TRANE®

Installation, Operation, and Maintenance

Blower Coil Air Handler

Air Terminal Devices
400 to 3000 cfm

Models BCHC and BCVC
"AO" and later design sequence

September 2002

BCXC-SVX01A-EN

General Information

About This Manual

Literature Change History

Use this manual for commercial blower coil models BCHC and BCVC. This is the first version of this manual. This manual supercedes BCXB-SVX01B-EN, which was for the previous models BCHB and BCVB. It provides specific installation, operation, and maintenance instructions for "AO" and later design sequences. Models BCHC/BCVC include the following design changes that differ from the BCHB/BCVB:

- standard and high-capacity hydronic cooling & heating coils
- DX coils
- steam preheat coil
- stainless steel drain pan option
- bottom/top filter access box
- $^1/_2$", 1", or 1 $^1/_4$" piping packages

For previous design sequence information, contact your local Trane representative.

Warnings and Cautions

Warnings and cautions appear at appropriate sections throughout this manual. Read these carefully.

⚠ WARNING

Indicates a potentially hazardous situation, which can result in death or serious injury if not avoided.

⚠ CAUTION

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

CAUTION

Indicates a situation that may result in equipment or property-damage-only accidents.

Sample Warnings and Cautions

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

CAUTION

Use copper conductors only!
Unit terminals are not designed to accept other conductor types. Failure to use copper conductors may cause equipment damage.

Special Note on Refrigeration Emissions

World environmental scientists have concluded that ozone in our upper atmosphere is being reduced due to the release of CFC fully halogenated compounds.Trane urges all HVAC service personnel to make every effort to prevent any refrigerant emissions while installing, operating, or servicing equipment. Always conserve refrigerants for continued use and follow all warnings and cautions in this manual.

Common HVAC Acronyms

For convenience, a number of acronyms and abbreviations are used throughout this manual. These acronyms are alphabetically listed and defined below.

BAS = Building automation systems
cfm = Cubic-feet-per-minute
ewt = entering water temperature
F/A = Fresh air
HVAC = Heating, ventilation and air conditioning
I/O = Inputs/outputs
IOM= Installation, operation, and maintenace manual
LH = Left-hand
O/A = Outside air
R/A = Return air
RH = Right-hand
rpm = Revolutions-per-minute
S/A = Supply air
w.c. = Water column
ZSM = Zone sensor module

Contents

Cross reference to related publications/information for blower coil units with Tracer ZN controls:

- *Installation, Operation, and Programming Guide for Tracer ZN010 and ZN510 Unit Controllers, CNT-IOP-1*
- *Installation, Operation, and Programming Guide for Tracer ZN520 Unit Controller, CNT-SVX04A-EN*
- *Blower Coil Air Handler Catalog, UNT-PRC003-EN*

Blower Coil General Information

Blower coil units are draw-thru air handlers for cooling load conditions of 400-3000 cfm. Units are available in either horizontal (model BCHC) or vertical (model BCVC) configurations. Horizontal units are typically ceiling suspended via threaded rods. Knockouts are provided in all four corners to pass the rods through the unit. Horizontal units can also be floor mounted. Vertical units are typically floor mounted. They have a side inlet for easy duct connection, and do not require a field fabricated inlet plenum. Vertical units ship in two pieces and can be set up in either a pre-swirl or counter-swirl configuration.

Basic unit components consist of a water coil, condensate drain pan, filter, duct collars, one fan wheel, and motor with drive. See Figure GD-1. Drive components consist of sheaves, belt, and motor. The coil, drain pan, and motor/drive assembly can easily be field-converted from right hand to left hand configurations or vice versa.

Two, four, or six-row main coils are available for either hydronic cooling or heating. Four or six-row direct expansion (DX) coils are also available for cooling. An optional one, two, four, or six-row heating coil is available factory-installed in either the preheat or reheat position. Also, a one-row preheat steam is available.

All units have an internal flat filter frame for one or two-inch filters. An optional angle filter box (two inch only), mixing box, bottom/top filter access box, or combination angle filter mixing box is available.

In addition, all units are available with either a basic or deluxe piping package option that includes a variety of control valve sizes in two or three-way configurations. The basic package consists of a control valve and stop (ball) valves. The deluxe package consists of a control valve, a stop (ball) valve, a circuit setter, and strainer.

Belt-drive motors range from $^1/_3$ to 3 horsepower in a wide range of voltages.

All motors have internal thermal and current overloads, permanently sealed ball bearings, and a resilient cradle mount to reduce noise and vibration transmission.

Variable pitch sheave drive kit options help make it possible to more accurately select design static pressure. For additional flexibility, 115 volt single phase, two speed motors are optional.

Note: Sheaves are factory set in the middle of the range.Field adjustment of sheaves, motor, and belt are required to arrive at desired rpm. Refer to the original sales order and Table GD-1 for drive information.

Units may have no controls (4 x 4 junction box) or any of four different control types:
1. control interface
2. Tracer ZN010
3. Tracer ZN510
4. Tracer ZN520

All control options are factoryinstalled and tested.

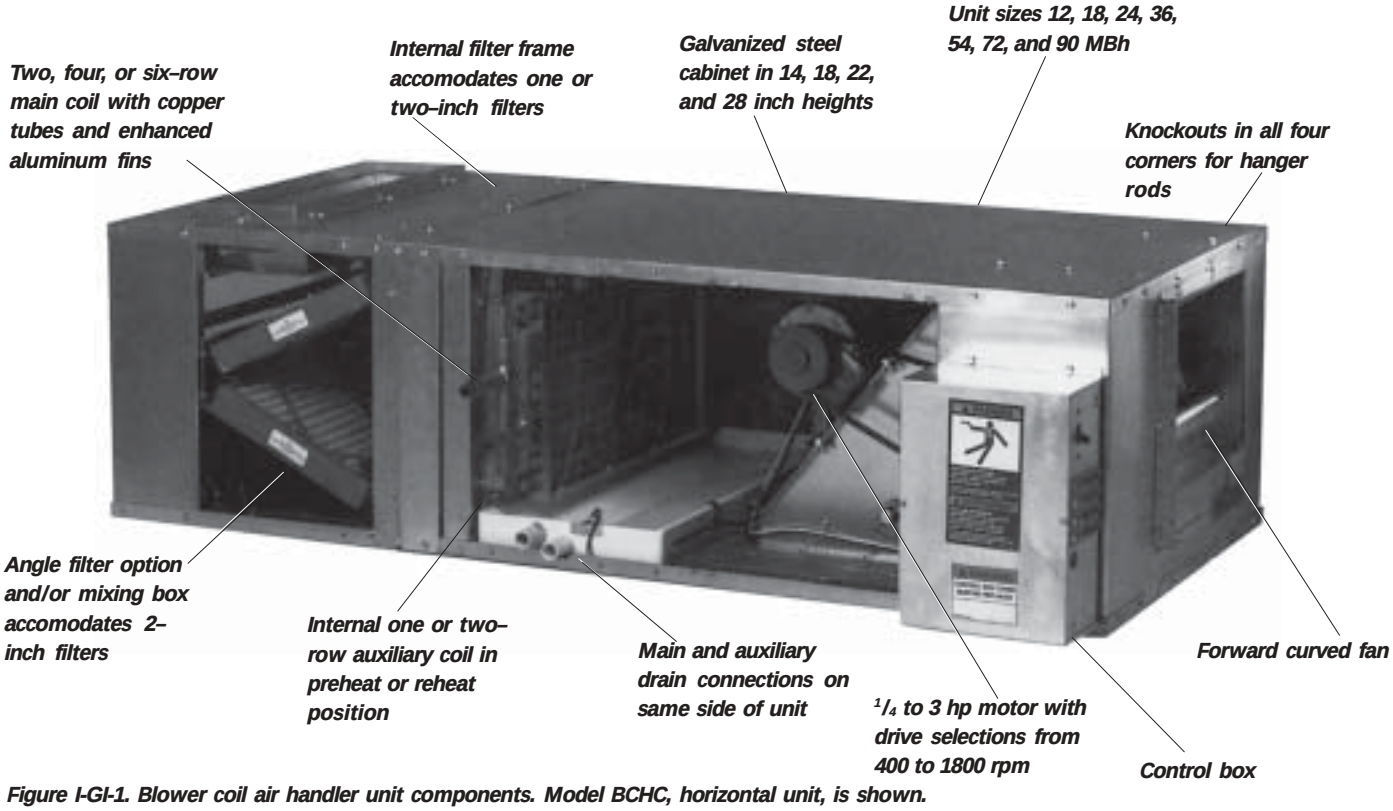


Figure I-GI-1. Blower coil air handler unit components. Model BCHC, horizontal unit, is shown.

Blower Coil Model Number Description

Following is a complete description of the blower coil model number. Each digit in the model number has a corresponding code that identifies specific unit options.

BC	H	C	012	1	C	A0	A	1	G	A	2	B	0	000	0	0	2	C	3	B	A	2	2	B	2	0	5	R	A	0	1	1	0
1			5			10				15				20				25				30				35				40				

Digits 1 thru 4 — Unit Model
BCHC = horizontal blower coil
BCVC = vertical blower coil

Digits 5 thru 7 — Unit Size

012	024	054
018	036	072
		090

Digit 8 — Unit Voltage

A = 115/60/1	H = 575/60/3
B = 208/60/1	J = 220/50/1
C = 230/60/1	K = 240/50/1
D = 277/60/1	L = 380/50/3
E = 208/60/3	M = 415/50/3
F = 230/60/3	N = 190/50/3
G = 460/60/3	P = 2-speed, 115/60/1

0 = no motor, ctrls, elec ht.

Digit 9 —Insulation Type
1 = 1" matt faced
2 = 1" foil faced

Digits 10 & 11 — Design Sequence
A0 = A

Digit 12 — Motor, Drive, & Control Box Location
A = same side as coil connections, horizontal or counterswirl only
B = opposite side from coil connections, horizontal or counterswirl only
C = same side as coil connections, pre-swirl only
D = opposite side from coil connections, pre-swirl only
R = right-hand access
L = left-hand access

Digit 13 — Drain Pan Type, Coil & Drain Connection Side
0 = none
1 = polymer drain pan & right-hand connections
2 = polymer drain pan & left-hand connections
3 = stainless steel drain pan & right-hand connections
4 = stainless steel drain pan & left-hand connections

Digit 14 — Unit Coil #1*
*** all coils are hydronic unless stated otherwise**
0 = none
A = 1-row heating
B = 2-row heating
C = 4-row heating
D = 6-row heating
E = 2-row cooling
F = 4-row cooling
G = 6-row cooling
H = 2-row heating/cooling with autochangeover
J = 4-row heating/cooling with autochangeover
K = 6-row heating/cooling with autochangeover
L = 2-row high-capacity cooling
M = 4-row high-capacity cooling
N = 6-row high-capacity cooling
P= 2-row heating/high-capacity cooling with autochangeover
R = 4-row heating/high-capacity cooling with autochangeover
T= 6-row heating/high-capacity cooling with autochangeover
U = 4-row DX, $^{3}/_{16}$" distributor
V = 6-row DX, $^{3}/_{16}$" distributor
W = 4-row DX, $^{1}/_{4}$" distributor
X = 6-row DX, $^{1}/_{4}$" distributor

Digit 15 — Unit Coil #2*
*** all coils are hydronic unless stated otherwise**
0 = none
A = 1-row heating
B = 2-row heating
C = 4-row heating
D = 6-row heating
E = 2-row cooling
F = 4-row cooling
G = 6-row cooling
H = 2-row heating/cooling with autochangeover
J = 4-row heating/cooling with autochangeover
K = 6-row heating/cooling with autochangeover
L = 2-row high-capacity cooling
M = 4-row high-capacity cooling
N = 6-row high-capacity cooling
P= 2-row heating/high-capacity cooling with autochangeover
R = 4-row heating/high-capacity cooling with autochangeover
T= 6-row heating/high-capacity cooling with autochangeover
U = 4-row DX, $^{3}/_{16}$" distributor
V = 6-row DX, $^{3}/_{16}$" distributor
W = 4-row DX, $^{1}/_{4}$" distributor
X = 6-row DX, $^{1}/_{4}$" distributor

Digit 16 — Motor Horsepower

0 = none	4 = 1 hp
1 = $^{1}/_{3}$ hp	5 = 1 $^{1}/_{2}$ hp
2 = $^{1}/_{2}$ hp	6 = 2 hp
3 = $^{3}/_{4}$ hp	7 = 3 hp

Digit 17 — Motor Drives
0 = none
A = 390-552 rpm/60 hz or 323-457 rpm/50hz
B = 478-678 rpm/60 hz or 396-562 rpm/50hz
C = 619-878 rpm/60 hz or 513-727 rpm/50hz
D = 619-878 rpm/60 hz or 513-727 rpm/50hz
E = 727-1029 rpm/60 hz or 602-853 rpm/50hz
F = 879-1245 rpm/60 hz or 728-1031 rpm/50hz
G = 1000-1417 rpm/60 hz or 829-1174 rpm/50hz
H = 1200-1700 rpm/60 hz or 995-1410 rpm/50hz
J = 1313-1859 rpm/60 hz or 1088-1541 rpm/50hz
K = 1615-2288 rpm/60 hz or 1338-1896 rpm/50hz
L = 678-877 rpm/60 hz or 562-727 rpm/50hz
M = 765-990 rpm/60 hz or 634-820 rpm/50hz
N = 878-1136 rpm/60 hz or 727-941 rpm/50hz
P = 1029-1332 rpm/60 hz or 853-1104 rpm/50hz
R = 1245-1611 rpm/60 hz or 1031-1335 rpm/50hz
T = 1174-1519 rpm/50hz

Digit 18 — Electric Heat Stages
0 = none
1 = 1-stage
2 = 2-stage

Digits 19 thru 21 — Electric Heat kW

000 = none	100 = 10.0 kW
010 = 1.0 kW	110 = 11.0 kW
015 = 1.5 kW	120 = 12.0 kW
020 = 2.0 kW	130 = 13.0 kW
025 = 2.5 kW	140 = 14.0 kW
030 = 3.0 kW	150 = 15.0 kW
035 = 3.5 kW	160 = 16.0 kW
040 = 4.0 kW	170 = 17.0 kW
045 = 4.5 kW	180 = 18.0 kW
050 = 5.0 kW	190 = 19.0 kW
055 = 5.5 kW	200 = 20.0 kW
060 = 6.0 kW	210 = 21.0 kW
065 = 6.5 kW	220 = 22.0 kW
070 = 7.0 kW	240 = 24.0 kW
075 = 7.5 kW	260 = 26.0 kW
080 = 8.0 kW	280 = 28.0 kW
090 = 9.0 kW	300 = 30.0 kW

Digit 22 — Electric Heat Controls
0 = none
A = 24 volt magnetic contactors
B = 24 volt mercury contactors

Digit 23 — Electric Heat Options
0 = none
A = electric heat with heater fuse
B = electric heat interlocking non-fused disconnect
C = A & B

Digit 24 — Filters
0 = none
A = 1" throwaway
B = 2" pleated throwaway

Digit 25 — Accessory Section
0 = none
A = mixing box only
B = angle filter box
C = angle filter/mixing box
D = top access filter box
E = bottom access filter
F = A & D
G = A & E

Digit 26 — Control Type
0 = no controls (4 x 4 junction box)
1 = control interface
2 = Tracer ZN010
3 = Tracer ZN510
4 = Tracer ZN520

Digit 27 — Coil #1 Control Valve
0 = none
A = 2-way, 2-position, n.c.
B = 2-way, 2-position, n.o.
C = 3-way, 2-position, n.c.
D = 3-way, 2-position, n.o.
E = 2-way modulating
F = 3-way modulating
G = field supplied valve, 2-pos., n.c.
H = field supplied valve, 2-pos., n.o.
J = field supplied modulating valve

Digit 28 — Coil #1 Control Valve Cv
0 = none
A = 3.3 Cv, 1/2" modulating, 1/2" pipe
B = 3.3 Cv, 1/2" modulating, 3/4" pipe
C = 4.0 Cv, 1/2" modulating, 3/4" pipe
D = 6.0 Cv, 1" modulating, 1" pipe
E = 8.3 Cv, 1" modulating, 1" pipe
F = 9.0 Cv, 1 1/4" modulating, 1 1/4" pipe
G = 3.5 Cv, 1/2" 2-position, 1/2" pipe
H = 4.4 Cv, 1/2" 2-position, 1/2" pipe
J = 7.0 Cv, 3-way valve, 1" 2-position, 1" pipe **OR**
6.0 Cv, 2-way valve,1" 2-position, 1" pipe
K = 8.0 Cv, 1" 2-position, 1" pipe
L = 8.3 Cv, 1" 2-position, 1" pipe
M = 9.0 Cv, 1 1/4" 2-position, 1 1/4" pipe

Digit 29 — Coil #1 Piping Package
0 = none
1 = basic piping package
2 = deluxe piping package

Digit 30 — Coil #2 Control Valve
0 = none
A = 2-way, 2-position, n.c.
B = 2-way, 2-position, n.o.
C = 3-way, 2-position, n.c.
D = 3-way, 2-position, n.o.
E = 2-way modulating
F = 3-way modulating
G = field supplied valve, 2-pos., n.c.
H = field supplied valve, 2-pos., n.o.
J = field supplied modulating valve

Digit 31 — Coil #2 Control Valve Cv
0 = none
A = 3.3 Cv, 1/2" modulating, 1/2" pipe
B = 3.3 Cv, 1/2" modulating, 3/4" pipe
C = 4.0 Cv, 1/2" modulating, 3/4" pipe
D = 6.0 Cv, 1" modulating, 1" pipe
E = 8.3 Cv, 1" modulating, 1" pipe
F = 9.0 Cv, 1 1/4" modulating, 1 1/4" pipe
G = 3.5 Cv, 1/2" 2-position, 1/2" pipe
H = 4.4 Cv, 1/2" 2-position, 1/2" pipe
J = 7.0 Cv, 3-way valve, 1" 2-position, 1" pipe **OR**
6.0 Cv, 2-way valve,1" 2-position, 1" pipe
K = 8.0 Cv, 1" 2-position, 1" pipe
L = 8.3 Cv, 1" 2-position, 1" pipe
M = 9.0 Cv, 1 1/4" 2-position, 1 1/4" pipe

Digit 32 — Coil #2 Piping Package
0 = none
1 = basic piping package
2 = deluxe piping package

Digit 33 — Remote Heat Options
0 = none
1 = staged electric heat
2 = 2-position hot water, n.c.

Digit 34 — Mixing Box Damper Actuator
0 = none
1 = 2-position, n.o., ship loose
2 = modulating, n.c.
3 = modulating, n.o.
4 = modulating, ship loose
5 = field supplied 2-position, n.o.
6 = field supplied 2-position, n.c.
7 = field supplied modulating

Digit 35 — Factory Mounted Control Options
0 = none
A = fan status
B = dirty filter
C = condensate overflow
D = low limit
E = A & B
F = A & C
G = A & D
H = B & C
J = B & D
K = C & D
L = A, B, & D
M = A, B, & C
N = A, C, & D
P = B, C, & D
R = all (A, B, C, & D)

Digit 36 — Control Options 2
0 = none
A = outside air sensor, field mounted
B = discharge air sensor
C = A & B

Digit 37 — Control Options 3
0 = none
A = dehumidification with communicated value
B = dehumidification with local humidity sensor

Digit 38 — Zone Sensors
0 = none
1 = off/auto, setpoint knob, on/cancel, & comm jack
2 = off/auto/high/low, setpoint knob, on/cancel, and comm jack
3 = setpoint knob, on/cancel, comm jack
4 = on/cancel, comm jack
5 = sensor only
6 = off/auto, celsius setpoint knob, on/cancel, & comm jack
7 = off/auto/high/low, celsius setpoint knob, on/cancel, & comm jack
8 = Celsius setpoint knob, on/cancel, & comm jack

Digit 39 — Extra Belt
0 = none
1 = ship loose extra belt

Digit 40 — Extra Filter
0 = none
1 = ship loose extra 1" throwaway filter
2 = ship loose extra 2" pleated throwaway

Installation

Pre-Installation Considerations

Receiving and Handling

Blower coil units are packaged for easy handling and storage on the job site. Upon delivery, inspect all components for possible shipping damage. See the Receiving Checklist section for detailed instructions. Trane recommends leaving units and accessories in their shipping packages/skids for protection and handling ease until installation.

Shipping Package
Blower coil air handlers ship assembled on skids with protective coverings over the coil and discharge openings.

Ship-Separate Accessories
Field-installed sensors ship separately inside the unit's main control panel. Piping packages, mixing boxes, ship separately packaged on the same skid as the unit.

Receiving Checklist
Complete the following checklist immediately after receiving unit shipment to detect possible shipping damage.

