</th><th colspan="3">Digit 29</th></tr>
<tr><th>Main/Aux.
Control Valve
BASIC</th><th>Basic (A)</th><th>Circuit Setter (B)</th><th>Automatic Circuit Setter (C)</th></tr>
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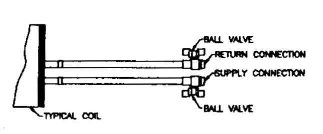
<td>
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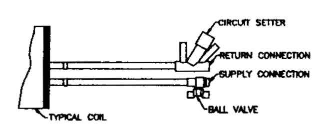
<td>
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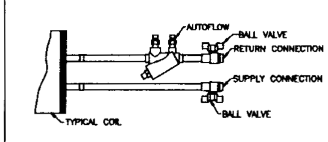
<td>
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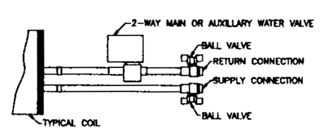
<tr><td>2-Way
A, C, E, G, J, L, N, Q</td>
<td>
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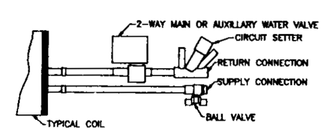
<td>
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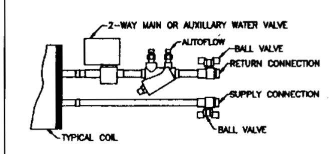
<td>
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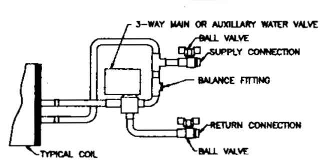
B, D, F, H, K, M, P, R</td>
<td>
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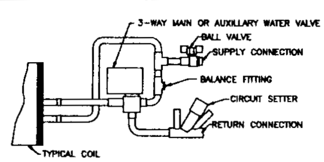
<td>
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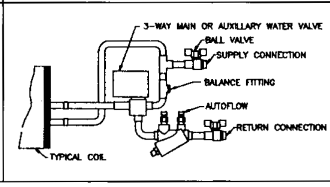
<td>
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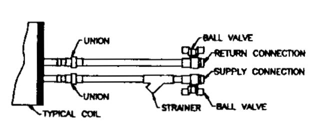
<td>
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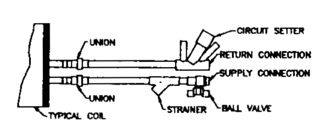
<td>
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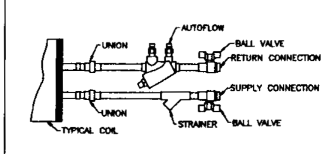
<td>
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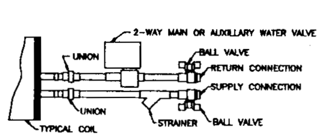
<td>
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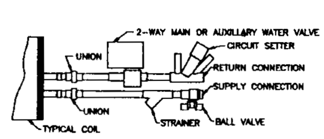
<td>
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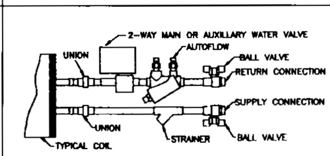
<td>
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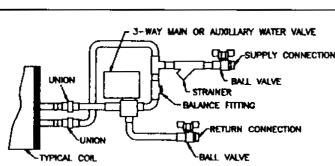
<td>
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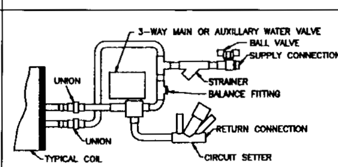
<td>
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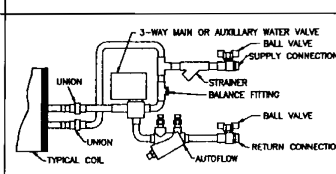
<td>
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Fan Mode Switch Typical Wiring Diagram

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This schematic shows typical wiring of a fan-coil. It is not intended for a basis of design or for equipment installation purposes in the field. For an as-built schematic specific to a particular unit, please see the ship-with schematic for that specific unit.