- ☐ Inspect individual cartons before accepting. Check for rattles, bent carton corners, or other visible indications of shipping damage.
- ☐ If a unit appears damaged, inspect it immediately before accepting the shipment. Manually rotate the fan wheel to ensure it turns freely. Make specific notations concerning the damage on the freight bill. Do not refuse delivery.
- ☐ **Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Report concealed damage to the freight line within the allotted time after delivery. Check with the carrier for their allotted time to submit a claim**.
- ☐ Do not move damaged material from the receiving location. It is the receiver's responsibility to provide reasonable evidence that concealed damage did not occur after delivery.
- ☐ Do not continue unpacking the shipment if it appears damaged. Retain all internal packing, cartons, and crate. Take photos of damaged material if possible.
- ☐ Notify the carrier's terminal of the damage immediately by phone and mail. Request an immediate joint inspection of the damage by the carrier and consignee.
- ☐ Notify your Trane representative of the damage and arrange for repair. Have the carrier inspect the damage before making any repairs to the unit.
- ☐ Compare the electrical data on the unit nameplate with the ordering and shipping information to verify the correct unit is received.

Jobsite Storage Recommendations

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.

Installation Preparation

Before installing the unit, perform the following procedures to ensure proper unit operation.

1. Verify the floor or foundation is level. Shim or repair as necessary. To ensure proper unit operation, install the unit level (zero tolerance) in both horizontal axes. Failure to level the unit properly can result in condensate management problems, such as standing water inside the unit. Standing water and wet surfaces inside units can result in microbial growth (mold) in the drain pan that may cause unpleasant odors and serious health-related indoor air quality problem.
2. Allow adequate service and code clearances as recommended in "Service Access" section on page 7. Position the unit and skid assembly in its final location. Test lift the unit to determine exact unit balance and stability before hoisting it to the installation location.

Service Access

See Table I-PC-1 and Figure I-PC-1 on page 8 for recommended service and code clearances.

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

Rigging and Handling

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of placement of internal components, the unit weight may be unevenly distributed, with more weight in the coil area. Approximate unit weights are given in the Dimensions and Weights section beginning on page 9. Also, you may reference the unit weight on the unit nameplate.

Before hoisting the unit into position, use a proper rigging method such as straps, slings, or spreader bars for protection and safety. Always test-lift the unit to determine the exact unit balance and stability before hoisting it to the installation location.

⚠ WARNING

Improper Unit Lift!

Test lift the unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level. Failure to properly lift unit can result in serious injury, possible equipment or property-damage, or death.

Unit Handling Procedure

1. Position rigging sling under wood skid using spreader bars to avoid unit damage.
2. Use a forklift with caution to prevent unit damage. The fork length must be at least 68 inches long to safely fork the unit from front or back.
3. The unit center of gravity will fall within the center of gravity block at various locations depending on unit options.
4. See unit nameplate for unit weight.

Table I-PC-1. Service Requirements, in. (cm)

Unit Size	Dimension A
012	20 (50.8)
018	25 (63.5)
024	25 (63.5)
036	37 (94.0)
054	37 (94.0)
072	45(114.3)
090	45 (114.3)

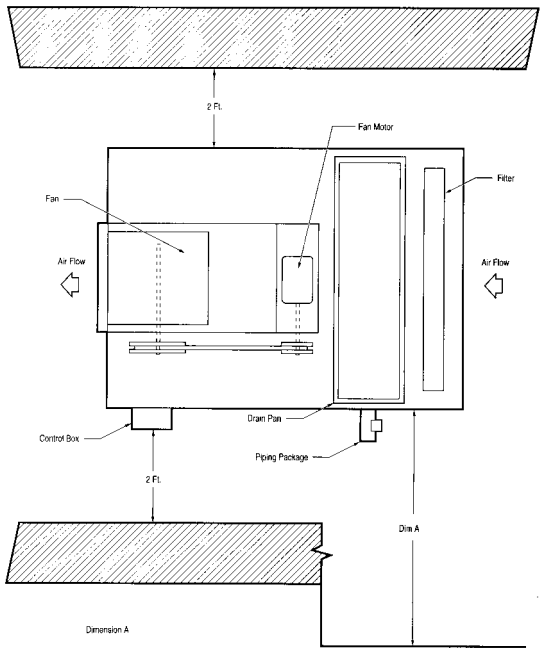


Figure I-PC-1. Top view of blower coil unit showing recommended service and code clearances.

Unit Location Recommendations

When selecting and preparing the unit installation location, consider the following recommendations.

1. Consider the unit weight. Reference the unit weight on the unit nameplate or in the Dimensions and Weights section on pages 9–10.
2. Allow sufficient space for the recommended clearances, access panel removal, and maintenance access. Refer to Figure I-PC-1.
3. The installer must provide threaded suspension rods for ceiling mounted units. All units must be installed level.
4. Coil piping and condensate drain requirements must be considered. Allow room for proper ductwork and electrical connections. Support all piping and ductwork independently of unit to prevent excess noise and vibration.

Skid Removal

The unit ships on skids that provide forklift locations from the front or rear. The skid allows easy maneuverability of the unit during storage and transportation. Remove the skids before placing the unit in its permanent location.

Remove the skids using a forklift or jack. Lift one end of the unit off of the skids. Vibration isolators for external isolation are field supplied.

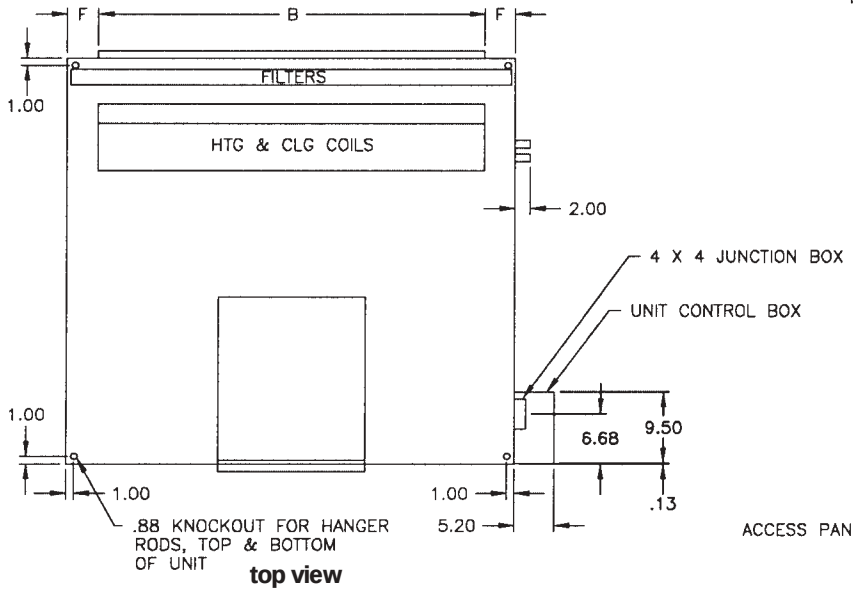
Pre-Installation Checklist

Complete the following checklist before beginning unit installation.

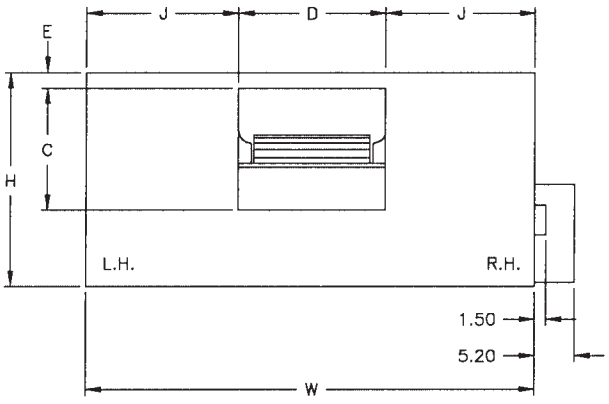
- ☐ Verify the unit size and tagging with the unit nameplate.
- ☐ Make certain the floor or foundation is level, solid, and sufficient to support the unit and accessory weights. Reference unit and accessory weights on pages 9–14. Level or repair the floor before positioning the unit if necessary.
- ☐ Allow minimum recommended clearances for routine maintenance and service. Refer to unit submittals for dimensions.
- ☐ Allow one and one half fan diameters above the unit for the discharge ductwork.

Horizontal Blower Coil

NOTES: ALL DIMENSIONS ARE IN INCHES.
ALL COIL CONNECTIONS ARE SWEAT STYLE.
WEIGHT OF BASIC UNIT INCLUDES CABINET, FAN, AVERAGE DRIVE, WIRING AND AVERAGE FILTER. IT DOES NOT INCLUDE COIL, MOTOR OR SHIPPING PACKAGE. PLEASE REFER TO CATALOG FOR MOTOR WEIGHTS.
*ADD TO BASIC UNIT WEIGHT, 9 LBS FOR WEIGHT OF CONTROL BOX.
4 X 4 JUNCTION BOX OR CONTROL BOX FACTORY MOUNTED ON DRIVE SIDE.

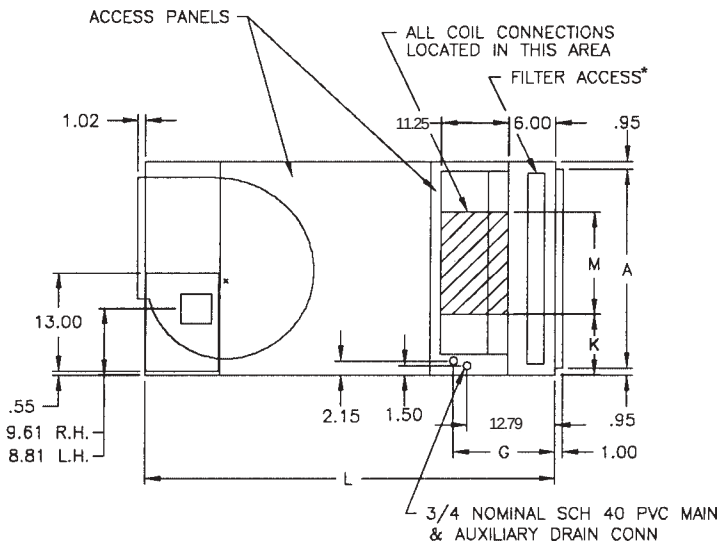


top view



front view

*NOTE: ON UNITS WITHOUT A BOTTOM FILTER ACCESS SECTION

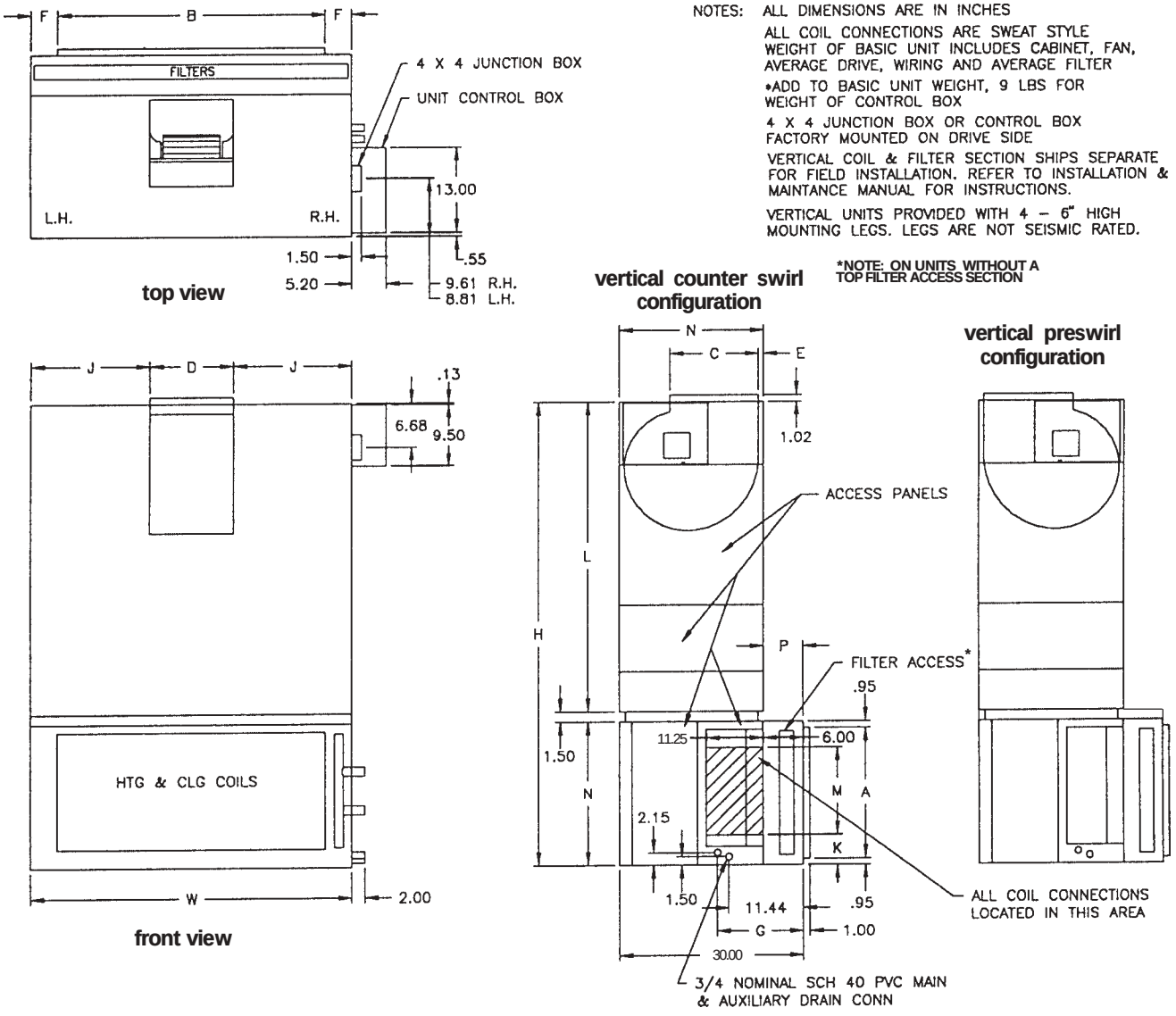


right side view

Horizontal Blower Coil Unit Dimensions and Weights, in-lbs.

Unit Size	H	W	L	A	B	C	D	E	F	G (RH)	G (LH)	J	K	M	unit weight
12	14.00	24.00	40.75	12.09	18.00	10.56	7.09	0.55	3.00	10.79	14.79	8.46	2.82	6.80	71.5
18	14.00	28.00	40.75	12.09	22.00	10.56	7.09	0.55	3.00	10.79	14.79	10.46	2.82	6.80	77.4
24	18.00	28.00	46.00	16.09	22.00	13.56	12.56	1.30	3.00	10.79	14.79	7.72	3.58	9.00	104.1
36	18.00	40.00	46.00	16.09	34.00	13.56	12.56	1.30	3.00	10.79	14.79	13.72	3.57	9.00	121.6
54	22.00	40.00	49.00	20.09	34.00	13.56	12.56	0.72	3.00	10.79	14.79	13.72	4.21	10.43	138.9
72	22.00	48.00	49.00	20.09	40.00	13.56	12.56	0.72	4.00	10.79	14.79	17.72	4.18	10.43	152.2
90	28.00	48.00	52.00	26.09	40.00	13.56	12.56	1.66	4.00	10.79	14.79	17.72	4.81	15.61	174.8

Vertical Blower Coil

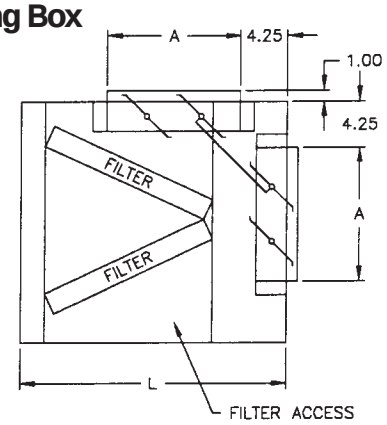


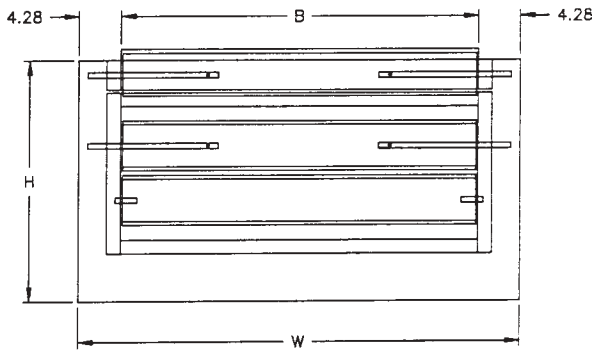
Vertical Blower Coil Unit Dimensions and Weights, in-lbs.

Unit Size	H	W	L	A	B	C	D	E	F	G (RH)	G (LH)	J	K	M	N	unit weight
24	65.50	28.00	44.00	16.09	22.00	13.56	12.56	1.30	3.00	10.79	14.79	7.72	3.58	9.00	18.00	155.5
36	65.50	40.00	44.00	16.09	34.00	13.56	12.56	1.30	3.00	10.79	14.79	13.72	3.57	9.00	18.00	185.9
54	72.50	40.00	47.00	20.09	34.00	13.56	12.56	0.72	3.00	10.79	14.79	13.72	4.21	10.43	22.00	206.4
72	72.50	48.00	47.00	20.09	40.00	13.56	12.56	0.72	4.00	10.79	14.79	17.72	4.18	10.43	22.00	228.2
90	81.50	48.00	50.00	26.09	40.00	13.56	12.56	1.66	4.00	10.79	14.79	17.72	4.81	15.61	28.00	258.4

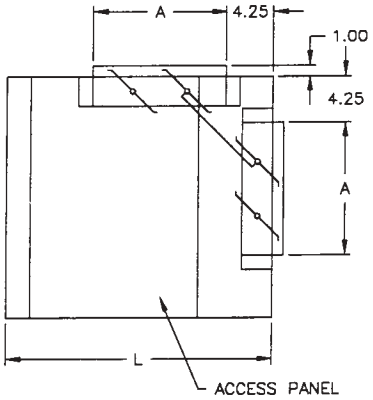
Angle Filter & Mixing Box

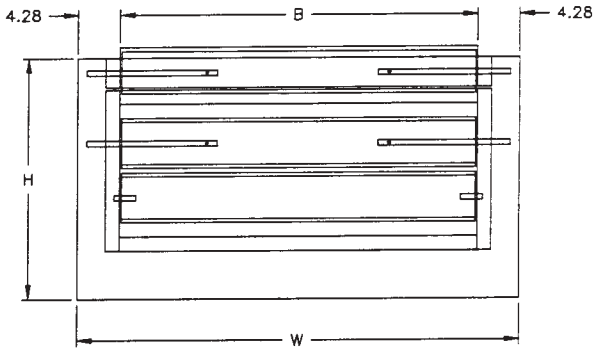
combination angle filter & mixing box



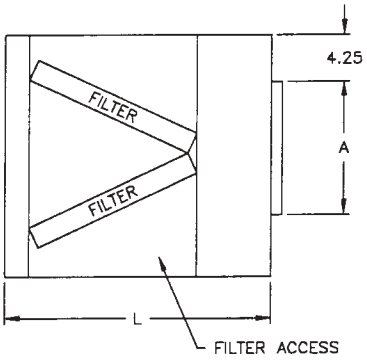


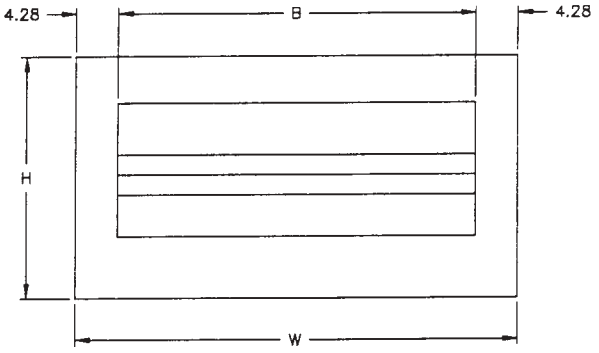
mixing box





angle filter box



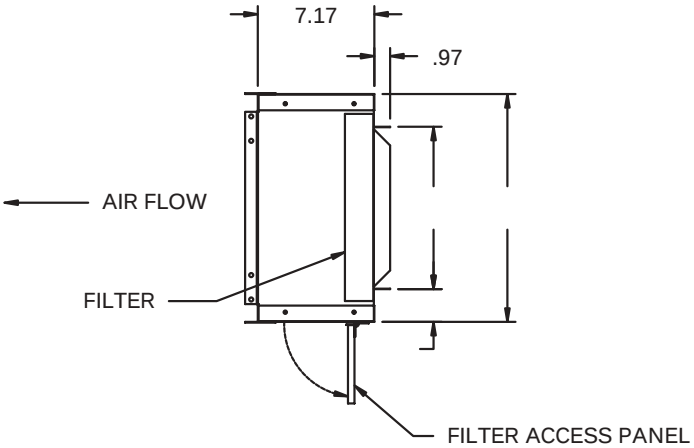


Angle Filter & Mixing Box Dimensions and Weights, in-lbs.

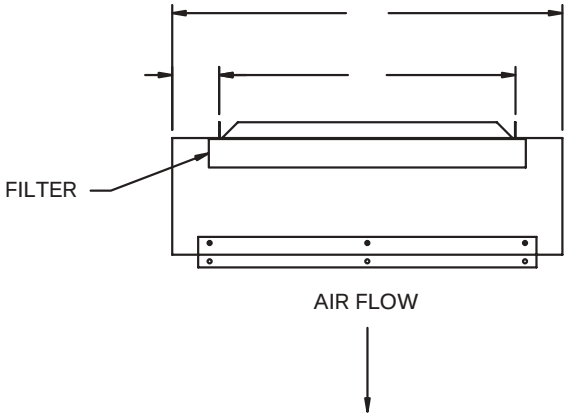
Unit Size	H	L	W	A	B	weight
12	14.12	22.00	24.11	7.06	15.56	36.0
18	14.12	22.00	28.11	7.06	19.56	41.0
24	18.12	19.50	28.11	7.06	19.56	43.0
36	18.12	24.50	40.11	7.06	31.56	56.0
54	22.12	23.50	40.11	12.81	31.56	72.0
72	22.00	23.50	48.00	12.81	31.56	72.5
90	27.90	27.56	48.00	12.85	31.56	84.1

NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. MIXING BOX SHIPS ASSEMBLED FOR FIELD INSTALlatION.
3. LINKAGE BETWEEN DAMPERS IS FACTORY INSTALLED INSIDE MIXING BOX, OPPOSITE DRIVE SIDE. DRIVE ROD ON BACK DAMPER MAY BE EXTENDED THRU KNOCKOUT FOR EXTERNALLY MOUNTED ACTUATOR. TO ADJUST, LOOSEN HEX HD SET scREW ON BLADE.
4. UNIT SIZE 36 HAS ONLY ONE ANGLE FILTER TRACK. ALL OTHER UNIT SIZES HAVE 2 FILTER TRACKS AS SHOWN.
5. ALL SECTIONS SHIP SEPARATELY.

Bottom or Top Access Filter Box



right side view



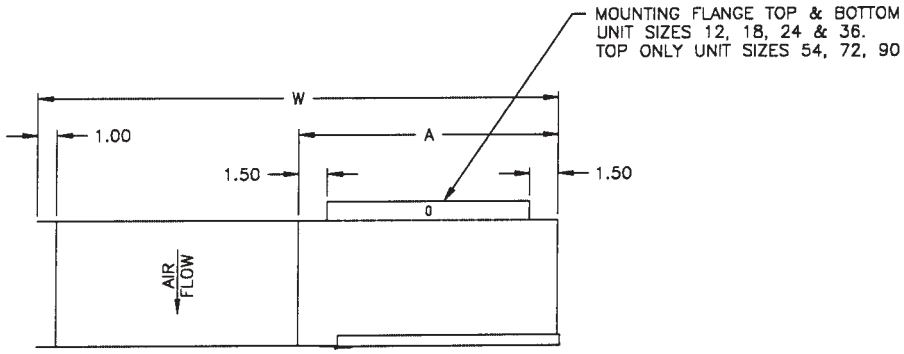
top view

NOTES:
1. DIMENSIONS ARE IN INCHES.
2. ROTATE 180° FOR TOP ACCESS.
3. SECTION SHIPS ATTACHED TO THE UNIT.

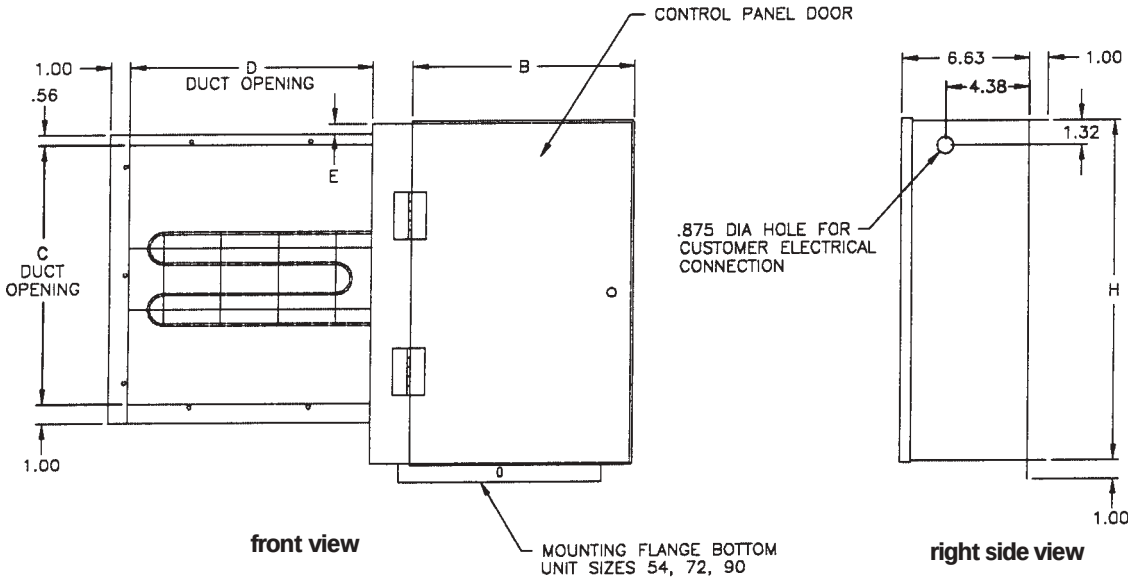
Bottom or Top Access Filter Box Dimensions and Weights, in-lbs.

Unit Size	H	W	A	B	C	D	weight
12	14.00	24.00	9.98	2.01	18.23	2.88	15
18	14.00	28.00	9.98	2.01	21.98	3.01	17
24	18.00	28.00	14.23	1.89	23.23	2.38	18
36	18.00	40.00	14.23	1.89	33.73	3.13	25
54	22.00	40.00	18.23	1.89	33.73	3.13	28
72	22.00	48.00	18.23	1.89	42.73	2.63	32
90	28.00	48.00	23.23	1.89	41.23	3.38	37

Electric Heat



top view



front view

right side view

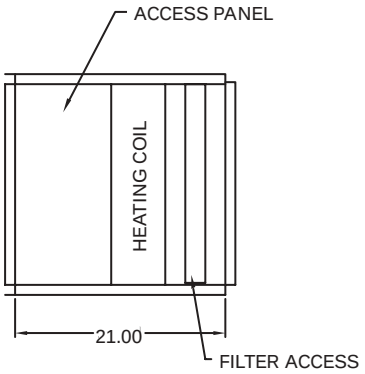
Electric Heat Dimensions and Weights, in-lbs.

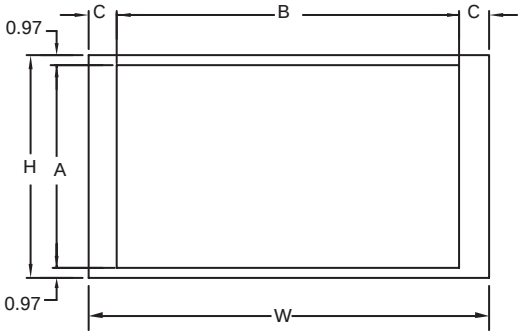
Unit Size	H	W	A	B	C	D	E	weight
12	14.06	17.88	8.13	6.79	10.50	7.75	0.03	10.0
18	14.06	19.88	10.13	8.79	10.50	7.75	0.03	10.8
24	18.06	21.25	7.63	6.29	13.50	12.63	0.80	11.3
36	18.06	27.25	13.63	12.29	13.50	12.63	0.80	12.8
54	18.06	27.25	13.63	11.67	13.50	12.63	0.22	16.0
72	18.06	27.25	13.63	11.67	13.50	12.63	0.22	17.4
90	18.06	27.25	13.63	11.67	13.50	12.63	1.16	19.2

NOTES:
- ALL DIMENSIONS ARE IN INCHES.
- ELECTRIC HEATER IS FACTORY MOUNTED ON UNIT DISCHARGE FACE & WIRED TO UNIT CONTROL BOX.
- RIGHT HAND HEATER SHOWN. LEFT HAND HEATER IS MIRROR IMAGE OF RIGHT HAND.
- CONTROL PANEL DOOR IS HINGED AT BOTTOM ON UNIT SIZES 12, 18, 24 & 36. UNIT SIZES 54, 72, & 90 ARE HINGED AT SIDE AS SHOWN.
- HEATER MAY BE MOUNTED WITH HORIZONTAL OR VERTICAL UP AIRFLOW.
- OPTIONAL MERCURY CONTACTORS CANNOT BE USED WITH VERTICAL UP AIRFLOW.

Steam Coil

NOTES:
1. FILTER ACCESS & ACCESS PANEL LOCATED ON BOTH SIDES.
2. WEIGHT INCLUDES CABINET WITH AVERAGE FILTER, BUT DOES NOT INCLUDE COIL WEIGHT. SEE GENERAL DATA SECTION FOR COIL WEIGHTS.





Steam Coil Box Dimensions and Weights, in-lbs.

Unit Size	H	W	A	B	C	Weight	Coil Connections, NPT Supply	Return
12	14.00	24.00	12.06	18.04	2.98	34	1.0	0.75
18	14.00	28.00	12.06	22.04	2.98	37	1.0	0.75
24	18.00	28.00	16.06	22.04	2.98	40	1.5	1.00
36	18.00	40.00	16.06	34.04	2.98	48	1.5	1.00
54	22.00	40.00	20.06	34.04	2.98	50	2.0	1.00
72	22.00	48.00	20.06	42.04	2.98	56	2.0	1.00
90	28.00	48.00	26.06	40.04	3.98	63	2.5	1.25

Coil Connections

Hydronic Coil Connection Sizes, in.

Unit Size	1-row	2-row	4-row	6-row
12	0.750	0.750	0.750	0.750
18	0.750	0.750	0.750	0.750
24	0.875	0.875	0.875	0.875
36	0.875	0.875	0.875	0.875
54	1.125	1.375	1.375	1.375
72	1.125	1.375	1.375	1.375
90	1.125	1.375	1.625	1.625

High-Capacity Hydronic Coil Connection Sizes, in.

Unit Size	2-row	4-row	6-row
12	0.625	0.625	0.625
18	0.625	0.625	0.625
24	0.750	0.750	0.750
36	0.750	0.750	0.750
54	1.125	1.125	1.125
72	1.125	1.125	1.125
90	1.125	1.125	1.125

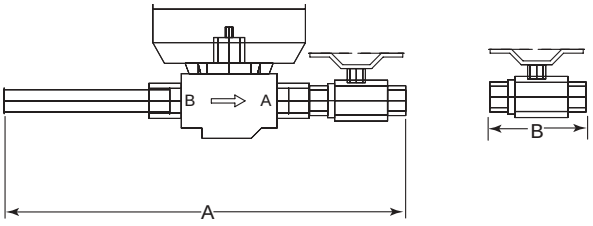
DX Coil Connection Sizes, in. O.D.

Unit Size	suction	liquid
12	1/2	1/2
18	1/2	1/2
24	7/8	1/2
36	7/8	1/2
54	7/8	1/2
72	7/8	1/2
90	1 1/4	1/2

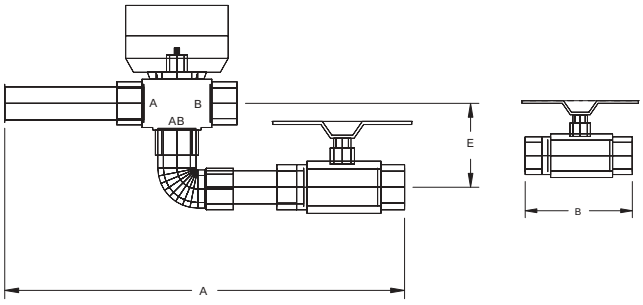
Note: The DX coil is equipped with a single distributor. Do not manifold two, independent refrigeration circuits into a single-circuited DX (evaporator) coil.

Piping Packages

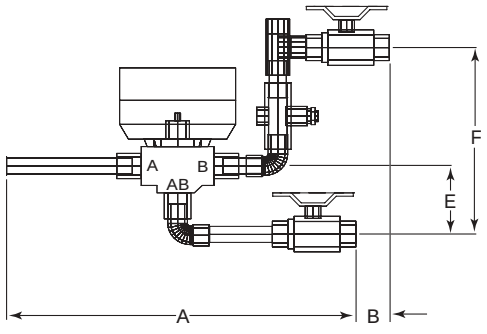
Basic Piping



Two-Way, 1/2" & 1" Basic Piping Package

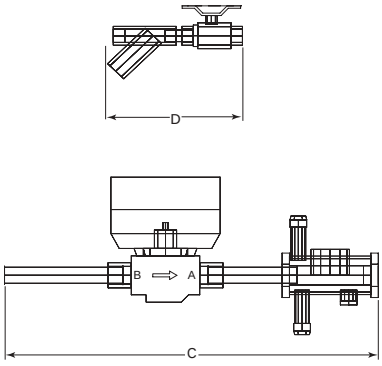


Two-Way, 1 1/4" Basic Piping Package

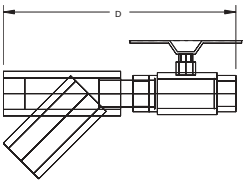


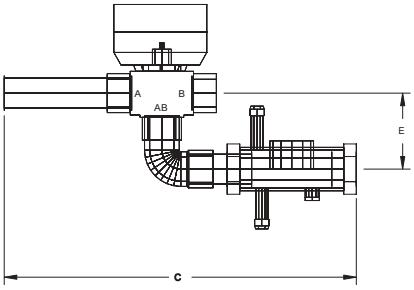
Three-Way, 1/2" & 1" Basic Piping Package

Deluxe Piping

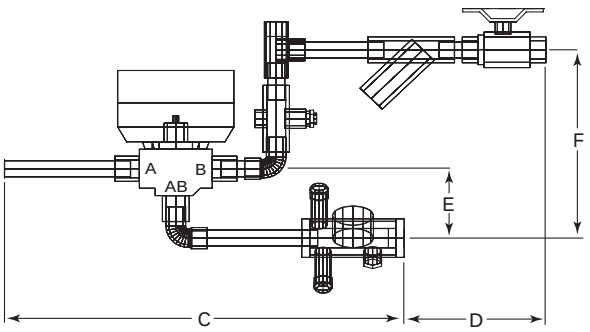


Two-Way, 1/2" & 1" Deluxe Piping Package





Two-Way 1 1/4" Deluxe Piping Package



Three-Way, 1/2" & 1" Deluxe Piping Package

Piping Package Dimensions, in.

Piping Package	nominal size	actual size	A	B	C	D	E	F
2-way	0.50	0.625	12.025	2.650	12.625	5.650	na	na
	1.00	1.125	13.295	4.260	13.220	9.288	3.020	na
3-way	0.50	0.625	12.088	2.097	12.688	4.497	6.351	6.351
	0.75	0.875	15.623	1.750	15.313	6.290	6.701	6.701
	1.00	1.125	13.370	3.690	13.210	9.060	9.813	9.813
	1.25	1.375	16.885	3.738	16.410	10.023	3.052	10.520

Installation Mechanical Requirements

Duct Connections

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

Install all air ducts according to the National Fire Protection Association standards for the "Installation of Air Conditioning and Ventilation Systems other than Residence Type (NFPA 90A) and Residence Type Warm Air Heating and Air Conditioning Systems (NFPA 90B).

Make duct connections to the unit with a flexible material such as heavy canvas to help minimize noise and vibration. If a fire hazard exists, Trane recommends using Flexweave 1000, type FW30 or equivalent canvas. Use **three inches** for the return duct and **three inches** for the discharge duct. Keep the material loose to absorb fan vibration.

Run the ductwork straight from the opening for a minimum of 1 $^1/_2$ fan diameters. Extend remaining ductwork as far as possible without changing size or direction. Do not make abrupt turns or transitions near the unit due to increased noise and excessive static losses. Avoid sharp turns and use elbows with splitters or turning vanes to minimize static losses.

Poorly constructed turning vanes may cause airflow generated noise. Align the fan outlet properly with the ductwork to decrease duct noise levels and increase fan performance. Check total external static pressures against fan characteristics to be sure the required airflow is available throughout the ductwork.

To achieve maximum acoustical performance, minimize the duct static pressure setpoint.

Condensate Drain Connections

Note: It is the installer's responsibility to provide adequate condensate piping to prevent potential water damage to the equipment and/or building.

Size the main drain lines and trap them the same size as the drain connection, which is $^3/_4$" schedule 40 PVC, 1.050" O.D. on blower coils.

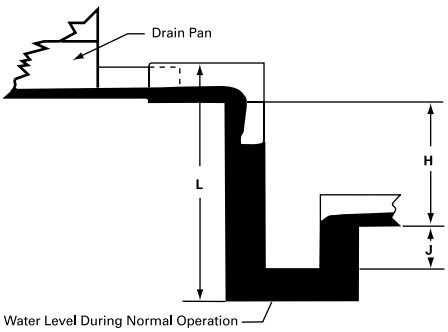
If drain pan removal is required, make the main and auxiliary drain connections with compression fittings. Follow the procedure below to remove the drain pan.

1. Remove the opposite side coil access panel.
2. Remove the drain pan clips.
3. Disconnect drain lines.
4. Remove the sheet metal screw.
5. Pull out drain pan through the opposite side.

Note: Prime drain traps to prevent the drain pan overflow.

Plug or trap the auxiliary connection to prevent air from being drawn in and causing carryover. See Figure I-MR-1.

All drain lines downstream of the trap must flow continuously downhill. If segments of the line are routed uphill, this can cause the drain line to become pressurized. A pressurized drain line may cause the trap to back up into the drain pan, causing overflow.



H = 1" of length for each 1" of negative pressure + 1" additional
J = $^1/_2$ of H
L = H+ J + pipe diameter + insulation

Figure I-MR-1. Recommended drain trap installation for draw-thru units.

Water Coil Connections

Water coils have sweat connections. Reference coil connection dimensions in the Dimensions and Weights section. Proper installation and piping is necessary to ensure satisfactory coil operation and prevent operational damage. Water inlet and outlet connections extend through the coil section side panel. See Figure I-MR-2. Follow standard piping practices when piping to the coil.

Note: If the unit has the high-capacity cooling coil option, you must insulate both the bottom and top of the unit casing.

CAUTION

Potential coil-freeze condition!
Make provisions to drain the coil when not in use to prevent coil freeze-up.

Piping Packages

Piping packages ship separate for field installation and have sweat type connections. Interconnecting piping is field provided.
When brazing piping, follow these guidelines to prevent piping component damage.

1. Avoid exposing piping components to high heat when making sweat connections.
2. Protect the closest valve to the connection with a wet rag.
3. Ensure the circuit balancing valve option is in the unseated position.

Figure I-MR-2. Horizontal unit coil connection location.

Refrigerant Coil Piping

The DX cooling coil in a BCHC/BCVC unit is equipped with a single distributor (single-circuited). Some condensing units have two, independent refrigeration circuits. **Do not manifold two, independent refrigeration circuits into a single-circuited DX (evaporator) coil.**

Note: Refer to the "Special Note on Emissions" section on page 2 for information on handling refrigerants.

Units that are UL listed shall not have refrigerant temperatures and pressures exceeding that listed on the unit nameplate.

Follow accepted refrigeration piping practices and safety precautions for typical refrigerant coil piping and components. Specific recommendations are provided with the compressor unit, including instructions for pressure-testing, evacuation, and system charging. Leak test the entire refrigerant system after all piping is complete. Charge the unit according to approximate weight requirements, operating pressures and superheat/subcooling measurements. Adjust the thermal expansion valve setting, if necessary, for proper superheat.

Liquid Line

Line Sizing: Properly sizing the liquid line is critical to a successful application. If provided, use the liquid line size recommended by the manufacturer of the compressor unit. The selected tube diameter must be as small as possible, while still providing at least 5°F [2.7°C] of subcooling at the expansion valve throughout the operating envelope.

Routing: Install the liquid line with a slight slope in the direction of flow so that it can be routed with the suction line. Minimize tube bends and reducers because these items tend to increase pressure drop and reduce subcooling at the expansion valve.

Insulation: The liquid line is generally warmer than the surrounding air, so it does not require insulation.

Components: Liquid-line refrigerant components necessary for a successful job include an expansion valve, moisture-indicating sight glass, filter drier, manual ball shutoff valves, access port, and possibly a solenoid valve. Position these components as close to the evaporator as possible.

• **Thermal expansion valve (TEV):** Select the TEV based on the actual evaporator capacity, considering the full range of loadings. Verify that the valve will successfully operate at the lightest load condition, considering if hot gas bypass is to be used. For improved modulation, choose a TEV with balanced port construction and an external equalizer connection. The valve must be designed to operate against a back pressure of 20 psi higher than actual evaporator pressure. Install the TEV directly on the coil liquid connection (distributor provided).

The remote expansion-valve bulb should be firmly attached to a straight, well-drained, horizontal section of the suction line. The external equalizer line should be inserted downstream of the remote bulb.

• **Moisture-indicating sight glass:** Install a moisture-indicating sight glass in the liquid line between the expansion valve and filter drier. The sight glass should be sized to match the size of the liquid line.

• **Filter drier:** Install a properly sized liquid line filter-drier upstream from the expansion valve and as close to the evaporator coil as possible. Select the filter-drier for a maximum pressure drop of 2 psi at the design condition.

Manual, ball-type shutoff valves on either side of the filter drier allows replacement of the core without evacuating the entire refrigerant charge.

• **Access port:** The access port allows the unit to be charged with liquid refrigerant and is used to determine subcooling. This port is usually a Schraeder valve with a core.