Two-pipe unit without control valve
Fan mode switch option "K"
Wall mounted mode switch — off/high/med/low
Disconnect switch
Automatic two-position fresh air damper

DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	CONTROL PANEL
2	CONTROL END
3	PIPING END
4	FAN SECTION
5	COIL SECTION
6	CUSTOMER

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1K1-3	FAN STARTERS	25-26-27
1T1	TRANSFORMER	20
2L2	DAMPER ACTUATOR	28
1TB6	TERMINAL STRIP	
1TB3	TERMINAL STRIP	
4B1	FAN MOTOR	9
6S13	FAN SWITCH	25

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FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

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.

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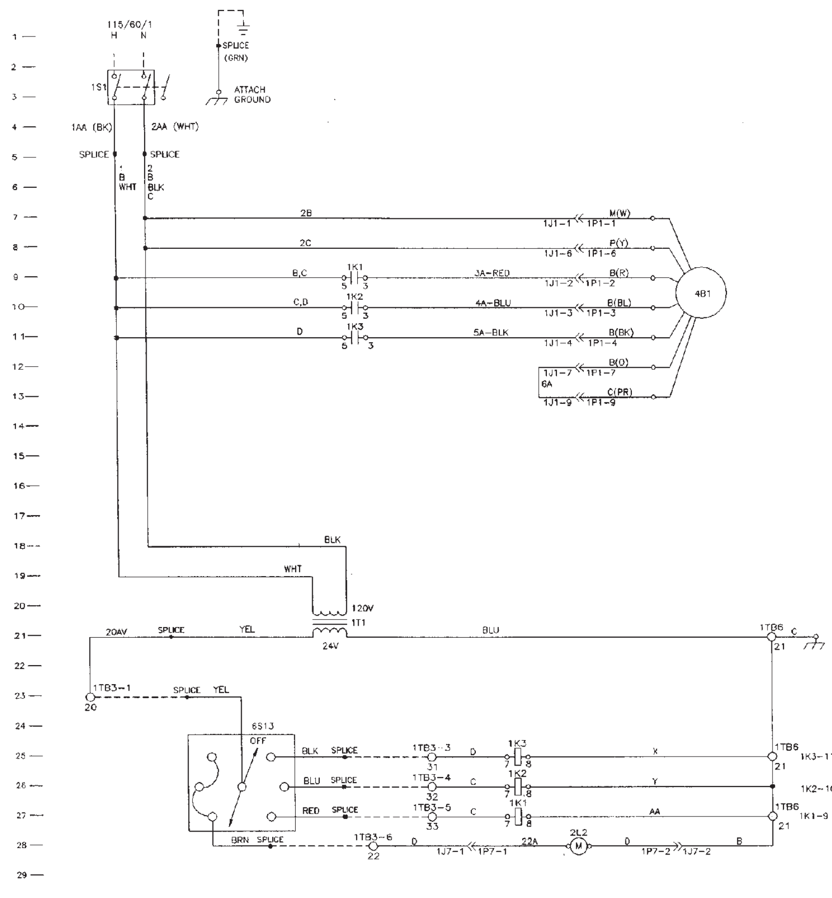
3 NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.

4. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (NEC), STATE AND LOCAL REQUIREMENTS.