• **Solenoid valve:** If required by the compressor unit, install the solenoid valve between the filter drier and sight glass.

CAUTION

Disassemble the thermal expansion valve before completing the brazing connections. If necessary, wrap the valve in a cool wet cloth while brazing. Failure to protect the valve from high temperatures may damage internal components.

Suction Line

Line sizing: Properly sizing the suction line is critical for ensuring that the oil returns to the compressor throughout the system operating envelope. If provided, use the suction line size(s) recommended by the manufacturer of the compressor unit. The selected tube diameter(s) must maintain adequate refrigerant velocities at all operating conditions.

Routing: To prevent residual or condensed refrigerant from "free-flowing" toward the compressor, install the suction line so it slopes slightly — 1 inch per 10 feet of run [1 cm per 3 m] — toward the evaporator. Avoid putting refrigerant lines underground. Refrigerant condensation, installation debris inside the line, service access, and abrasion/corrosion can quickly impair system reliability.

Insulation: After operating the system and testing all fittings and joints to verify the system is leak-free, insulate the suction

lines to prevent heat gain and unwanted condensation.

Components: Installing the suction line requires field installation of these components: an access port and possibly a suction filter. Position them as close to the compressor as possible.

• **Access port:** The access port is used to determine suction pressure and adjust the TEV. It should be located near the external equalizer line connection. This port is usually a Schraeder valve with a core.

• **Suction filter:** If required by the compressor unit, a replaceable-core suction filter is installed as close to the compressor unit as possible. Adding manual, ball-type shutoff valves upstream and downstream of the filter simplifies replacement of the filter core.

Field-Installing Evaporator Piping

See Figure I-MR-3 and refer to the instructions below to field-install evaporator piping.

1 Pitch the liquid line slightly—1 in./10 ft [1 cm/3 m] — so that the refrigerant drains toward the evaporator.

2 Provide one expansion valve per distributor.

3 Slightly pitch the outlet line from the suction header toward the suction riser — that is, 1 in./10 ft [1 cm/3 m] in the direction of flow. Use the tube diameter that matches the suction-header connection.

4 For the vertical riser, use the tube diameter recommended by the condensing unit manufacturer. Assure the top of the riser is higher than the evaporator coil.

5 Arrange the suction line so the refrigerant vapor leaving the coil flows downward, below the suction-header outlet, before turning upward.

6 Pitch the suction line slightly—1 in./10 ft [1 cm/3 m] — so the refrigerant drains toward the evaporator.

7 Insulate the suction line.

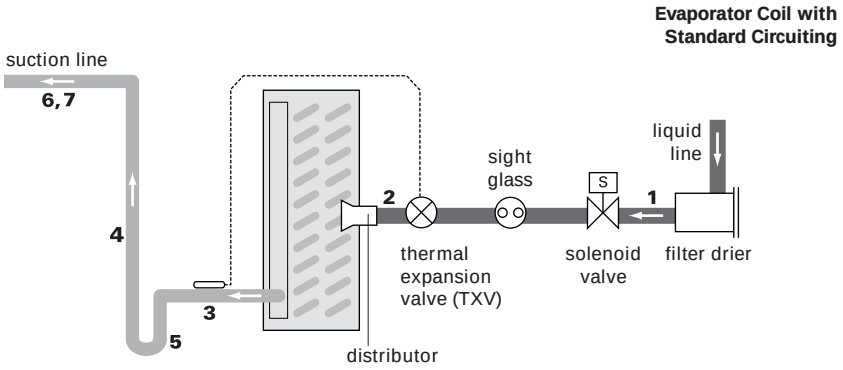


Figure I-MR-3. Field-installed evaporator piping example

Unit Wiring Diagrams

Specific unit wiring diagrams are provided on the inside of the control panel door. Typical unit wiring diagrams are in the Maintenance section on pages 58–69. Use these diagrams for connections or trouble analysis.

Supply Power Wiring

It is the installer's responsibility to provide power supply wiring to the unit terminal block or the non-fused disconnect switch option. Wiring should conform to NEC and all applicable code requirements.

Bring supply wiring through the knockout in the unit control box. Connect the three phase wires to the power terminal block or the non-fused disconnect switch in the control box terminals. Refer to specific wiring diagrams and fuse information in the unit's control panel.

Refer to unit specific wiring diagrams for specific wiring connections. Locate unit wiring diagrams on the inside of the control box cover. Refer to the unit nameplate for unit specific electrical information, such as voltage, minimum circuit ampacity (MCA), and maximum fuse size (MFS).

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

CAUTION

Use copper conductors only!
Unit terminals are not designed to accept other conductor types. Failure to use copper conductors may cause equipment damage.

CAUTION

Correct phase critical!
Correct phase sequence is critical. If phase sequence of the incoming line voltage is not correct, it may cause motor damage.

Electrical Connections

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

1. **If the unit has no controls:** power and ground are tucked inside of the handy box.
2. **If the unit has a control interface or Tracer ZN controller:** power and ground are inside the control box. If the unit has a control interface or a Tracer controller, the power wires and ground wire are inside the control box connected to a non fused disconnect switch.
3. **If the unit has a electric heat:** power and ground connections are inside the electric heat control box, connected to a non-fused disconnect switch or terminal block.

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 controller, avoid creating ground loops with grounded conductors external to the unit control circuit. Ground loops can affect the measurement accuracy of the controller.

Note: Unit transformer IT1 provides power to the blower coil unit only and is not intended for field connections. Field connections to the transformer IT1 may cause 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.

The installer must provide interconnection wiring to connect wall mounted devices such as a 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 I-ER-1 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 I-ER-1. Zone Sensor Maximum Wiring Distances, ft (m)

Wire Size Range	Max. Wiring Distance
16 - 22 AWG	200 (60.96)

Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS) Calculations for Units with Electric Heat

Use these formulas to calculate the MCA and MFS.

Heater amps = (heater kW x 1000)/ heater voltage

Note: Use 120V heater voltage for 115V units. Use 240V heater voltage for 230V units. Use 480V heater voltage for 460V units. Use 600V heater voltage for 575V units.

MCA = 1.25 x (heater amps + all motor FLA's)

MFS or HACR type circuit breaker = (2.25 x largest motor FLA) + second motor FLA
+ heater amps (if applicable)

HACR (Heating, Air-Conditioning and Refrigeration) type circuit breakers are required in the branch circuit wiring for all units with electric heat.

See Table I-ER-2 for electric heat kW and Table I-ER-3 on page 22 for motor FLAs.

Select a standard fuse size or HACR type circuit breaker equal to the MCA. Use the next larger standard size if the MCA does not equal a standard size.

Standard fuse sizes are: 15, 20, 25, 30, 35, 40, 45, 50, 60 amps

Useful Formulas

kW = (cfm x ΔT)/3145
ΔT = (kW x 1000)/voltage
Single phase amps = (kW x 1000)/voltage
Three phase amps = (kW x 1000)/ (voltage x 1.73)
Electric heat MBh = (Heater kW) (3.413)

Table I-ER-2. Available Electric Heat Kw (min.-max)

	Unit Size						
Voltage	**12**	**18**	**24**	**36**	**54**	**72**	**90**
115/60/1	1-3	1-3	1-3	1-3	1-3	1-3	1- 3
208/60/1	1-4	1-6	1-8	1-8	1-8	1- 8	1-8
230/60/1	1-4	1-6	1-8	1-8	1-8	1-8	1-8
277/60/1	1-4	1-6	1-8	1-11	1-11	1-11	1-11
208/60/3	1-4	1-6	1-8	1-11	1-12	1-12	1-12
230/60/3	1-4	1-6	1-8	1-11	1-12	1-12	1-12
460/60/3	1.5-4	1.5-5	1-8	1-11	1-16	1-21	1-30
575/60/3	2-4	2-4	1-8	1-11	1-16	1-21	1-30
220/50/1	1-4	1-6	1-8	1-8	1-8	1-8	1-8
240/50/1	1-4	1-6	1-8	1-8	1-8	1-8	1-8
380/50/3	1-4	1-5	1-8	1-11	1-16	1-20	1-28
415/50/3	1.5-4	1.5-5	1-8	1-11	1-16	1-21	1-30
190/50/3	na	na	na	na	na	na	na

Notes:
1. Heaters are available in the following Kw increments : 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 24.0, 26.0, 28.0, 30.0.
2. Magnetic contactors are standard. Mercury contactors are available on horizontal units only.
3. Units with electric heat are available with or without door interlocking disconnect switch.
4. Units with electric heat are available with or without line fuses.
5. Units with electric heat must not be run below the minimum cfm listed in the general data section.
6. Electric heat is balanced staging: 1 stage = 100%, 2 stages = 50%/50%
7. Electric heat is not available on 190/50/3 units.

Table I-ER-3. Motor Electrical Data

Voltage	voltage range	rpm	rated hp	lbs.	fla	lra
115/60/1	104-126	1750	1/3	18	5.8	22.8
			1/2	21	7.2	30.4
			3/4	29	12.0	58.4
			1.0	29	12.8	58.4
two-speed						
115/60/1	104-126	1750/1160	3/4	40	8.9/6.1	42.0
			1.0	41	11.5/8.1	58.2
208-230/60/1	187-253	1750	1/3	18	3.1	11.4
			1/2	21	3.6	15.2
			3/4	29	6.0	29.2
			1.0	29	6.4	29.2
277/60/1	249-305	1750	1/3	15.5	2.5	12.1
			1/2	21.5	3.6	19.3
			3/4	25	4.3	25.3
			1.0	29	5.6	32.6
208/60/3	187-229	1750	1/2	22	2.3	11.4
			3/4	26	2.9	15.9
			1.0	28	3.5	20.2
			1.5	29	4.8	30.0
			2.0	34	6.2	38.5
			3.0	49	8.6	55.1
230/60/3	207-253	1750	1/2	22	2.4	12.8
			3/4	26	3.0	18.6
			1.0	28	3.6	23.0
			1.5	29	4.8	33.4
			2.0	34	6.2	43.6
			3.0	49	8.6	62.0
460/60/3	414-506	1750	1/2	22	1.2	6.4
			3/4	26	1.5	9.3
			1.0	28	1.8	11.5
			1.5	29	2.4	16.7
			2.0	34	3.1	21.8
			3.0	49	4.3	31.0
575/60/3	518-632	1750	3/4	20.5	1.1	7.5
			1.0	22.5	1.4	9.0
			1.5	31	1.9	13.3
			2.0	36	2.5	17.9
			3.0	49	3.3	23.7
220/50/1	198-242	1450	1/3	20.5	3.0	15.6
			1/2	25	3.6	20.5
			3/4	29	5.2	25.6
			1.0	38	9.3	52.2
240/50/1	216-264	1450	1/3	20.5	3.3	17.1
			1/2	25	4.0	22.7
			3/4	29	5.5	39.1
			1.0	38	10.6	57.8
190/50/3	171-209	1450	1/3	22	1.1	5.6
380/50/3	342-418		1/2	26	1.4	7.8
			3/4	28	1.7	9.8
			1.0	29	2.1	14.6
			1.5	34	2.8	18.7
			2.0	49	3.6	27.2
415/50/3	374-456	1450	1/3	22	1.2	6.8
			1/2	26	1.5	9.4
			3/4	28	1.9	11.0
			1.0	29	2.5	17.4
			1.5	34	3.1	22.6
			2.0	49	3.6	32.3

Installing the Unit

Follow the procedures below to install the blower coil unit.

Horizontal Units, Model BCHC
Install horizontal units suspended from the ceiling with $^3/_8$" threaded rods that are field provided. There are two knockouts in each corner of the unit for installation of the threaded rods. Ensure the ceiling opening is large enough for unit installation and maintenance requirements.

BCHC Installation Procedure

Materials needed:
- threaded rods, $^3/_8$" (4)
- nuts (8)
- flat washers or steel plates (8)
- vibration isolator hangers or turnbuckles (4)

1. Determine the unit mounting hole dimensions. Prepare the hanger rod isolator assemblies, which are field provided, and install them in the ceiling. Trane recommends using threaded rods to level the unit. Consult the unit nameplate or the Dimensions and Weights section in this manual for the unit weight. See Figure I-IP-1 for proper horizontal unit installation.
2. Remove motor access panels and filter access panels.
3. Punch out the eight knockouts in the top and bottom panels.
4. Guide the threaded rod through the unit from the top, careful not to damage insulation or wiring. See Figure I-IP-2. Insert the threaded rod at an angle to help prevent internal unit damage.
5. Put a nut and large flat washer or steel plate on the bottom of the threaded rod. See Figure IP-I-3.
6. Put a nut and flat washer or steel plate on the top to prevent air leakage.
7. Thread the top of the rod into the isolator or turnbuckle.
8. Hoist the unit to the suspension rods and attach with washers and lock–nuts. See Figure I-IP-1 for details.
9. Level the unit for proper coil drainage and condensate removal from the drain pan. Refer to the condensate drain trap instructions on page 20.
10. Connect the ductwork to the unit. Refer to the Duct Connection section on page 20.

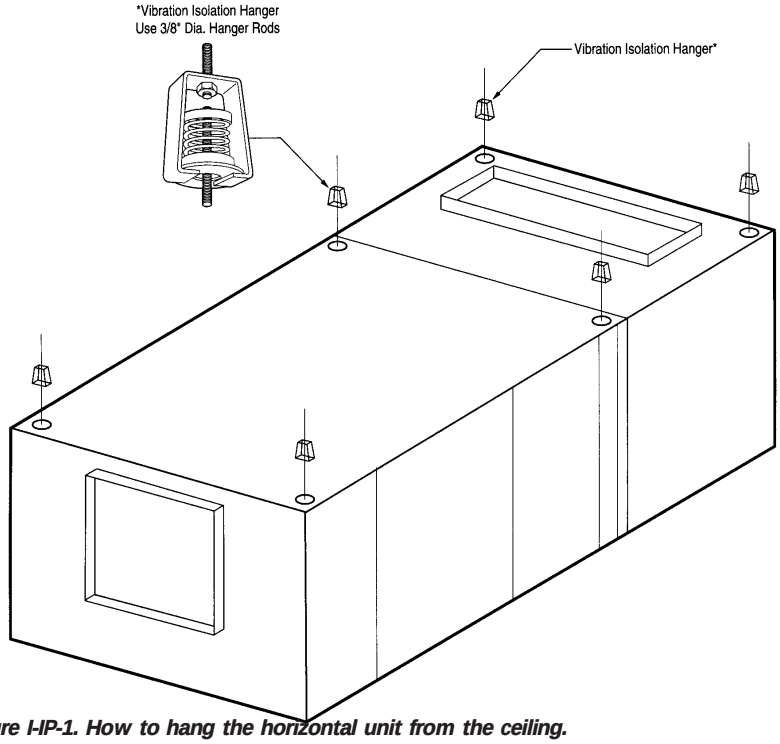


Figure I-IP-1. How to hang the horizontal unit from the ceiling.

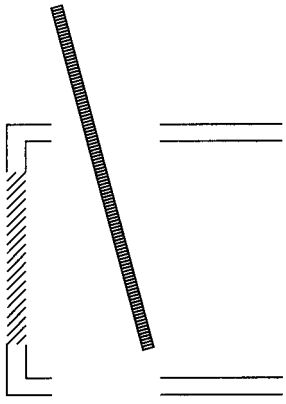


Figure I-IP-2. When inserting the threaded rod through the unit knockouts, angle it through the top, careful not to damage unit coil or insulation.

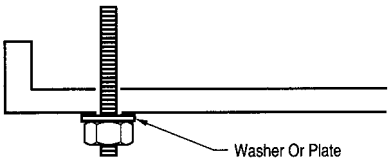


Figure I-IP-3. Correct placement of washer or steel plate and nut between threaded rod and unit. This helps prevent air leakage.

Vertical Units, Model BCVC
Install vertical units on the floor. Units are provided with legs that are field-installed to help accomodate a U-trap on the drain connection, if necessary. A field-fabricated inlet plenum is not required. The unit is shipped in two pieces, and can be arranged in either a pre-swirl or counter-swirl inlet configuration. See Figure I-IP-4.

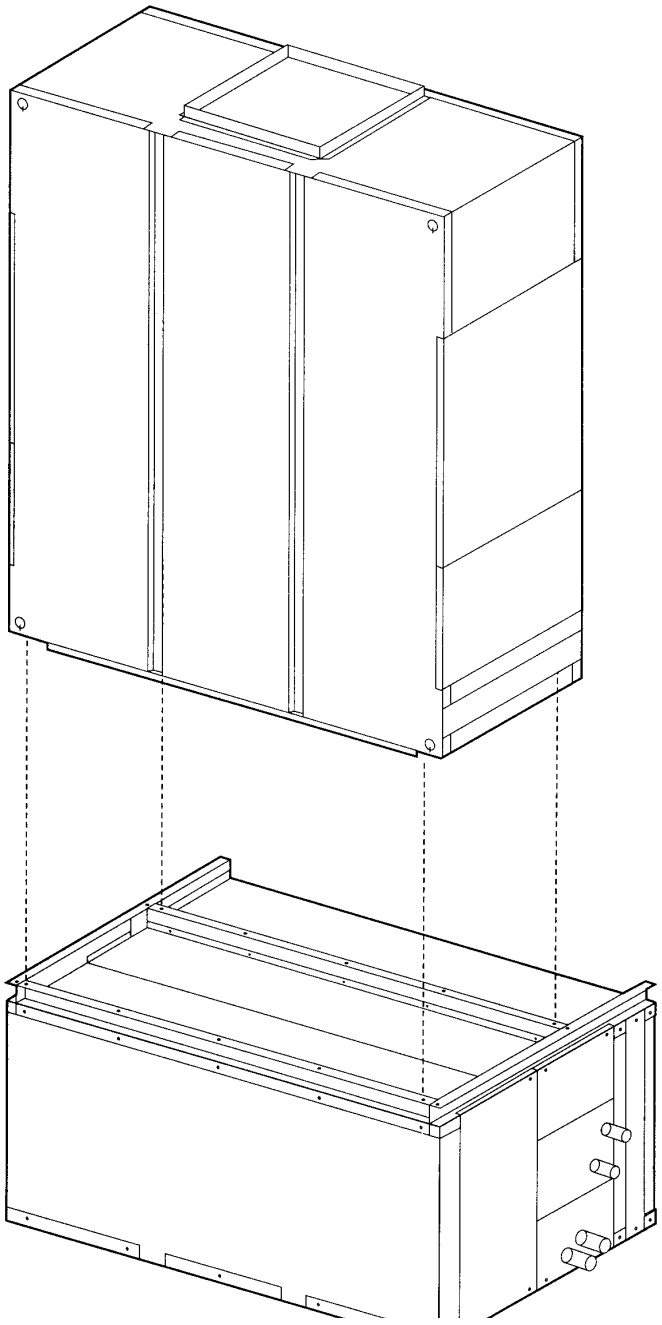


Figure I-IP-4. Typical vertical unit installation.

Heating Coil Option

Note: The hydronic heating coil option is factory installed in either the reheat or preheat position. Coils can be rotated for either right or left-hand connections.

If you need to rotate the hydronic heating coil option to change the coil connection side, follow the procedure below.

1. Remove both coil access panels.
2. Remove the coil and rotate to change connection position.
3. Exchange coil patch plates.
4. Knock out drain pipe connections on new coil hand access panel.
5. Plug old drain connections.

Mixing Box Option

Materials provided:

- mounting legs
- interconnecting linkage, LH or RH attachment

Materials needed:

- grooved and extendible drive rods, $^1/_2$-inch O.D. grooved
- screws

The mixing box option ships separately for field installation. It has two low-leak, opposed blade dampers and all necessary interconnecting linkage components for left or right hand attachment onto $^1/_2$-inch O.D. grooved, extendible drive rods. Also, mounting legs are provided for floor mounting on a vertical unit. Knockouts are provided to suspend the mixing box from the ceiling horizontally.

Mixing Box Installation Procedure

1. Support the mixing box independent of the unit in the horizontal position.
2. Install the mixing box as a sleeve around the duct collar of the filter frame. To attach the mixing box to the filter frame, insert screws through the matching the holes on all sides of the mixing box and filter frame.
3. Install the linkage, following the procedure below.

Linkage Installation Procedure

1. Attach the linkage on either the right or left side of the mixing box following the procedure below.
2. Open the damper blades fully. Locate drive rods on the LH or RH side for linkage attachment. Loosen drive rod set screw, without removing.
3. Remove knockouts on side access panel adjacent to the drive rods.
4. Pierce a hole through the insulation at the knockouts to allow the drive rod to extend freely through side of mixing box. Cut away insulation sufficiently to allow drive rod to turn smoothly.
5. Extend drive rod end at desired position beyond side of unit. Tighten drive rod set screws.
6. Attach linkage and tighten all set screws. Note that neither hand levers are provided. However, mixing box actuators are a factory-provided option that ship inside the mixing box when ordered.
7. Position linkage so both sets of dampers operate freely and so that when one damper is fully open, the other is fully closed.

Installing Wall Mounted Controls

Wall mounted zone sensors ship taped to the control box. Refer to Figure I-IP-5 for zone sensor dimensions.

Position the controller on an inside wall three to five feet above the floor 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.