5. ALL FAN SWITCH FIELD WIRING MAY BE CLASS 2.



For reference only:
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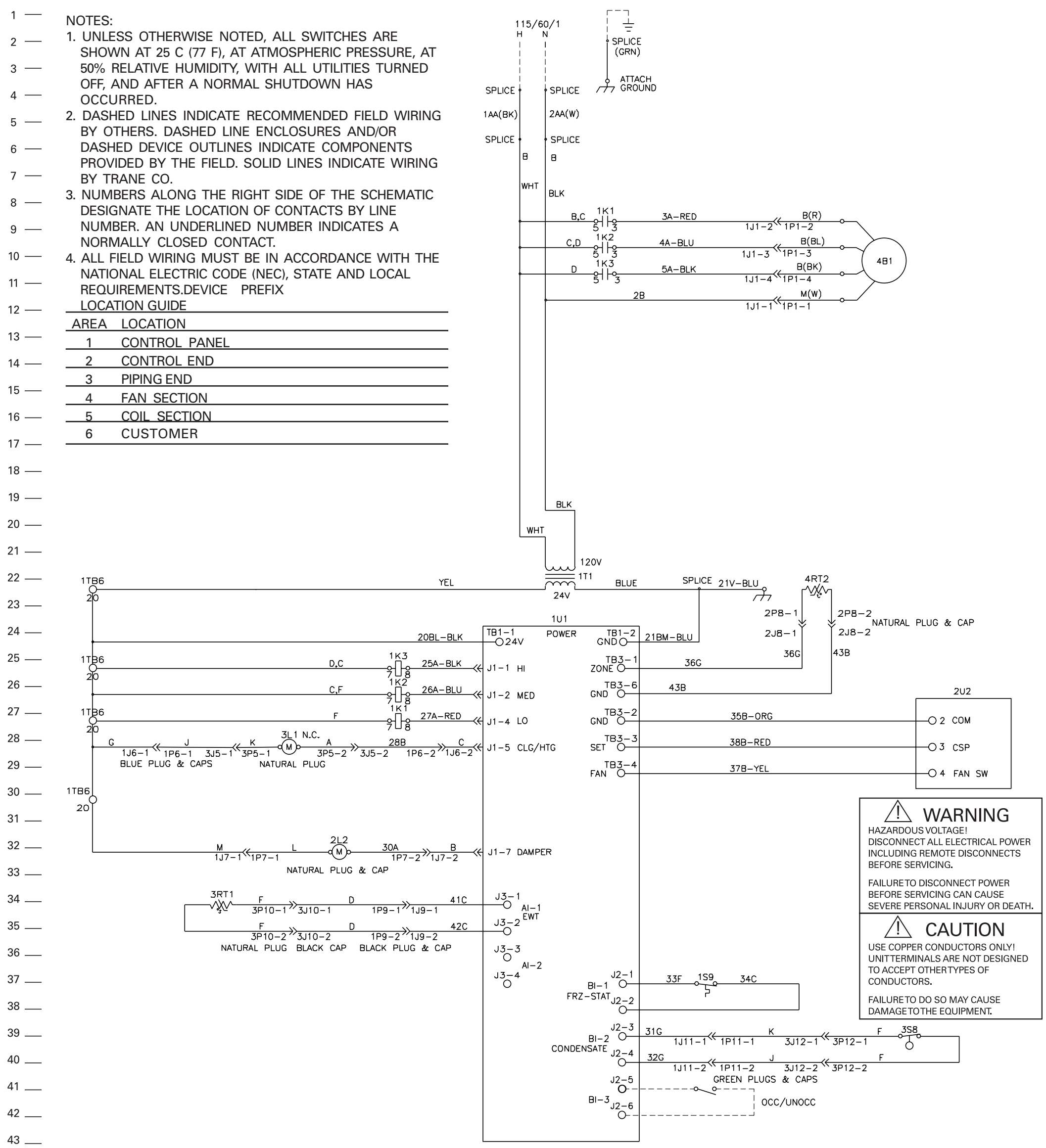
Tracer® ZN.010 Typical Wiring Diagram