Before beginning installation, follow the wiring instructions below. Also, refer to the unit wiring schematic for specific wiring details and point connections.

Wiring Instructions

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 controller, such as outside walls or unoccupied spaces.
- Concealed pipes, air ducts, or chimneys in partition spaces behind the controller.

Zone Sensor Installation

Follow the procedure below to install the zone sensor module. See Figure I-IP-5.

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 $^{3}/_{16}$" diameter holes approximately one-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" x 4" 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.

If installing a Tracer ZN510 or ZN520 zone sensor, see the Tracer Summit Communication section regarding communication wiring on page 27 for more information.

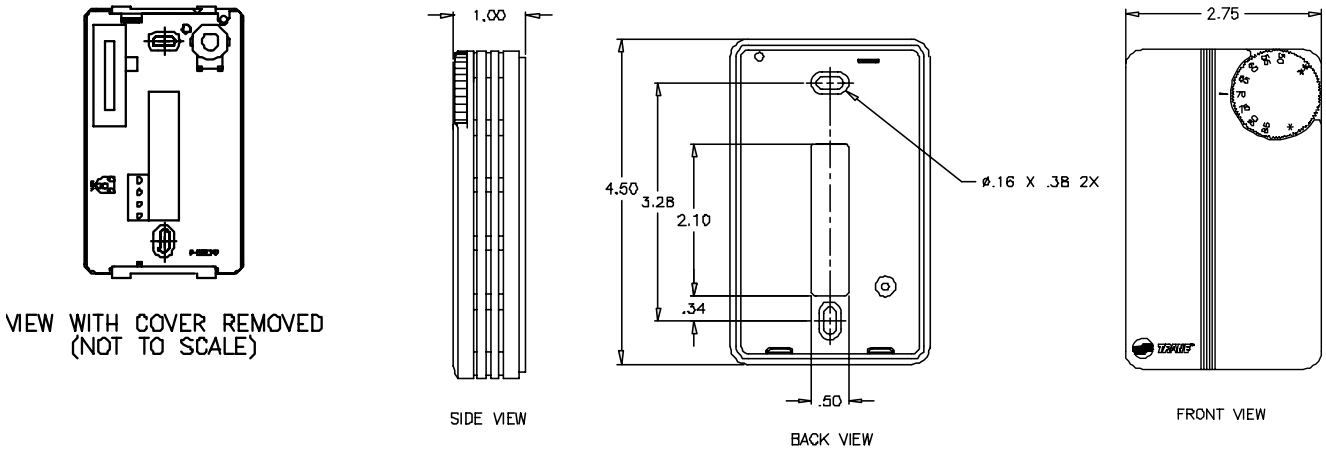


Figure I-IP-5. Wall mounted zone sensor dimensions.

Communication Wiring

Units with Tracer ZN510 or ZN520 Only

Note: Communication link wiring is a shielded, twisted pair of wire and must comply with applicable electrical codes.

Follow these general guidelines when installing communication wiring on units with either a Tracer ZN510 or ZN520 controller:

- 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 using Rover™ service software connected to the Tracer ZN controller using a twisted wire pair to one of the following connection points:

- Remote zone sensor module
- Connections on the board

This allows the technician to view and edit the Tracer controller configuration and troubleshoot the unit.

Note: Unit control options and field-wiring practices may limit the controller's communication ability.

Route interconnecting wiring from the Tracer controller to provide service communication at the wall-mounted zone sensor module. Install wiring by referencing the unit wiring diagram and Table I-ER-1 on page 20 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 computer running Trane Rover software to communicate.

Zone Sensors Without Interconnecting Wiring

Establish service communication to the Tracer ZN controller by wiring directly to the board inside the control box. Refer to the unit-wiring diagram for appropriate communication terminals on the board.

Once wiring is complete, Use Trane Rover™ software to communicate to the Tracer ZN controller.

Unit Startup

Refer to the Trane publication, *CNT-SVX04A-EN Installation Operation and Programming Guide,* to operate the Tracer ZN controller with Trane Integrated Comfort™ System (ICS). The factory pre-programs the Tracer ZN controller 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 controller in a stand-alone operation:

1. Turn power on at the disconnect switch option.
2. Position the fan mode switch to either high, 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°F and less than 85°F.
2. For a two-pipe 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° lower than room temperature) 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 controllers have Comm5 communication ports. 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

Each controller has its own unique address or I.D. number on a Neuron chip. Setting dip switches are not required on the Tracer controller.

Tracer Summit™ Communication Wiring

For Tracer ZN 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 controller, taping the opposite end of each shield to prevent any connection between the shield and anther ground. Refer to Trane publication, *CNT-SVX04A-EN 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. Tracer Summit® Communication Wiring

Pre-Startup Checklist

Complete this checklist after installing the unit to verify all recommended installation procedures are complete before unit startup. This does not replace the detailed instructions in the appropriate sections of this manual. Disconnect electrical power before performing this checklist. Always read the entire section carefully to become familiar with the procedures.

⚠ WARNING

Hazardous Voltage!

Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

Receiving

- ☐ Inspect unit and components for shipping damage. File damage claims immediately with the delivering carrier.
- ☐ Check unit for missing material. Look for ship-with drives, isolators, filters, and sensors that are packaged separately and placed inside the main control panel, fan section, or compressor section. See the "Receiving and Handling" section on page 7.
- ☐ Check nameplate unit data so that it matches the sales order requirements.

Unit Location

- ☐ Remove crating from the unit. Do not remove the shipping skid until the unit is set in its final position.
- ☐ Ensure the unit location is adequate for unit dimensions, ductwork, piping, and electrical connections.
- ☐ Ensure access and maintenance clearances around the unit are adequate. Allow space at the end of the unit for shaft removal and servicing. See the "Service Access" section on page 7.

Unit Mounting

- ☐ Place unit in its final location.
- ☐ Remove shipping skid bolts and skid.
- ☐ If using isolators, properly mount unit according to the isolator placement sheet.

Component Overview

- ☐ Verify the fan and motor shafts are parallel.
- ☐ Verify the fan and motor sheaves are aligned.
- ☐ Check the belt tension for proper adjustment. Adjust the belt tension if it is floppy or squeals continually.
- ☐ Ensure the fan rotates freely in the correct direction.
- ☐ Tighten locking screws, bearing set screws and sheaves.
- ☐ Ensure bearing locking collars do not wobble when rotated and correct torque settings. Refer to Table M-MP-1 on page 43 for recommended torques.
- ☐ Verify that a clean air filter is in place.

Ductwork

- ☐ If using return ductwork to the unit, secure it with three inches of flexible duct connector.
- ☐ Extend discharge duct upward without change in size or direction for at least one and one half fan diameters.
- ☐ Use a 3" flexible duct connection on discharge ductwork.
- ☐ Ensure trunk ductwork is complete and secure to prevent leaks.
- ☐ Verify that all ductwork conforms to NFPA 90A or 90B and all applicable local codes

Unit Piping

- ☐ Verify the condensate drain piping is complete for the unit drain pan. Install and tighten the condensate "P" trap drain plug.
- ☐ Make return and supply water connections to the unit and/or piping package.
- ☐ Ensure the drain pan and condensate line are not obstructed. Remove any foreign matter that may have fallen into the drain pan during installation.
- ☐ Verify that piping does not leak. Make sure drain lines are open while performing the leak test.
- ☐ Treat water to prevent algae, slime, and corrosion.
- ☐ Connect refrigerant piping lines.

Electrical

- ☐ Check all electrical connections for tightness.
- ☐ Verify motor voltage and amps on all phases with the unit nameplate ratings to ensure unit operates correctly.

Unit Panels

- ☐ Ensure all unit access panels are in place and that all screws, nuts, and bolts are tightened to their proper torques.

Note: During the unit break-in period, bearing temperature may be 150–160°F. during normal operation bearing temperature should range be 90–100°F.

Figure C-1. ZN010 Control Board

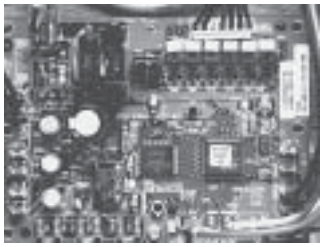


Figure C-2. ZN510 Control Board

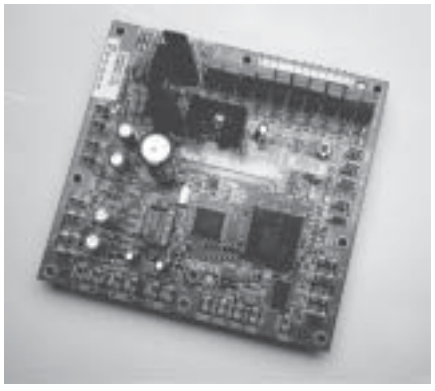


Figure C-3. ZN520 Control Board

Control Options

Blower coil air handlers are available without controls or with one of four different control options:

- Control interface
- Tracer ZN010
- Tracer ZN510
- Tracer ZN520

Units without controls have a junction box mounted on the drive side for motor power wire terminations. The controller is easily accessible in the control box for service. Control option descriptions follow below.

Control interface

The control interface is for use with a field–supplied low voltage thermostat. It includes a control box with a transformer, motor contactor, and disconnect switch. All hot leads to the motor are disconnected at the contactor and disconnect switch to eliminate the risk of shock during service. The end devices are mounted with the wires pulled and terminated inside the two–sided terminal strip. All customer connections other than power are on the outside of the two-sided terminal strip.

Tracer® Controls

The Tracer family of controllers, ZN010; ZN510; and ZN520, offer the combined advantages of simple and dependable operation with the latest Trane-designed controller. Standard control features include options normally available on more elaborate control systems. All control options are available factory-configured or can be field-configured using Rover™ service software. For more detailed information, refer to the Trane publication number, *CNT-IOP-1 or CNT-SVX04A-EN.*

Tracer ZN010

Tracer ZN010 is a stand-alone microprocessor controller.

Tracer ZN510 and ZN520

ZN510 can be used as either a stand-alone or as part of a Trane Integrated Comfort System (ICS).

In the stand-alone configuration, ZN510 or 520 receives operation commands from the zone sensor and/or the auto changeover sensor (on auto changeover units). ZN520 also receives commands from the discharge air sensor. The entering water temperature is read from the auto changeover sensor and determines if the unit is capable of cooling or heating. The zone sensor module is capable of transmitting the following information to the controller:

- Timed override on/cancel request
- Zone setpoint
- Current zone temperature
- Fan mode selection (off-auto-high-low)

For optimal system performance, blower coil units can operate as part of an Integrated Comfort™ System (ICS) building automation system controlled by Tracer Summit®. The controller is linked directly to the Summit control panel via a twisted pair communication wire, requiring no additional interface device (i.e., a command unit). The Trane ICS system can monitor or override ZN520 control points. This includes such points as temperature and output positions.

Rover™ Service Software

This windows-based software package option allows field service personnel to easily monitor, save, download, and configure Tracer controllers through a communication link from a portable computer. When connected to the communication link, Rover can view any Tracer controller that is on the same communication link.

Operation

General Information

Table O-GI-1. Tracer Controller Input/Output Summary

	Tracer Controller		
	ZN010	ZN510	ZN520
Binary Outputs			
2-speed fan	✔	✔	✔
2-position hydronic valve	✔	✔	✔
2-position mixing box damper	✔	✔	
1-stage electric heat	✔	✔	✔
modulating mixed air damper			✔
modulating hydronic valve			✔
2-stage electric heat			✔
reheat (hydronic)			✔
generic	✔	✔	✔
Binary Inputs			
condensate overflow detection	✔	✔	✔
low temperature detection	✔	✔	✔
occupancy	✔	✔	✔
generic input	✔	✔	✔
Analog Inputs			
zone temperature	✔	✔	✔
setpoint	✔	✔	✔
fan mode: auto, high, low	✔	✔	✔
entering water	✔	✔	✔
discharge air	✔	✔	✔
outside air			✔
generic			✔

Note: The generic input and output are for use with a Tracer Summit system only.

Table O-GI-2. Tracer Controller Function Summary

	Tracer Controller		
	ZN010	ZN510	ZN520
Control Functions			
entering water temp. sampling (purge)	✔	✔	✔
timed override	✔	✔	✔
auto changeover	✔	✔	✔
fan cycling	✔	✔	
warmup	✔	✔	✔
pre-cool	✔	✔	✔
data sharing (master/slave)		✔	✔
random start	✔	✔	✔
dehumidification			✔
staged capacity (2-stage electric supplementary)			✔
DX cooling			✔
Other Functions			
manual test	✔	✔	✔
filter maintenance timer	✔	✔	✔
setpoint limits	✔	✔	✔

Table O-GI-3. End Device Option Availability

Device	Control Interface	Tracer ZN010	Tracer ZN510	Tracer ZN520
condensate float switch	✔	✔	✔	✔
low limit	✔	✔	✔	✔
filter status	✔			
filter run-time diagnostic	✔	✔	✔	
fan status	✔			✔
positive proof fan status switch	✔			✔
2-position control valves	✔	✔	✔	✔
modulating control valves	✔			✔
2-position mixing box actuator	✔	✔	✔	
modulating mixing box actuator	✔			
1-stage electric heat	✔	✔	✔	✔
2-stage electric heat	✔			✔
Frostat™ protection (DX coils)	✔			✔

Note: Units with a DX coil are provided with a DX cool relay if unit has the control interface or Tracer ZN510 controls.

Tracer ZN Controller Sequence of Operation

Power-Up Sequence
When 24 VAC power is initially applied to the Tracer® ZN controller, the following sequence occurs:
- all outputs are controlled off
- Tracer reads all input values to determine initial values,
- the random start time (0-25 seconds) expires, and
- normal operation begins.

Tracer ZN Modes of Operation
Tracer ZN controllers operate the fan in one of the modes listed below as noted:
- occupied
- unoccupied
- occupied standby (Tracer ZN510 or ZN520 only)
- occupied bypass
- Tracer Summit with supply fan control (Tracer ZN510 or ZN520 only)

Note: The Tracer ZN520 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.

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.

Occupancy Sources
There are four ways to control the Tracer ZN controller's occupancy, as noted below:
1. By pressing the zone sensor's timed override "on" button
2. Occupancy binary input, either normally open or normally closed, see Table O-SO-1 for occupancy sensor states
3. Default operation of the controller (occupied mode)
4. Communicated request, usually provided by the building automation system (BAS) or peer device (available on Tracer ZN510 and ZN520 only)

A communicated request will control the controller's occupancy. Typically, this request comes from the BAS time-of-day scheduling to the controller. However, if a communication request from a BAS or peer controller 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.

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.

For complete information about Tracer Summit application setup using the Tracer ZN controller, see the Tracer Summit product literature. For more information on the setup of another BAS, refer to the product-specific literature from that manufacturer.

Occupied Mode
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 (Tracer ZN520 only),
- 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.

Note: Heating and cooling setpoint high and low limits are always applied to the occupied and occupied standby setpoints.

Unoccupied Mode
When the controller is in the unoccupied mode, the controller attempts to maintain space temperature at the stored unoccupied heating or cooling setpoint based on the:
- measured space temperature,
- active setpoint , and
- control algorithm, regardless of the presence of a hardwired or communicated setpoint.

Similar to other controller configuration properties, the locally stored unoccupied setpoints can be modified using Rover™ service tool.

During 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 heating mode, when the space temperature is below the heat setpoint, the primary heating capacity turns on. All capacity turns off when the space temperature is between the unoccupied cooling and heating setpoints. Note that primary heating or cooling capacity is defined by the unit type and whether heating or cooling is enabled or disabled. For example, if the economizer is enabled (Tracer ZN520 only) and possible, it is the primary cooling capacity. If hydronic heating is possible, it will be the primary heating capacity.

Occupied Standby Mode (Tracer ZN510 or ZN520 only)
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.

During occupied standby mode, the Tracer ZN520 controller's economizer damper position goes to the economizer standby minimum position.

Note: The economizer standby minimum position can be changed using Rover service tool.

Table O-SO-1. 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

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 controller reduces heating/cooling demand for the space. Also, units with Tracer ZN520 and the fresh air economizer damper use the economizer standby minimum position to reduce heating and cooling demand.

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, Tracer ZN510 or ZN520 Only
The controller can be placed in occupied bypass mode by either communicating an occupancy bypass request to the controller or by using the timed override "on" button on the zone sensor. When the controller is in unoccupied mode, pressing the "on" button will place the controller into occupied bypass mode for the duration of the bypass time (typically 120 minutes).

Tracer Summit With Supply Fan Control, Tracer ZN510 or ZN520 Only
All Tracer ZN 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-SVX04A-EN Installation Operation and Programming Guide*, for specific Tracer ZN520 operating procedures.

Cooling Operation

During cooling mode, the Tracer ZN controller attempts to maintain the space temperature at the active cooling setpoint. Based on the controller's occupancy mode, the active cooling setpoint is either the:
- occupied cooling setpoint,
- occupied standby cooling setpoint (Tracer ZN510 or ZN520 only), or
- unoccupied cooling setpoint.

The controller uses the measured space temperature, the active cooling setpoint, and discharge air temperature (Tracer ZN520 only) 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 cooling outputs (modulating or 2-position hydronic valve, or economizer damper) are controlled based on the cooling capacity output.

Note: Economizer dampers and modulating valves are only available on units with the Tracer ZN520 controller. Two-position dampers are only available on units with Tracer ZN010 and ZN510.

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 (Tracer ZN520 only) or cycled with 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 (2-position valves).

Note: 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.

Economizer Cooling (Tracer ZN520 Only)
The economizer provides cooling whenever the outdoor temperature is below the economizer enable setpoint and there is a need for cooling. The economizer operates to meet the space demand, with other forms of cooling enabling when the economizer cannot meet the demand alone. See economizer air damper operation for additional information.

DX Cooling (Tracer ZN520 only)
The controller does not use both the DX compressor and the economizer at the same time. This prevents problems where the entering air temperature is too low for the evaporator coil to operate as designed, which leads to compressor short cycling due to low discharge air temperatures.

Discharge Air Tempering (Tracer ZN520 Only)
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, fresh air is brought in through the fresh air damper and causes 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 controller attempts to maintain the space temperature at the active heating setpoint. Based on the controller's occupancy mode, the active heating setpoint can be:
- occupied heating,
- occupied standby heating (Tracer ZN510 or ZN520 only), or
- unoccupied heating.

Note: Unit diagnostics can affect the controller operation, causing unit operation to be defined as abnormal. Refer to the Troubleshooting section for more information about abnormal unit operation.

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 (ZN520 only) or cycled with 2-position valves. As the load increases, modulating outputs open further and binary outputs are energized longer. At 100% capacity, the modulating valve is fully open (Tracer ZN520 only) or on continuously with 2-position valves.

Economizer Damper (Tracer ZN520 Only) The economizer damper option is never used for as a source for heating, but only 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.

Dehumidification (Tracer ZN520 only) During dehumidification, the Tracer ZN520 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 (Tracer ZN520 only) 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.

Fan Mode Operation

For multiple fan speed applications, the Tracer ZN controller offers additional fan configuration flexibility. See Table O-SO-2 on page 35 for fan operation sequences. Separate default fan speeds for heating and cooling modes can be configured using Rover service software.

The fan runs continuously at selected speeds, high 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 O-SO-3 on page 35 for Tracer ZN520 default fan configuration for heating and cooling modes. 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 in auto, the fan speed can switch depending on the error. The fan speed increases as the space temperature rises above the active cooling setpoint.

Additional flexibility built into the controller allows you to enable or disable the local fan switch input. The fan mode request can be hardwired to any of the Tracer ZN controllers or communicated to the Tracer ZN510 or ZN520 controller. When both inputs are present, the communicated request has priority over the hardwired input. See Table O-SO-2 on page 35.

Fan Speed Switch
Off: Fan is turned off, two-position damper option spring-returns closed.

High or Low: Fan runs continuously at the selected speed. The two-position damper option opens to an adjustable mechanical stop-position.

Tracer ZN010 and ZN510
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. If the unit has a 2-speed fan, in cooling mode the fan cycles from off to high and in heating mode it cycles from off to low (factory default that can be field-adjusted using Rover service software). When no heating or cooling is required, the fan is off and the fresh air damper option closes. Units with 2-speed fans can also be field-configured using Rover to run at a defined speed when the fan speed switch is in the auto position.

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

Tracer ZN520
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

Table O-SO-2. Tracer ZN520 Fan Configuration

	Auto Fan Operation	Fan Speed Default
Heating	Continuous	Off Low High
Cooling	Continuous	Off Low High

single or two-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 high speed and the water valve repositions to maintain an equivalent capacity. The reverse sequence takes place with a decrease in required capacity.

Units with 2-speed fans on low or high: The fan will run continously at the selected speed and the valve option will cycle to meet setpoint.

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, or low). When fan mode is auto, the fan operates at the default fan speed.

During unoccupied mode, the fan is off. While unoccupied, the controller will heat or cool to maintain the unoccupied heating and cooling setpoints. In unoccupied mode, the fan runs on high speed only, with heating or cooling. See Table O-SO-7 on page 36

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. See Table O-SO-6 on page 36.

Fan Cycling Operation
Tracer ZN520 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 controller automatically holds the fan on for an additional 30 seconds. This 30-second delay allows the fan 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 controller automatically starts the fan on high speed and runs the fan at high speed for 0.5 seconds. This provides ample torque required to start all fan motors from the off position.

Table O-SO-3. Fan Sequence of Operation

Fan Speed	Tracer ZN Controller	Sequence of Operation
Off	all	• fan is off • control valves and damper option are closed • low air temperature detection option is still active
Low or High (Continuous Fan)	ZN010 ZN510	• fan operates continuously at selected speed • 2-position control valve option cycle as needed • 2-position damper option opens to an adjustable mechanical stop-position
Low or High (Continuous Fan)	ZN520	• fan operates continuously at selected speed • modulating control valve option cycles as needed
Auto Cycling)	ZN010 ZN510	• fan, 2-position damper cycle, & control valve cycle as (Fan needed • in cooling, fan cycles from off to high • in heating mode fan cycles from off to low • when heating/cooling is not required, the fan is off & the 2-position damper option closes
Auto	ZN520	• fan cycles between high and medium, and never turns off unless the controller is in unoccupied mode • modulating or 2-position control open to maintain setpoint

Fan Operation During Occupied Heating Modes

The ZN520 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 or low position, the fan runs continuously at the selected speed. Refer to the Troubleshooting section for more information on abnormal fan operation.

Table O-SO-4. Fan Mode Operation, Tracer ZN010 and ZN510

Fan Mode	Heating Mode Occupied	Unoccupied	Cooling Mode Occupied	Unoccupied
Off	off	off	off	off
Low	low	off/high (3)	low	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	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® ZN010 and ZN510 automatically starts the fan on high speed and runs for one-half of a second 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, ZN010 and ZN510 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 high.

Table O-SO-5. Valid Operating Range and Factory Default Setpoints, Tracer ZN010 & ZN510

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

Table O-SO-6. Local Fan Switch Enabled

Communicated	Fan Switch (Local)	Fan Operation Fan Speed Input
Off	Ignored	Off
Low	Ignored	Low
High	Ignored	High
Auto	Off	Off
	Low	Low
	High	High
	Auto	Auto (configured default, determined by heat/cool mode)

Table O-SO-7. 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
High	High	Off/High	High	Off/High
Auto (continuous)	Default fan sp.	Off/High	Default fan sp.	Off/High

Two and Four-Pipe Changeover Operation

Tracer ZN controllers offer accurate and reliable unit changeover using 2-way valves and the controller's entering water temperature sampling function. Only units using the main hydronic coil for both heating and cooling (2-pipe and 4-pipe changeover units) use the entering water temperature sampling function.

Two-pipe and 4-pipe changeover applications require an entering water temperature sensor to allow the main coil to be used for heating and cooling. This sensor is factory-provided and should be field-installed on the entering water pipe.

The entering water temperature sampling function periodically opens the two-way valve to allow temporary water flow, producing reliable entering water temperature measurement. To ensure accurate unit changeover without sacrificing the benefits of 2-way, 2-position valves, Tracer ZN controllers periodically test the entering water temperature on 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 correct water temperature from the central plant.

Entering Water Temperature Sampling Function

The entering water temperature (EWT) 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 EWT is satisfactory.

However, when the controller detects an incorrect water temperature based on heating or cooling mode, it invokes the entering water temperature sampling function. For example, when the measured EWT is too cool to heat or too warm to cool. For cooling the EWT needs to be five degrees below the measured space temperature. For heating, the EWT should be five degrees above the measured space temperature.

After the controller invokes the function, the unit opens the main hydronic valve for no more than three minutes before considering the measured EWT. The controller allows an initial stabilization period, equal to 30 seconds plus ½ the valve stroke time, to flush the coil. Once the temperature stabilization period expires, the controller compares the EWT against the effective space temperature (either hardwired or communicated) to determine whether the EWT is correct for the desired heating or cooling mode. If the EWT is not usable for the desired mode, the controller continues to compare the EWT 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 EWT exceeds the high EWT limit (110°F). When the EWT is warmer than 110°F, the controller assumes the EWT is hot because it is unlikely the coil would drift to a high temperature unless the actual loop temperature was very high.

If the EWT 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 EWT is valid for heating or cooling, it resumes normal heating/cooling control and effectively disables entering water temperature sampling until it is required.

Table O-SO-8. 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

Electric Heat Operation

Tracer ZN controllers support 1-stage electric heat. Also, Tracer ZN520 supports 2-stage electric heat. Tracer ZN520 cycles the electric heat 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.

Economizer Damper (Tracer ZN520 Only)

With a valid outdoor air temperature (either hardwired or communicated), Tracer ZN520 uses the modulating economizer damper as the highest priority cooling source. Economizer operation is only possible using a modulating damper during the occupied, occupied standby, unoccupied, and occupied bypass modes.

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

Table O-SO-9. Relationship Between Outdoor Temperature Sensors and Economizer Damper Position (Tracer ZN520 Only)

Outdoor Air Temperature	Modulating Fresh Air Damper Occupied or Occupied Bypass	Ocupied Standby	Unoccupied
None or invalid	Open to occupied minimum position	Open to occupied standby min. pos.	Closed
Failed	Open to occ. min.pos.	Open to occ. standby	Closed min. pos.
Present and economizer feasible	Economizing: min pos. to 100%	Economizing: between occ. standby min. pos. to 100%	Open and econ. only when unit operating, closed otherwise
Present and economizer not feasible	Open to occ. min. pos.	Open to occ. standby min pos.	Closed

Tracer Dehumidification (Tracer ZN520 Only)

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 (Tracer ZN510 or ZN520 Only)

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

Tracer ZN controllers have the following binary inputs, 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 (Tracer ZN520 only)

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

BIP1: Low Temperature Detection Option

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

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

Note: See the "Diagnostics" section 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 controller. 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, Tracer ZN controls unit devices as listed below:

Fan:	Off
Valves:	Closed
Electric heat:	Off

BIP3: Occupancy Sensor

Binary input #3 (BIP3) on Tracer ZN 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 6.

BIP4: Fan Status (ZN520 Only)

Binary input #4 (BIP4) on Tracer ZN is available for sensor, such as a binary switch or a timeclock, to detect occupancy. The sensor defaults normally open but can be configured as either normally open or closed.

Table O-SO-10. Binary Input Configurations

Binary Input	Description	Configuration	Controller Operation Contact closed	Contact open
BI 1	Low temperature detection (Note 1)	NC	normal	diagnostic (note 5)
BI 2	Condensate overflow (Note 1)	NC	normal	diagnostic (note 5)
BI 3	Occupancy	NO	unnnoccupied	occupied
BI 3	Generic binary input	NO	normal (note 3)	normal (note 3)
BI 4	Fan status (Note 1)	NO	normal	diagnostic

Note 1: During low temperature, condensate overflow, and fan status diagnostics, the Tracer® ZN520 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.

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

Analog Inputs

See Table O-SO-11 on page 40 for a complete description of analog inputs.

Binary Outputs

Binary outputs are configured to support the following:

- Two fan stages (when one or two fan stages are present, J1-2 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 fresh air damper (Tracer ZN520 only)
- One-stage baseboard heat

Table O-SO-11. Analog Inputs

Analog Input	Terminal	Function	Range	ZN010	ZN510	ZN520
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) 15137 to 16463 W (High)	✓	✓	✓
Ground	TB3-6	Analog ground	NA	✓	✓	✓
Analog Input 1	J3-1 J3-2	Entering water temperature Analog ground	-40° to 212°F (-40° to 100°C) NA	✓	✓	✓
Analog Input 2	J3-3 J3-4	Discharge air temperature Analog ground	-40° to 212°F (-40° to 100°C) 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 4-20 ma Humidity CO_2	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.
3) Changeover units include an entering water temperature sensor.

Table O-SO-12. Binary Output Configuration

Binary Output Pin Connection	Configuration	ZN010	ZN510	ZN520
J1-1	Fan high	✓	✓	✓
J1-2	N/A	✓	✓	✓
J1-3	Fan low			✓
J1-4	(Key)			✓
	Fan low	✓	✓	
J1-5	Main valve – open, or 2 pos. valve, (Note 1)	✓	✓	✓
J1-6	Aux. valve/elec. ht.	✓	✓	
	Aux. valve – close (Note 1)			✓
J1-7	2-pos. damper	✓	✓	
J1-9	Heat valve – open, or 2 pos. valve, or first stage elec. ht. (Note 1)			✓
J1-10	Heat valve – close or sec. stage elec. ht.(Note 1)			✓
J1-11	Fresh air damper - open			✓
J1-12	Fresh air damper - close			✓
TB4-1	Generic / baseboard heat output			✓
TB4-2	24 VAC			✓

Note:
1. 2-pipe hydronic heat/cool changeover units use terminals J1-5 and J1-6 to control the primary valve for both heating and cooling. Units configured and applied as 2-pipe hydronic heat/cool changeover with electric heat, use terminals J1-5 and J1-6 to control the primary valve (for both cooling and heating), and terminals J1-9 and J1-10 for the electric heat stage. For those 2-pipe changeover units, electric heat will not energize while the hydronic supply is hot (5 or more degrees above the space temperature). In a four-pipe application, pin J1-5 is for cooling and pin J1-6 for heating.
2. If no valves are ordered with the unit, the factory default for Tracer ZN010 and ZN510 controllers are:
   main valve configured as normally closed
   aux. valve configured as normally open
3. If the fresh air damper option is not ordered on the unit, 2-pos. damper is configured as none.
4. Pin J1-2 can be configured for an exhaust fan with the use of Rover Software.Factory default is none.

Zone Sensor

The Tracer ZN 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 mode switch
- Timed override , using “on” and “cancel” buttons (Tracer ZN510 and ZN520 only)
- Communication jack (Tracer ZN510 and ZN520 only)

Space Temperature Measurement
Zone sensors use a 10kW thermistor to measure the space temperature. Wall-mounted zone sensors include a space temperature thermistor. Unit-mounted zone sensors have a return air sensor mounted in the unit’s return airstream. If both a hardwired and communicated space temperature value exists, the controller ignores the hardwired space temperature input and uses the communicated value.

Local Setpoint
The zone sensor may be 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, high, or auto.

External Setpoint Adjustment
Zone sensors with an external setpoint adjustment (1kW) provide the Tracer ZN 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

Note: Only units with ZN510 or ZN520 can receive a communicated setpoint from Tracer or other building automation system. However, Rover service software can communicate with all Tracer ZN controllers.

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, 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 O-SO-13. Zone Sensor Wiring Connections

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

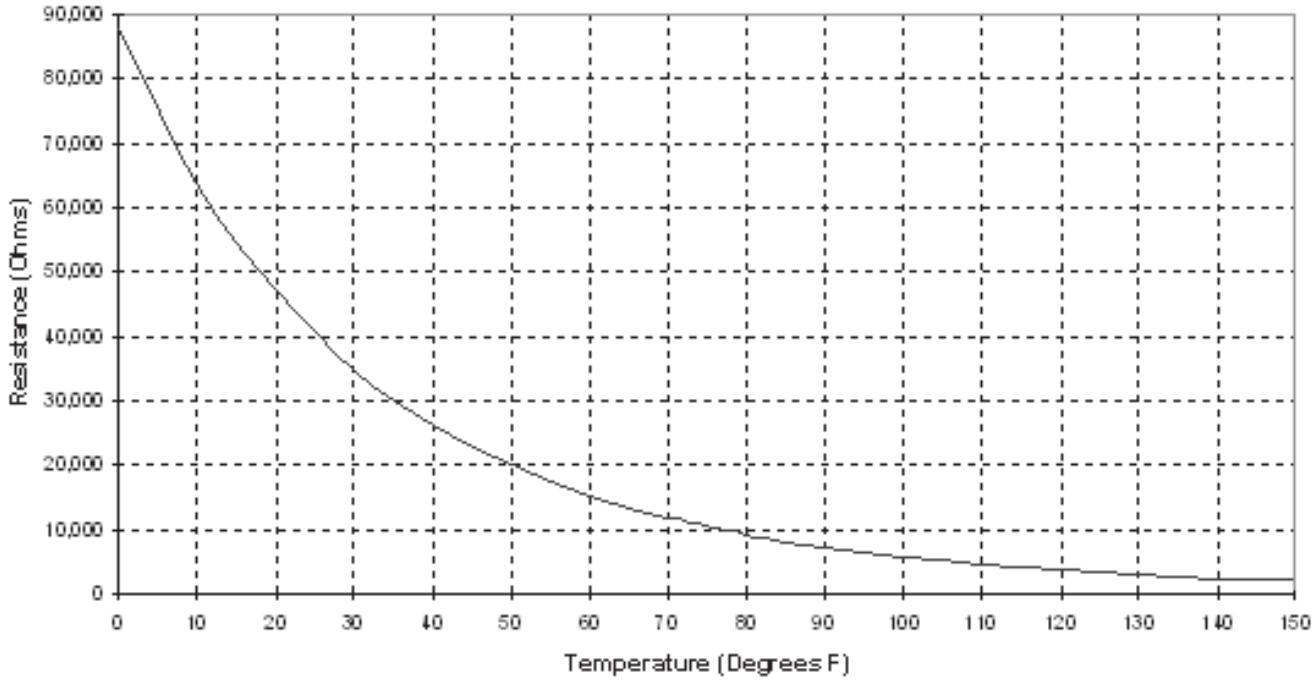


Figure O-SO-14. Resistance temperature curve for the zone sensor, entering water temperature sensor, and discharge air sensor.

Maintenance Procedures

Perform the following maintenance procedures to ensure proper unit operation.

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/ tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

Air Filters
Always install filters with directional arrows pointing toward the fan.

Fan Bearings
Fan bearings are permanently sealed and lubricated and do not require additional lubrication.

Fan Motors
Inspect fan motors periodically for excessive vibration or temperature. Operating conditions will vary the frequency of inspection and lubrication. Motor lubrication instructions are on the motor tag or nameplate. If for some reason these instructions are not available, contact the motor manufacturer. Some motor manufacturers may not provide oil tubes on motors with permanently sealed bearings.

Before lubricating the motor:
1. Turn the motor off and disconnect power to the unit to ensure themotor doesn't accidentally start.
2. Use a No. 10 SAE, non-detergent automotive type oil. Do not over-oil.

Sheave Alignment
To prevent interference of the fan frame with the belt, make sure that the belt edge closes to the motor has the proper clearnce from the fan frame as shown in Figure M-MP-1.

Align the fan and motor sheaves by using a straight–edge or taut string, as shown in Figure M-MP-2. The straight-edge must be long enought to span the distance between the sheave outside edges.

When the sheaves are aligned, the straigt–edge will touch both sheaves at points A through D, as shown in Figure M-MP-5 on page 44. For uneven width sheaves, place a string in the center groove of both sheaves and pull tight. Adjust sheaves and tighten the sheave set screws to the correct torques recommended in Table M-MP-1.

Fan Assembly Set Screws
Check and adjust fan wheel, bearing, and sheave set screws whenever a compnent is removed r an adjustment is made. Refer to Table M-MP-1 for recommendations.

Fan Belt Tension
Proper belt tension is necessary to endure maximum bearing and drive component life and is based on fan brake horsepower requirements. Replace belt when frayed or worn.

Fan belt tension should only be tight enough so the belt does not slip and maintains adequate airflow.

Note: Check fan belt tension at least twice during the first days of new belt operation since there is a rapid decrease in tension until belts are run-in.

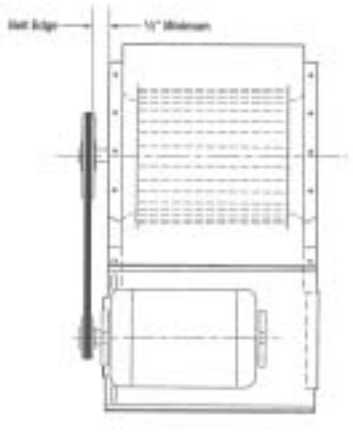


Figure M-MP-1. Clearance recommendation to prevent fan frame and belt interface.

Be careful not to over-tension fan belt. Excessive tension will reduce fan and motor bearing life, accelerate belt wear and possibly cause shaft failure. Clean the sheaves and belt with a dry cloth. Keep oil and grease away from the belt because they may cause belt deterioration and slippage. Trane does not recommend belt dressing.

CAUTION

Belt tension!
Do not over-tension belts. Excessive belt tension will reduce fan and motor bearing life, accelerate belt wear, and possibly cause shaft failure.

Coil Maintenance

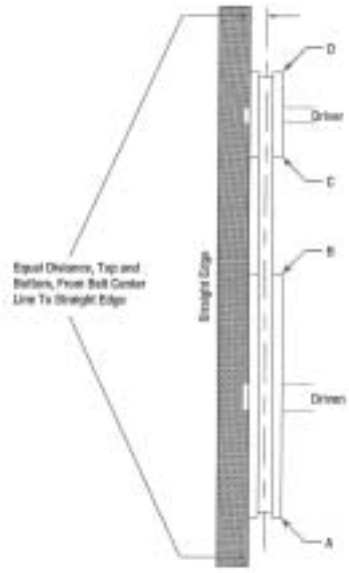


Figure M-MP-2. Correct sheave alignment.

Table M-MP-1. Recommended Torques for Tightening Sheaves and Bearing Thrust Collar

	Torque In-lbs	Ft-lbs	N-m
Sheave Setscrew	144	12	16.3
Bearing Thrust Collar	66	5.5	7.5
Fan Wheel Setscrew	144	12	16.3

Table M-MP-2. BCHC/BCVC Fan, Filter, & Mixing Box General Data

Unit Size	**12**	**18**	**24**	**36**	**54**	**72**	**90**
nominal cfm	400	600	800	1200	1800	2400	3000
airflow							
minimum cfm	250	375	500	750	1125	1500	1875
maximum cfm	500	675	1000	1600	2400	3000	4000
Fan Data							
fan wheel dia., in.	9.5 x 4.5	9.5 x 4.5	9.5 x 4.5	9.5 x 4.5	9.5 x 4.5	9.5 x 4.5	9.5 x 4.5
max rpm	2300	2300	1800	1800	1500	1500	1500
motor hp	0.33-1.0	0.33-1.0	0.33-1.0	0.33-1.5	0.33-2.0	0.33-3.0	0.33-3.0
Unit Flat Filter							
qty. - size, in.	1 - 12x 24	1 - 12x 24	1 - 16x 25	2 - 16x 20	1 - 20x 20 1 - 20x 25	3 - 16x 25	2 - 20x 25 1 - 16x 25
area, sq. ft.	2.000	2.000	2.778	4.444	5.556	6.250	8.333
velocity, ft./min.	200	300	288	270	324	384	360
Angle Filter							
qty. - size, in.	2 - 12x24	2 - 12x24	2 - 12x24	2 - 20x20	4 - 16x20	4- 16x20	4- 20x20
area, sq. ft.	4.000	4.000	4.000	5.556	8.889	8.889	11.111
velocity, ft./min.	100	150	200	216	203	270	270
Bottom/Top Access Filter Box							
qty. - size, in.	1 - 12x20	1 - 12x24	1 - 16x25	1 - 16x20 1 - 16x16	1 - 16x20 1 - 20x20	1 - 20x25 1 - 20x20	2 - 16x25 1 - 14x25
area, sq. ft.	1.7	2.0	2.8	4.0	5.0	6.3	8.0
velocity, ft./min.	240	300	288	300	360	384	375
Mixing Box							
damper opening width, in.	15.5	19.5	19.5	31.5	31.5	31.5	31.5
damper opening height, in.	7	7	7	7	12.75	12.75	12.75
area, sq. ft.	0.753	0.948	0.948	1.531	2.789	2.789	2.789
velocity, ft./min.	531	633	844	784	645	861	1076

Note: Minimum airflow limits apply to units with hot water or electric heat only. There is no minimumairflow limit on cooling on units. Maximum airflow limits are to help prevent moisture carryover.

Table M-MP-3. BCHC/BCVC Piping Package Waterflow Limits

Piping Size	gpm
1/2”	8.6
3/4”	19.3
1”	34.3
1 1/4”	53.5

Note: Trane recommends these maximum gpms to help prevent erosion and/or noise problems. However lower gpms may be necessary, depending on the systemdesign, to avoid exceeding close-off pressure limit of the control valve.