For Reference Only:
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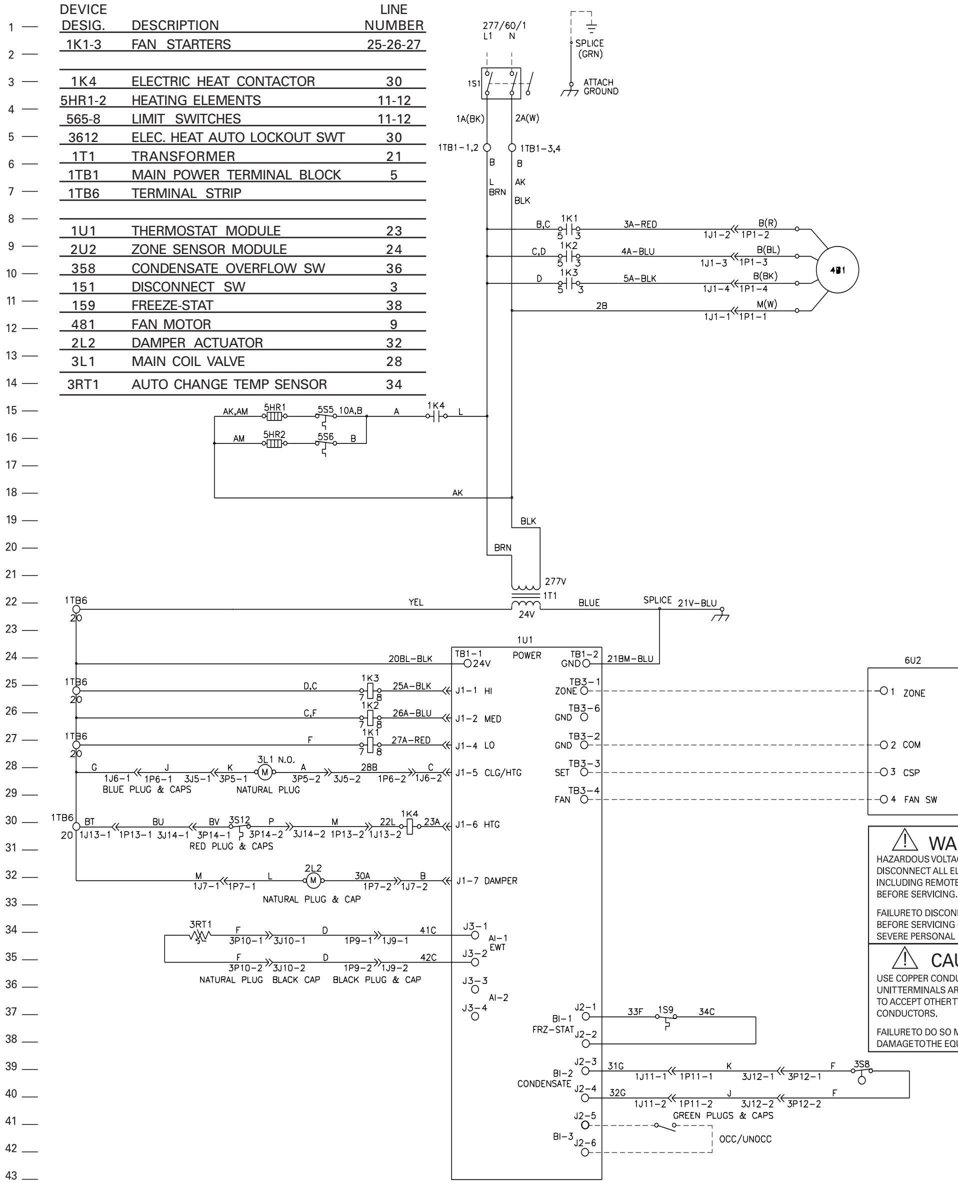
Two-pipe autochangeover
Two-position N/C control valve
Two-position N/C fresh air damper actuator
EWT sensor
Condensate overflow detection
Low temperature detection
Unit mounted fan mode switch and setpoint dial
Return air temperature sensor

Tracer® ZN.010 Typical Wiring Diagram

LEGEND		
DEVICE DESIG.	DESCRIPTION	LINE NUMBER
1K1-3	FAN STARTERS	25-26-27
1K4	ELECTRIC HEAT CONTACTOR	30
5HR1-2	HEATING ELEMENTS	11-12
565-8	LIMIT SWITCHES	11-12
3612	ELEC. HEAT AUTO LOCKOUT SWT	30
1T1	TRANSFORMER	21
1TB1	MAIN POWER TERMINAL BLOCK	5
1TB6	TERMINAL STRIP	
1U1	THERMOSTAT MODULE	23
2U2	ZONE SENSOR MODULE	24
358	CONDENSATE OVERFLOW SW	36
151	DISCONNECT SW	3
159	FREEZE-STAT	38
481	FAN MOTOR	9
2L2	DAMPER ACTUATOR	32
3L1	MAIN COIL VALVE	28
3RT1	AUTO CHANGE TEMP SENSOR	34



DEVICE PREFIX LOCATION GUIDE	
AREA	LOCATION
1	CONTROL PANEL
2	CONTROL END
3	PIPING END
4	FAN SECTION
5	COIL SECTION
6	CUSTOMER

NOTES:
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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. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
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Two-pipe autochangeover with electric heat
Two-position N/O control valve
Electric heat contactor
Two-position N/C fresh air damper actuator
EWT sensor
Electric heat limit switch(es)
Condensate overflow detection
Low temperature detection
Wall mounted fan mode switch, setpoint dial, zone temperature sensor, and unit mounted disconnect switch

![TRANE logo]

Tracer® ZN.010 Typical Wiring Diagram

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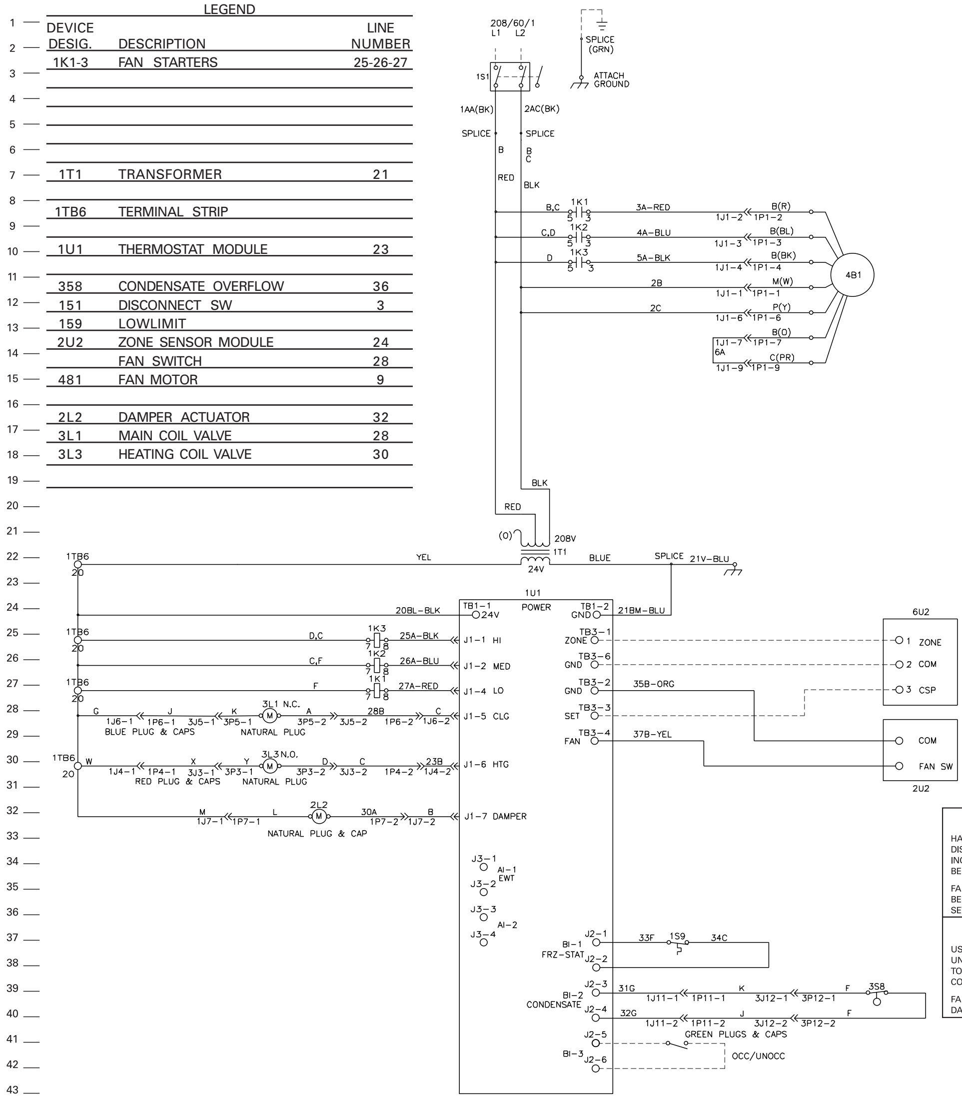
LEGEND