Table M-MP-4. BCHC/BCVC Coil General Data

Unit size	12	18	24	36	54	72	90
Nominal cfm	400	600	800	1200	1800	2400	3000
Hydronic & DX Coil Note 5							
area, ft² 0.83	1.04	1.74	2.78	3.89	4.86	6.25	
width, in. Note 1	7.5	7.5	12.5	12.5	17.5	17.5	22.5
length, in Note 2	16	20	20	32	32	40	40
velocity, ft./min.	480	576	461	432	463	494	480
1-Row Hydronic Coil							
min. gpm Note 3	2.6	2.6	4.4	4.4	6.1	6.1	7.9
max. gpm Note 4	14.0	14.0	23.3	23.3	32.6	32.6	42.0
dry coil weight,-lbs	6.1	7.0	9.8	13.2	17.6	20.4	25.8
wet coil weight, lbs	7.3	8.3	12.1	16.3	22.4	26.0	32.9
internal coil volume, in³	32.5	37.0	63.9	86.3	133.4	154.3	196.7
2-Row Hydronic Coil							
min. gpm Note 3 std	2.6	2.6	4.4	4.4	12.2	12.2	15.7
max. gpm Note 4 std	14.0	14.0	23.3	23.3	65.3	65.3	83.9
min. gpm Note 3 hi-cap	1.7	1.7	2.9	2.9	6.1	6.1	7.9
max. gpm Note 4 hi-cap	9.3	9.3	15.5	15.5	32.6	32.6	42.0
dry coil weight, lbs	8.2	9.6	13.7	19.4	27.2	32.1	39.4
wet coil weight, lbs	10.1	11.8	17.5	24.8	36.1	42.5	52.6
internal coil volume, in³	51.7	60.7	103.0	148.2	245.5	287.4	365.2
4-Row Hydronic & DX Coil Note 5							
min. gpm Note 3 Std	2.6	2.6	4.4	4.4	12.2	12.2	14.9
max. gpm Note 4 Std	14.0	14.0	23.3	23.3	65.3	65.3	79.3
min. gpm Note 3 Hi-Cap	1.7	1.7	2.9	2.9	6.1	6.1	7.9
max. gpm Note 4 Hi-Cap	9.3	9.3	15.5	34.2	47.0	56.3	73.1
wet coil weight, lbs	17.1	20.2	30.6	44.4	62.7	74.9	97.9
internal coil volume, in³	96.2	114.1	192.4	282.1	433.0	516.7	688.3
6-Row Hydronic & DX Coil Note 5							
min. gpm Note 3 Std	2.6	2.6	4.4	4.4	12.2	12.2	14.9
max. gpm Note 4 Std	14.0	14.0	23.3	23.3	65.3	65.3	79.3
min. gpm Note 3 Hi-Cap	1.7	1.7	2.9	2.9	6.1	6.1	7.9
max. gpm Note 4 Hi-Cap	9.3	9.3	15.5	15.5	32.6	32.6	42.0
dry coil weight, lbs	18.3	21.7	32.6	47.5	65.4	78.6	101.5
wet coil weight, lbs	23.4	27.7	42.8	62.5	87.8	105.6	137.0
internal coil volume, in³	140.6	167.5	281.4	416.0	620.4	745.9	983.1
1-Row Steam Coil							
area - ft²	0.71	0.88	1.75	2.75	4.13	5.13	6.83
width, in. Note 1	6	6	12	12	18	18	24
length, in Note 2	17	21	21	33	33	41	41
velocity, ft./min.	33	32	24	23	21	21	20
min. steam press, psig	2.0	2.0	2.0	2.0	2.0	2.0	2.0
max. steam press, psig	15.0	15.0	15.0	15.0	15.0	15.0	15.0
dry coil weight, lbs	16.7	26.4	40.2	48.8	67.1	74.5	67.5
wet coil weight, lbs	18.2	28.1	43.7	53.5	74.2	82.9	78.7
internal coil volume, in³	41.7	47.7	95.3	130.8	196.1	231.6	308.7

Notes:
[1] Coil width = length in the direction of a coil header, typically vertical.
[2] Coil length = length of coil in direction of the coil tubes, typically horizontal and perpendicular to airflow.
[3] The minimum water flow is to ensure the coil self-vents properly. There is no minimum waterflow limit for coils that do not require self venting. Coil water flow below minimum gpm requires coils to be vented.
[4] Maximum gpm limits are to prevent erosion and noise problems.
[5] DX coil dimensions and dry weights are identical to the 4 and 6-row standard hydronic coils. However, internal volumes are approximately 6% less.

Table M-MP-2. Drive Data

Unit Size	Motor Watts	HP	Browning Motor Sheave	Trane	Browning Fan Sheave	Trane	Belt BR	Trane	Fan RPM Range Motor Speed (Hz) 1750 (60 hz)	1450 (50 hz)	Drive Letter
012	186–1119	1/3 to 1 1/2	1VL40 X 5/8	X10090082090	AL74 X 3/4	X10070170080	A39	X10200254140	619–878	513–727	D
018					AL64 X 3/4	X10070170050	A38	X10200254130	727–109	602–853	E
					AL54 X 3/4	X10070170020	A36	X10200254110	879–1245	728–1031	F
					AL46 X 3/4	X10070172A20	A35	X10200254100	1000–1417	829–1174	G
					AK39 X 3/4	X10070172700	A34	X10200254090	1200–1700	994–1409	H
					AK34 X 3/4	X10070172640	A34	X10200254090	1313–1859	1088–1541	J
					AK28 X 3/4	X10070172440	A33	X10200254080	1615–2288	1338–1896	K
024	186–1119	1/3 to 1 1/2	1VL40 X 5/8	X10090082090	AL114 X 3/4	X10070170170	A50	X10200254250	390–552	323–457	A
036					AL94 X 3/4	X10070170130	A46	X10200254210	478–678	396–562	B
					AL84 X 3/4	X10070170110	A45	X10200254200	540–765	447–634	C
					AL74 X 3/4	X10070170080	A43	X10200254180	619–878	513–727	D
					AL64 X 3/4	X10070170050	A41	X10200254160	727–1029	602–853	E
					AL54 X 3/4	X10070170020	A40	X10200254150	879–1245	728–1031	F
					AK46 X 3/4	X10070172A20	A38	X10200254130	1000–1417	829–1174	G
					AK39 X 3/4	X10070172700	A37	X10200254120	1200–1700	994–1409	H
					AK34 X 3/4	X10070172640	A37	X10200254120	1313–1859	1088–1541	J
					AK28 X 3/4	X10070172440	A36	X10200254110	1615–2288	1338–1896	K
	1492–2238	2 & 3*	1VM50 X 5/8	X10090082170	AL94 X 3/4	X10070170130	A48	X10200254230	678–877	562–727	L
			31VM50 X 7/8	X10090082190	AL84 X 3/4	X10070170110	A46	X10200254210	765–990	634–820	M
					AL74 X 3/4	X10070170080	A45	X10200254200	878–1136	727–941	N
					AL64 X 3/4	X10070170050	A43	X10200254180	1029–1332	853–1104	P
					AL54 X 3/4	X10070170020	A41	X10200254160	1245–1611	1031–1335	R
					AL46 X 3/4	X10070172A20	A40	X10200254150	1174–1519		T
054	186–1119	1/3 to 1 1/2	1VL40 X 5/8	X10090082090	AL114 X 3/4	X10070170170	A53	X10200254280	390–552	323–457	A
072					AL94 X 3/4	X10070170130	A50	X10200254250	478–678	396–562	B
					AL84 X 3/4	X10070170110	A48	X10200254230	540–765	447–634	C
					AL74 X 3/4	X10070170080	A46	X10200254210	619–878	513–727	D
					AL64 X 3/4	X10070170050	A45	X10200254200	727–1029	602–853	E
					AL54 X 3/4	X10070170020	A43	X10200254180	879–1245	728–1031	F
					AK46 X 3/4	X10070172A20	A41	X10200254160	1000–1417	829–1174	G
					AK39 X 3/4	X10070172700	A40	X10200254150	1200–1700	994–1409	H
					AK34 X 3/4	X10070172640	A40	X10200254150	1313–1859	1088–1541	J
	1492–2238	2 & 3*	1VM50 X 5/8	X10090082170	AL94 X 3/4	X10070170130	A51	X10200254260	678–877	562–727	L
		3	1VM50 X 7/8	X10090082190	AL84 X 3/4	X10070170110	A49	X10200254240	765–990	634–820	M
					AL74 X 3/4	X10070170080	A48	X10200254230	878–1136	727–941	N
					AL64 X 3/4	X10070170050	A46	X10200254210	1029–1332	853–1104	P
					AL54 X 3/4	X10070170020	A45	X10200254200	1245–1611	1031–1335	R
					AL46 X 3/4	X10070172A20	A40	X10200254150	1174–1519		T
090	186–1119	1/3 to 1 1/2	1VL40 X 5/8	X10090082090	AL114 X 3/4	X10070170170	A59	X10200254340	390–552	323–457	A
					AL94 X 3/4	X10070170130	A56	X10200254310	478–678	396–562	B
					AL84 X 3/4	X10070170110	A53	X10200254280	540–765	447–634	C
					AL74 X 3/4	X10070170080	A53	X10200254280	619–878	513–727	D
					AL64 X 3/4	X10070170050	A50	X10200254250	727–1029	602–853	E
					AL54 X 3/4	X10070170020	A49	X10200254240	879–1245	728–1031	F
					AK46 X 3/4	X10070172A20	A48	X10200254230	1000–1417	829–1174	G
					AK39 X 3/4	X10070172700	A46	X10200254210	1200–1700	994–1409	H
					AK34 X 3/4	X10070172640	A46	X10200254210	1313–1859	1088–1541	J
	1492–2238	2 & 3*	1VM50 X 5/8	X10090082170	AL94 X 3/4	X10070170130	A56	X10200254310	678–877	562–727	L
		3	1VM50 X 7/8	X10090082190	AL84 X 3/4	X10070170110	A56	X10200254310	765–990	634–820	M
					AL74 X 3/4	X10070170080	A53	X10200254280	878–1136	727–941	N
					AL64 X 3/4	X10070170050	A53	X10200254280	1029–1332	853–1104	P
					AL54 X 3/4	X10070170020	A50	X10200254250	1245–1611	1031–1335	R
					AL46 X 3/4	X10070172A20	A49	X10200254240	1174–1519		T

Maintenance Procedures

Keep coils clean to maintain maximum performance. For operation at its highest efficiency, clean the coil often during periods of high demand or when dirty conditions prevail. Clean the coil a minimum of once per year to prevent dirt buildup in the coil fins, where it may not be visible.

Remove large debris from the coils and straighten fins before cleaning. Remove filters before cleaning. Rinse coils thoroughly after cleaning.

Clean the coil fins using one of these methods:
- steam with detergent
- hot water spray and detergent
- commercially available chemical coil cleaner

CAUTION

Potential unit damage from coil cleaners!

Do not use acidic chemical coil cleaners. Also, do not use alkaline chemical coil cleaners with a pH value greater then 8.5 (after mixing) without using an aluminum corrosion inhibitor in the cleaning solution. Using these type cleaners may cause unit damage.

Inspecting and Cleaning Coils

Coils become externally fouled as a result of normal operation. Dirt on the coil surface reduces it's ability to transfer heat and can cause 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, causing unpleasant odors and serious health-related indoor air quality problems.

Inspect coils at least every six months or more frequently as dictated by operating experience. Cleaning frequently is dependent upon system operating hours, filter maintenance, and efficiency and dirt load. Follow is the suggested method below:

Steam, Hot Water, and Cooling Coil Cleaning Procedure

1. Don the appropriate personal protective equipment (PPE).
2. Gain access to both sides of the coil section.
3. Use a soft brush to remove loose debris from both sides of the coil.
4. 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.
5. Repeat step 4 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 be damaged with a fin rake.
9. Replace all panels and parts and restore electrical power to the unit.
10. Ensure that contaminated material does not contact other areas of the unit or building. Properly dispose of all contaminated materials and cleaning solutions.

WARNING

Hazardous chemicals!

Some chemical coil cleaning compounds are caustic or toxic. Use these substances only in accordance with the manufacturer's instructions. Failure to do so may cause equipment damage, injury, or death.

Winterizing the Coil

Make provisions to drain coils that are not in use, especially when subjected to freezing temperatures.

To drain the coil, first blow out the coil with compressed air. Next, fill and drain the tubes with full-strength ethylene glycol several times. Then drain the coil as completely as possible.

CAUTION

Potential coil-freeze condition!

Make provisions to drain the coil when not in use to prevent coil freeze-up.

Maintenance

Maintenance Procedures

Periodic Maintenance Checklists

Monthly Checklist
The following check list provides the recommended maintenance schedule to keep the unit running efficiently.

⚠ WARNING

Hazardous Voltage!
Before servicing unit disconnect all electrical power including remote disconnects. Follow proper lockout/ tagout procedures to ensure power cannot be inadvertently energized. Failure to disconnect power before servicing can cause death or serious injury.

⚠ WARNING

Rotating parts!
Secure drive sheaves to ensure motor cannot freewheel. Failure to do so can cause severe personal injury or death.

1. Inspect unit air filters. Clean or replace if airflow is blocked or if filters are dirty.
2. Check the condition and tension of fan belts. Adjust tension if belts are floppy or squeal continually. Replace worn or fraying belts in matched sets.

Note: Check and adjust belt tension at least twice daily the first days of new belt operation. Belt tension will rapidly decrease until the belts are run in.

3. Re-lubricate motor bearings, if motor is fitted with oil tubes and operating conditions include moist or dirty air, continuous duty and/or high temperatures.

Semi-Annual Maintenance
1. Verify the fan motor is properly lubricated. Follow lubrication recommendations on the motor tag or nameplate. Contact the motor manufacturer for more information.
2. With power disconnected, manually rotate the fan wheel to check for obstructions in the housing or interference with fan blades. Remove any obstructions and debris.
3. Check the fan assembly sheave alignment. Tighten set screws to their proper torques.
4. Check fan belt tension. Adjust if belt is slipping. Replace if belt is worn or frayed.
5. Inspect the coils for dirt build-up. Clean fins if airflow is clogged.

Annual Maintenance
Check and tighten all set screws, bolts, locking collars and sheaves.
1. Inspect, clean, and tighten all electrical connections and wiring.
2. Visually inspect the entire unit casing for chips or corrosion. Remove rust or corrosion and repaint surfaces.
3. Clean fan wheels and fan shaft. Remove any rust from the fan shaft with an emergy cloth and recoat with L.P.S. 3 or equivalent.
4. Inspect the drainpan for sludge or other foreign material. Clear the drain openins and drain line to ensure adequate flow.
5. Rotate the fan wheel and check for obstructions in the fan housing. The wheel should bnot rub on the fan housing or cutoff. Adjust to center if necessary and tighten the wheel set screws per the torque recommendations in Table M-MP-1 on page 43.
6. Examine flex connector for cracks or leaks.
7. Repair or replace any damaged duct material.

LED Activity

Red Service LED
The red LED normally indicates if the unit controller is operating properly or not. Reference Table M-T-1.

Green Status LED
The green LED normally indicates whether the controller is powered on (24 VAC supplied). Reference Table M-T-2.

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. Reference Table M-T-3.

Note: If the service push button is held down for more than 15 seconds, the Tracer ZN 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.

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).

Manual Output Test Procedure
Follow the procedure below to test the Tracer™ ZN010, ZN510, or ZN520 controller.

1. Press and hold the Test button for at least two seconds (not exceeding five 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.

Table M-T-1. 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	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® ZN520 controller in a communication network.

Table M-T-2. 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.

Table M-T-3. 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 communication. (Normal for communicating applications, including data sharing.)
LED on continuously	Abnormal condition or extremely high traffic on the link. high traffic on the link.

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 M-T-4. Tracer ZN010 and ZN510 Test Sequence for 1–Heat /1–Cool Configurations

Steps	Fan J1-1, J1-3	Cool Output (1) J1-	Heat Output J1-	Damper J1-
1. Off	Off	Off	Off	Closed
2. Fan High	High	Off	Off	Closed
3. Exhaust Fan	Note 5	Off	Off	Closed
4. Fan	Low	Off	Off	Closed
5. Cool	High	On	Off	Closed
6. Heat	High	Off	On	Closed
7. Two position Damper *(3)*	High	Off	Off	Open
8. Exit	Note 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, the cooling and heat test stage energize. This occurs even though during normal 2-pipe changeover operation binary output controls the unit valve for both cooling and heating.
3. 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.
4. The 2-position damper energizes during this step if the controller is configured for a 2-position damper.
5. ZN010 and ZN510 has a binary output default as “none” on J1- X from the factory. If the unit has a 2-speed fan, step 3 will energize the low fan speed. If the unit has a single speed fan, step 3 will continue to energize the high fan speed. This binary output can be reconfigured as an exhaust fan, with the use of Rover software

Table M-T-5. Tracer ZN520 Test Sequence

Step	Fan J1-1	J1-2	Main valve J1-3	Electric heat or aux. valve J1-5	J1-6	Fresh air damper J1-9	J1-10	Generic/ baseboard heat J1-11	J1-12	TB4-1
1: Off [1]	Off	Off	Off	Off	On EH: off	Off	aux: on	Off	On	Off
2: Fan High [2]	High	Off	Off	Off	Off	Off	Off	Off	Off	OfF
3: (Note 3)	Off	Note3	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,	High EH1 on	Exh Note 4	Off	Off	Off	On	Off	Off	Off	Off
8: Aux close, damper open	High	Off	Off	Off	Off	Off EH1 off,	On EH2 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]Note 1. Upon entering manual output test mode, the controller turns off all fan and electric heat outputs and drives.
Note 2. At the beginning of step 2, the controller attempts to clear all diagnostics.
Note 3. The low fan speed output energizes at step 3. If the unit is configured for a 1 speed fan, the fan remains on high speed at step 3.
Note 4. If the unit is configured for a 1 or 2 speed fan, and BOP2 is configured for an exhaust fan, the exhaust fan output energizes on step 7. The exhaust fan output is shared with medium speed.
Note 5. After step 10, the test sequence performs an exit. This initiates a reset and attempts to return the controller to normal 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
- Condensate overflow
- Low air flow - fan status
- Discharge air temp limit
- Space temperature failure[1]
- Entering water temp failure[1]
- Discharge air temp failure[1]
- Outdoor air temp failure[1]
- Local setpoint failure[1]
- Local fan mode failure[1]
- CO_2 sensor failure[1]
- Generic AIP failure[1]
- Humidity input failure[1]
- Defrosting compressor lockout[1]
- Maintenance required
- Invalid Unit Configuration
- Generic temperature failure
- Discharge air low limit

Note: Non-latching diagnostics automatically reset when the input is present and valid.

Resetting Diagnostics

There are six ways to reset unit diagnostics:
1. Automatically by the controller
2. By initiating a manual output test at the controller
3. By cycling power to the controller
4. By using a building automation system (Tracer ZN510 or ZN520 only)
5. By using the Rover service tool
6. By using any other communicating device able to access the controller's diagnositc reset input (Tracer ZN510 or ZN520 only)
7. By cycling the fan switch from off to any speed setting (Tracer ZN520 only)

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 low temperatuare 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.

Ilf 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
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 page 49 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 (Tracer ZN510 or ZN520 Only)
Some building automation systems can reset diagnostics in the Tracer ZN510 or ZN520 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® ZN520 controller. For more complete information, refer to the Rover™ Installation, Operation, and Programming manual.

Diagnostic Reset (Tracer ZN510 or ZN520 Only)
Any device that can communicate the network variable nviRequest (enumeration "clear_alarm") can reset diagnostics in the Tracer ZN510 or ZN520 controller. The controller also attempts to reset diagnostics whenever power is cycled.

Cycling the Fan Switch (Tracer ZN520 Only)
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).

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.

Maintenance Diagnostics

Table M-D-1. Tracer ZN010 and ZN510 Controller Diagnostics

Diagnostic	Latching	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.	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.

Table M-D-2. Tracer ZN520 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	Of	Valves closed, fresh air damper closed, electric heat off, baseboard heat off
Space temperature failure	Of	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 ZN520 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 ZN520 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.

Maintenance

Common Diagnostics

Table M-D-3. 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 30 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 diagnostics 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.
No power to the controller	If the controller does not have power, the unit fan does not operate. For the Tracer ZN 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 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 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 .
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 specific unit wiring diagrams on the unit.

Table M-D-4. 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 affects 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.
Diagnostic present	A specific list of diagnostics affects valve operation. For more information, see the "Diagnostics" section.
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.
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	If the controller does not have power, the unit fan does not operate. For controllerthe Tracer® ZN010,510 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 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 unit unit wiring diagram on the unit.

Table M-D-5. 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.
Diagnostic present	A specific list of diagnostics affects valve operation. For more information, see the "Diagnostics" section.
Sampling logic	The controller includes entering water temperature sampling logic that automatically 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.
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 unit wiring diagram on

Table M-D-6. 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.
Diagnostic present	A specific list of diagnostics affects electric heat 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 device, the electric heat may not work properly.
No power to the controller	If the controller does not have power, the unit fan does not operate. For the Tracer® ZN010,510 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 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 unit wiring diagrams on the unit.

Table M-D-7. Fresh Air Damper Stays Closed

Probable Cause	Explanation
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 .
Diagnostic present	A specific list of diagnostics effects fresh air damper 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 device, the damper may not work correctly.
No power to the controller	If the controller does not have power, the unit fan does not operate. For the Tracer® ZN010,510 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 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 thelunit wiring diagrams on the unit.

Table M-D-8. 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.
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 unit wiring diagrams on the unit.
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.