DEVICE DESIG.	DESCRIPTION	LINE NUMBER
1K1-3	FAN STARTERS	25-26-27
1T1	TRANSFORMER	21
1TB6	TERMINAL STRIP	
1U1	THERMOSTAT MODULE	23
358	CONDENSATE OVERFLOW	36
151	DISCONNECT SW	3
159	LOWLIMIT	
2U2	ZONE SENSOR MODULE	24
	FAN SWITCH	28
481	FAN MOTOR	9
2L2	DAMPER ACTUATOR	32
3L1	MAIN COIL VALVE	28
3L3	HEATING COIL VALVE	30



DEVICE PREFIX LOCATION GUIDE

AREA	LOCATION
1	CONTROL PANEL
2	CONTROL END
3	PIPING END
4	FAN SECTION
5	COIL SECTION
6	CUSTOMER

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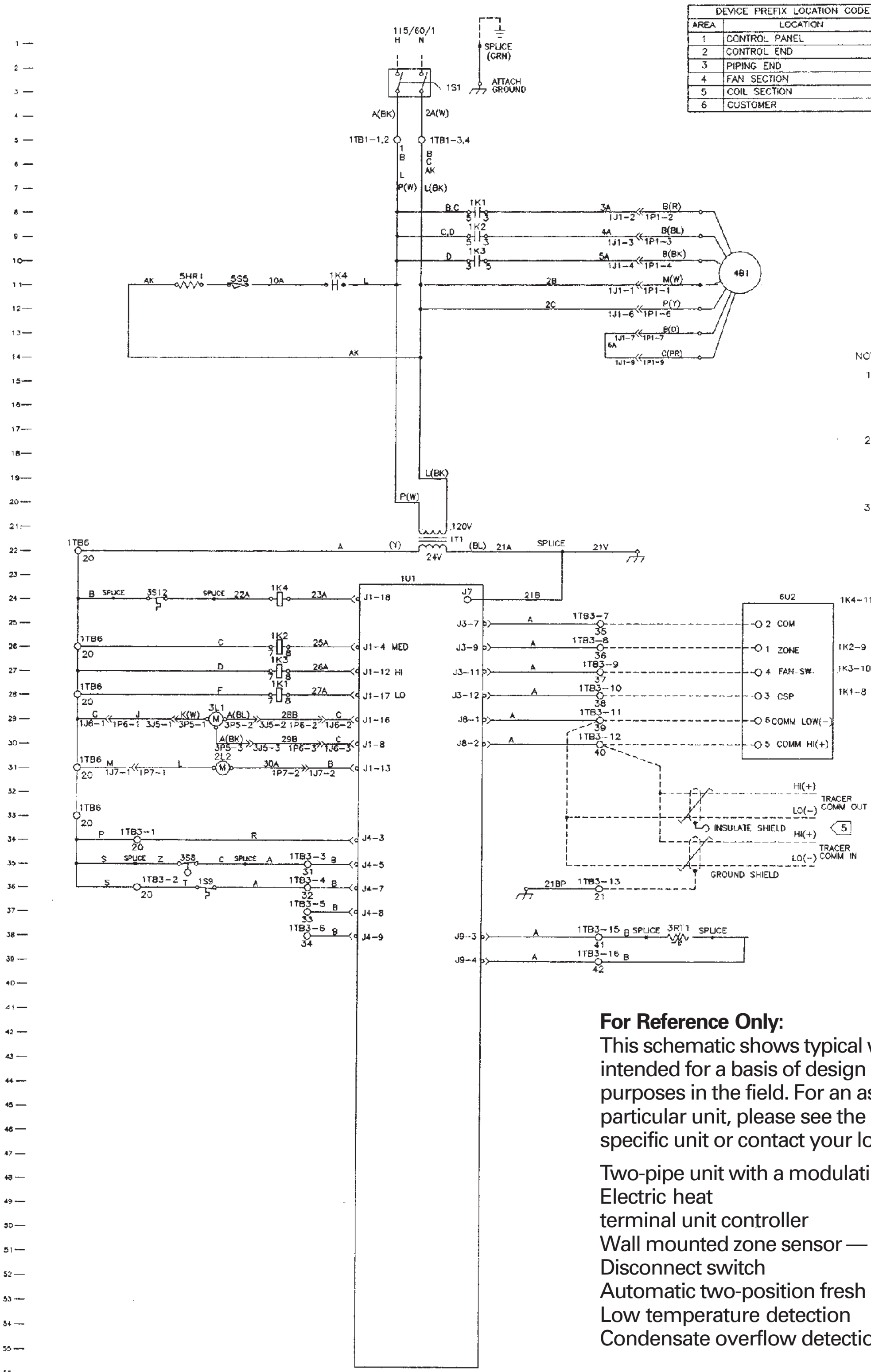
Four-pipe
Two-position N/C cooling control valve
Two-position N/O heating control valve
Two-position N/C fresh air damper actuator
Condensate overflow detection
Low temperature detection
Unit mounted fan mode switch,
Wall mounted setpoint dial and zone temperature sensor
Unit mounted disconnect switch

TUC Typical Wiring Diagram



DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	CONTROL PANEL
2	CONTROL END
3	PIPING END
4	FAN SECTION
5	COIL SECTION
6	CUSTOMER

LEGEND

DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1K1-3	FAN STARTERS	26-27-28
1K4	ELECTRIC HEAT CONTACTOR	24
5HR1	HEATING ELEMENT	11
5S5	LIMIT SWITCH	11
3S12	ELEC HEAT AUTO LOCKOUT SWT	24
1T1	TRANSFORMER	21
1TB1	MAIN POWER TERMINAL BLOCK	5
1TB6	TERMINAL STRIP	
1TB3	TERMINAL STRIP	
1U1	MAIN BOARD	23
6U2	ZONE SENSOR MODULE	24
3S8	CONDENSATE OVERFLOW SW	35
1S1	DISCONNECT SW	3
1S9	FREEZE-STAT	36
4B1	FAN MOTOR	10
2L2	DAMPER ACTUATOR	31
3L1	MAIN COIL VALVE (MOD)	29
3RT1	AUTO CHANGE TEMP SENSOR	37

NOTES:

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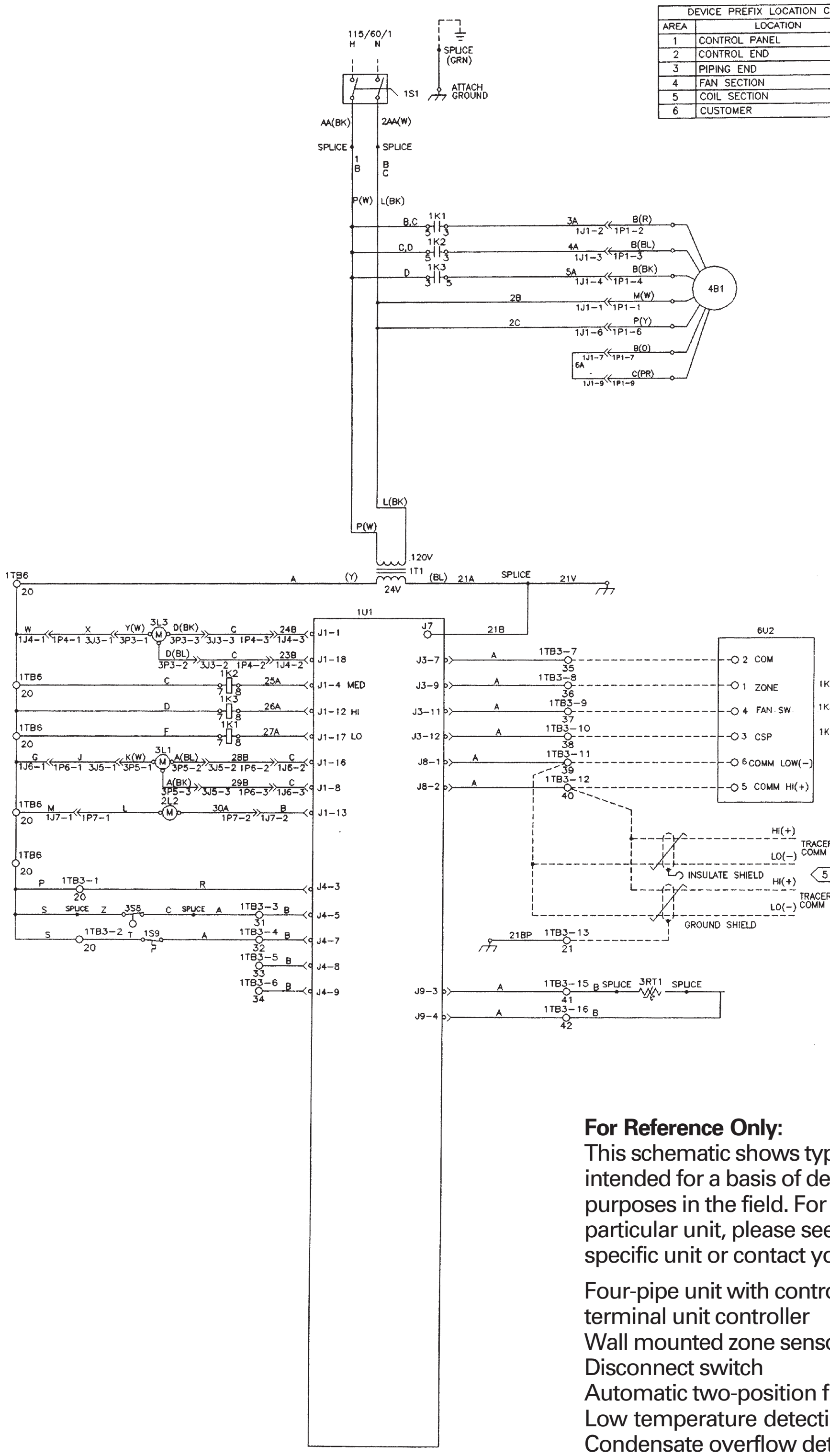
Two-pipe unit with a modulating valve
Electric heat
terminal unit controller
Wall mounted zone sensor — off/auto/high/med/low
Disconnect switch
Automatic two-position fresh air damper
Low temperature detection
Condensate overflow detection

TRANE

TUC Typical Wiring Diagram



DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
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3	PIPING END
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5	COIL SECTION
6	CUSTOMER

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1K1-3	FAN STARTERS	26-27-28
1T1	TRANSFORMER	21
1TB6	TERMINAL STRIP	
1TB3	TERMINAL STRIP	
1U1	MAIN BOARD	23
6U2	ZONE SENSOR MODULE	24
3S8	CONDENSATE OVERFLOW SW	35
1S1	DISCONNECT SW	3
1S9	FREEZE-STAT	36
4B1	FAN MOTOR	10
2L2	DAMPER ACTUATOR	31
3L1	MAIN COIL VALVE (MOD)	29
3L3	HEATING COIL VALVE (MOD)	24
3RT1	AUTO CHANGE TEMP SENSOR	37

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Four-pipe unit with control valves (both modulating)
terminal unit controller
Wall mounted zone sensor — off/auto/high/med/low
Disconnect switch
Automatic two-position fresh air damper
Low temperature detection
Condensate overflow detection

The Trane Company
Worldwide Applied Systems Group
3600 Pammel Creek Rd.
LaCrosse, WI 54601-7599
www.trane.com
An American Standard Company

Literature Order Number	UNT-IOM-6
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