Table M-D-9. Valves Stay Closed

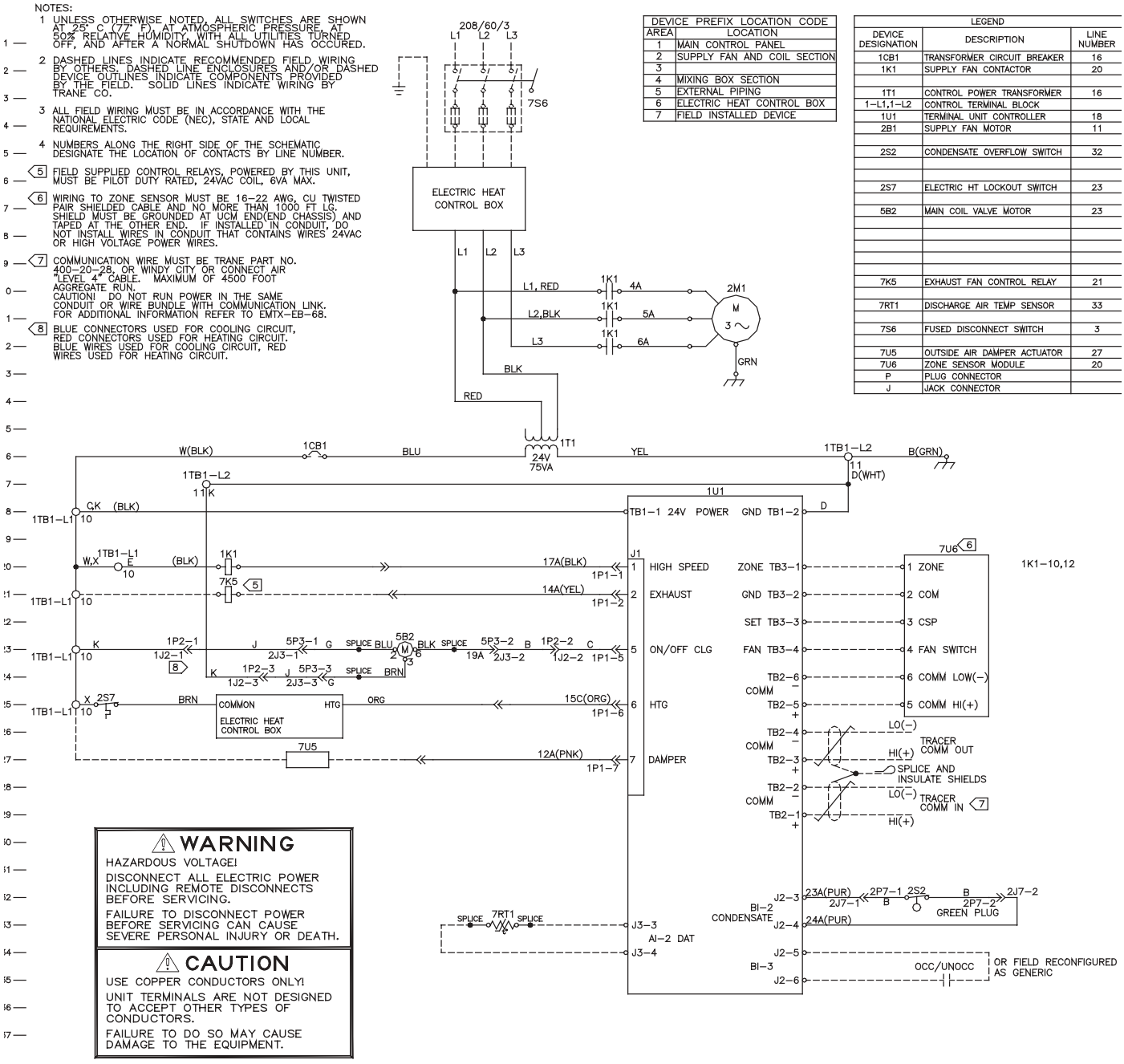
Probable Cause	Explanation
Requested mode off	You can communicate a desired operating mode (such as off, heat, and cool) to the controller. When off is communicated to the controller, the unit controls the fan off. There is no heating or cooling (valves are closed).
Power up control wait	When power up 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 orcooling.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 temperature 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.

Table M-D-10. DX or electric outputs do not energize

Probable Cause	Explanation
Unit wiring	The wiring between the controller outputs and the end devices must be present and correct for normal operation.
Unit configuration	The controller must be properly configured based on the actual installed end devices and application. When the unit configurationdoes not match the actual end devices, the unit may not work correctly.
Diagnostic present	A specific list of diagnostic affects valve operation. For more information, see the Diagnostics section.
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.
Freeze avoidance	When the fan is off with no demand for capacity (0%) and the outdoor air temperature is below is below the freeze avoidance setpoint, the controller disables compressors and electric heat outputs. This includes unoccupied mode when there is no call for capacity or any other time the fan is off.
Normal operation	The controller energizes the outputs only as needed to meet the unit capacity requirements.

Two-Pipe BCXB with Tracer ZN510

- 208 volt/3 phase
- 2- position damper
- single stage electric heat
- 2-positon valve
- condensate overflow
- wall-mounted zone sensor

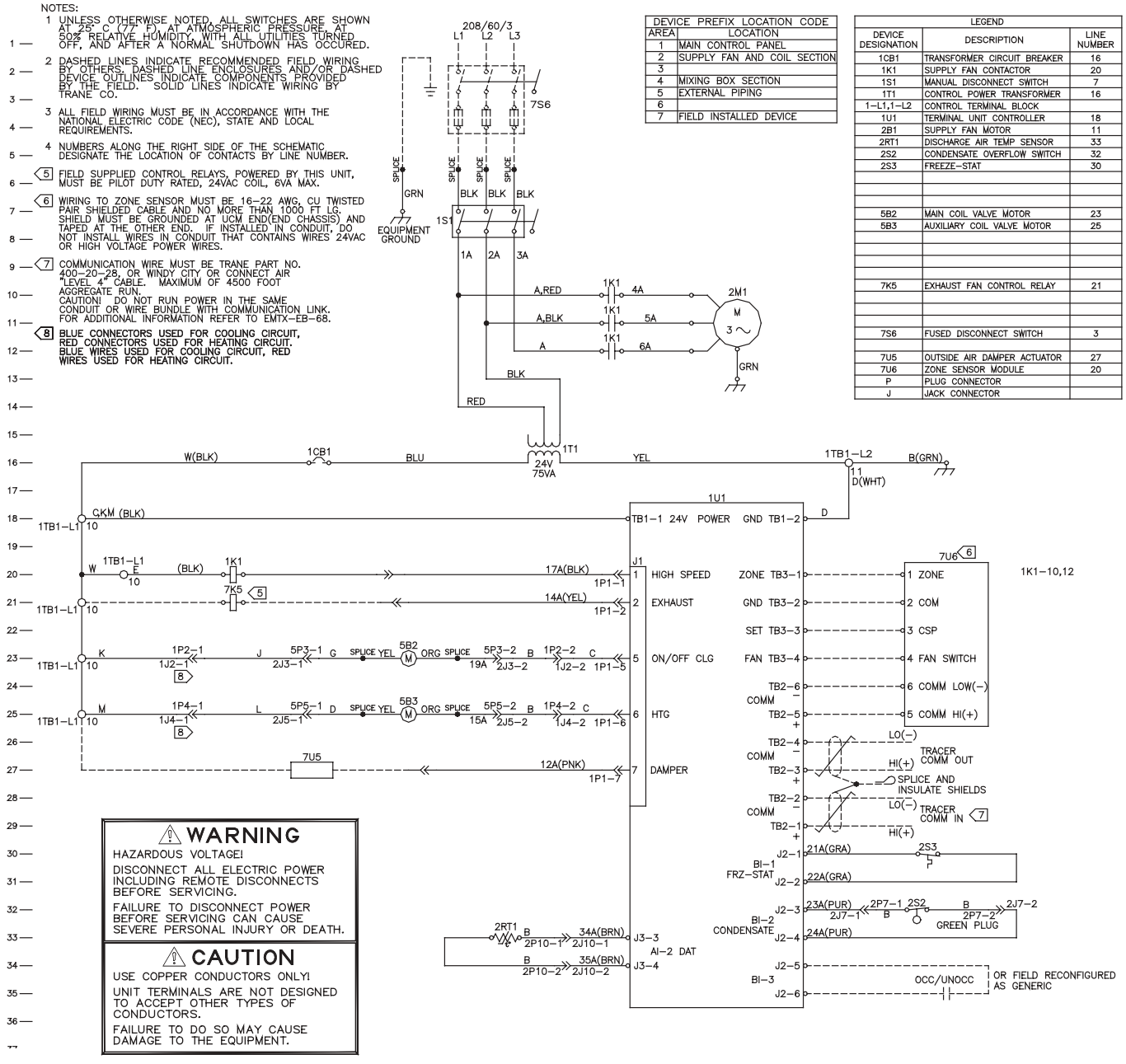


DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	ELECTRIC HEAT CONTROL BOX
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1T1	CONTROL POWER TRANSFORMER	16
1–L1,1–L2	CONTROL TERMINAL BLOCK	
1U1	TERMINAL UNIT CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2S2	CONDENSATE OVERFLOW SWITCH	32
2S7	ELECTRIC HT LOCKOUT SWITCH	23
5B2	MAIN COIL VALVE MOTOR	23
7K5	EXHAUST FAN CONTROL RELAY	21
7RT1	DISCHARGE AIR TEMP SENSOR	33
7S6	FUSED DISCONNECT SWITCH	3
7U5	OUTSIDE AIR DAMPER ACTUATOR	27
7U6	ZONE SENSOR MODULE	20
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

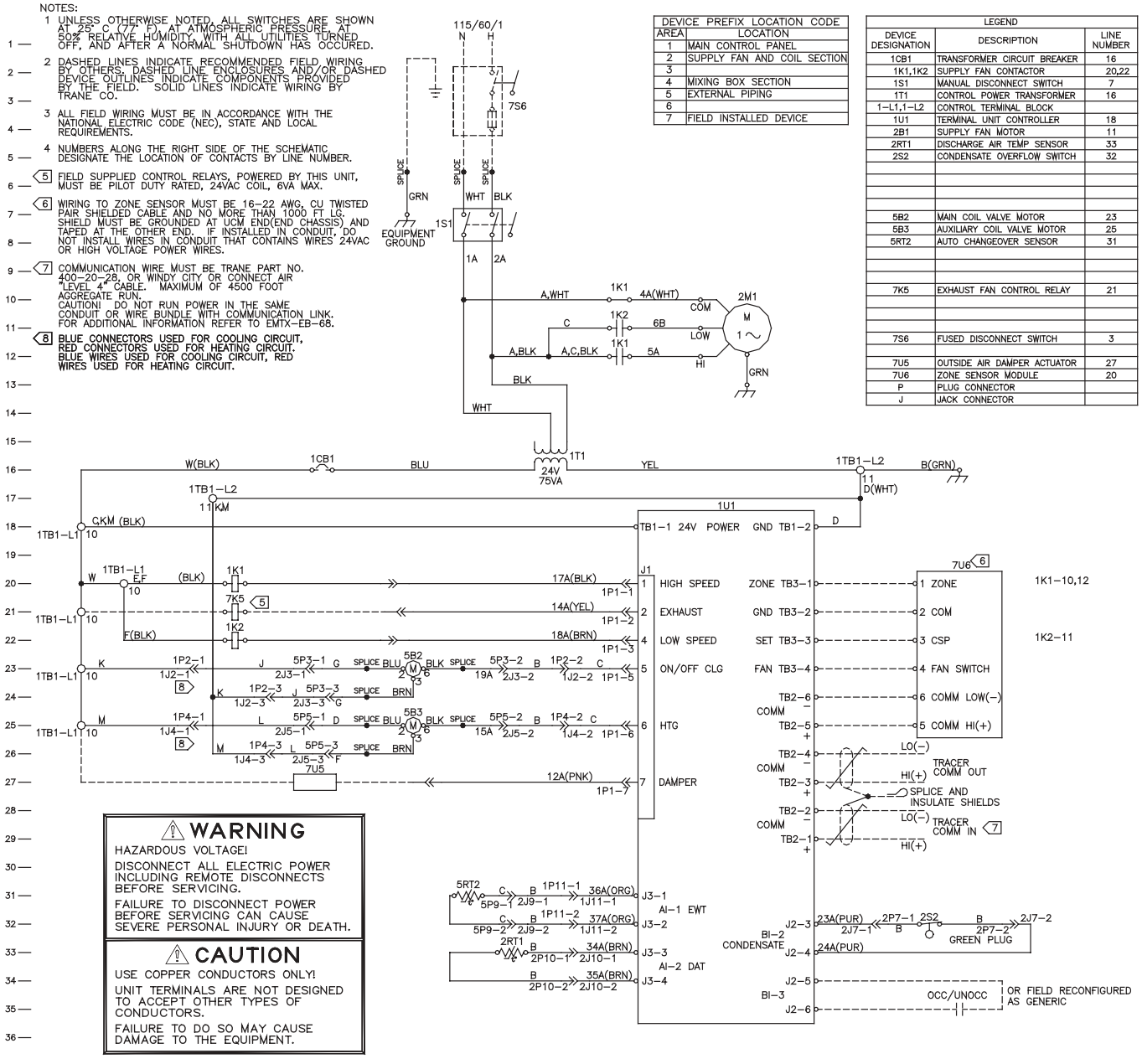
Four-Pipe BCXB with Tracer ZN510

- 208 volt/3 phase
- 2-position valves
- 2-position damper
- condensate overflow
- low limit protection
- wall-mounted zone sensor



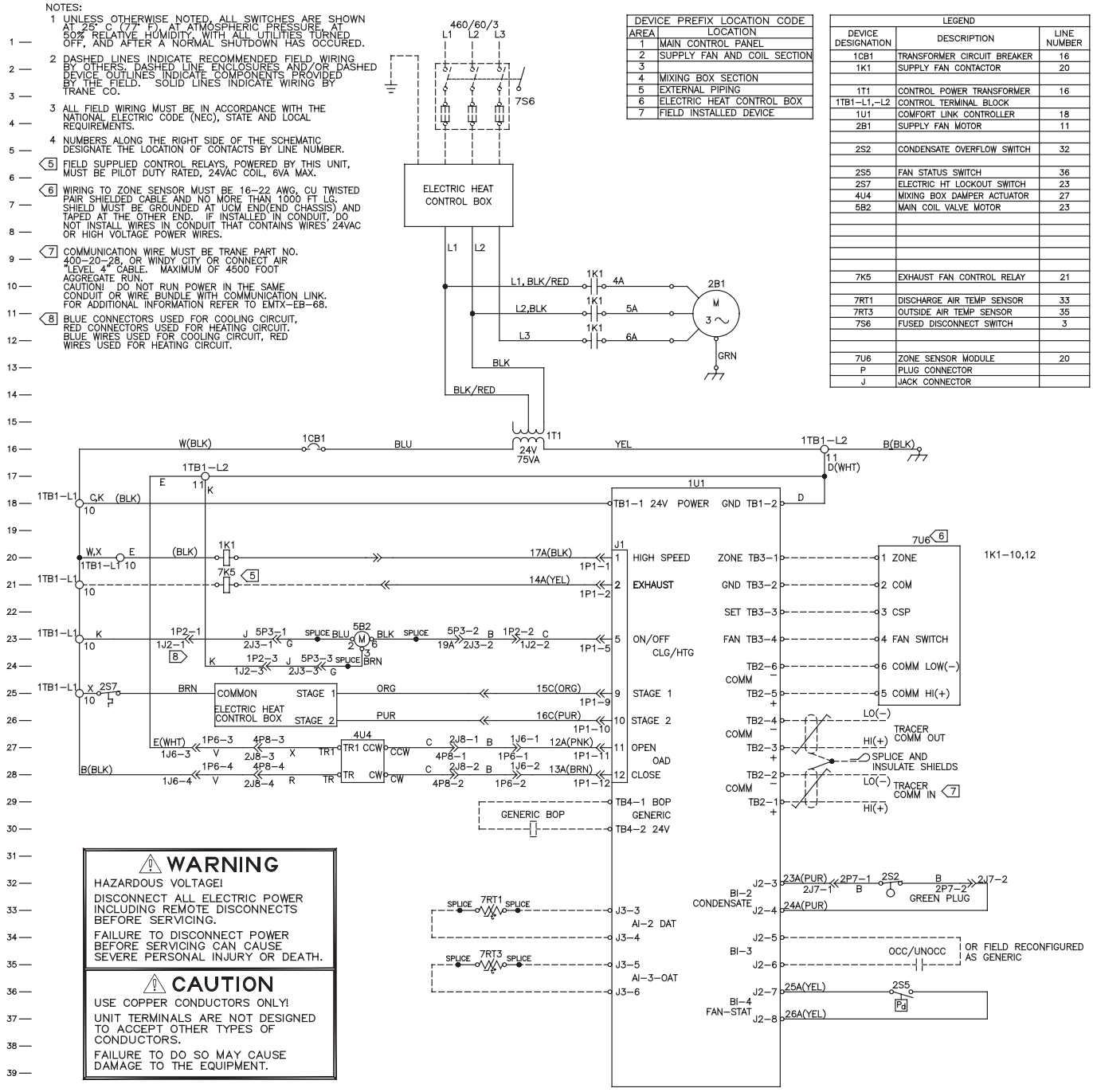
Four-Pipe BCXB with Tracer ZN510

- 115 volt/1 phase
- 2-position valves
- 2-position damper
- 2-speed motor
- condensate overflow



Two-Pipe BCXB with Tracer ZN520

- 460 volt/3 phase
- 2-position valve
- economizer damper
- 2-stage electric heat
- fan status switch
- condensate overflow
- wall-mounted zone sensor

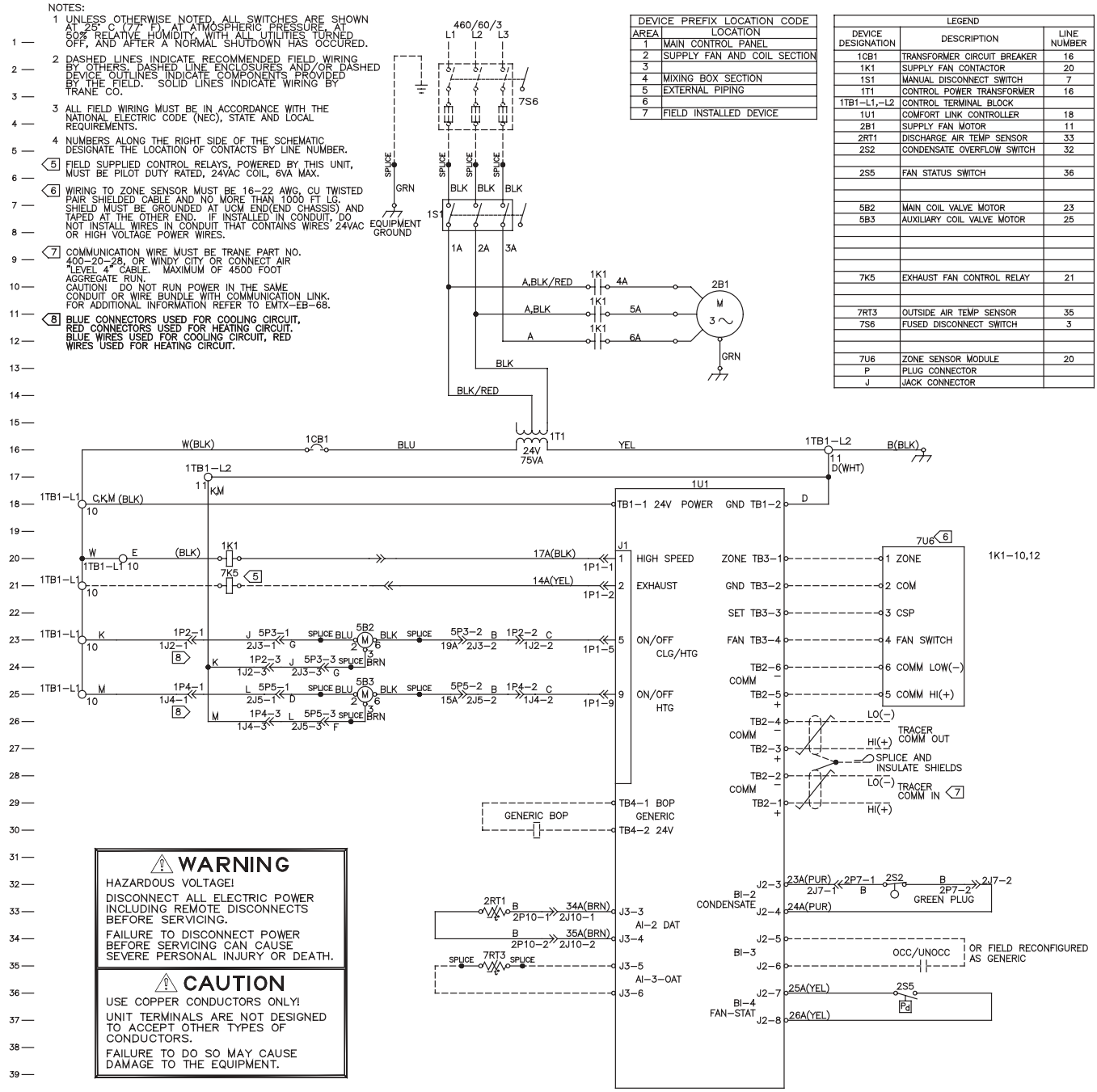


DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	ELECTRIC HEAT CONTROL BOX
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1T1	CONTROL POWER TRANSFORMER	16
1TB1–L1,–L2	CONTROL TERMINAL BLOCK	
1U1	COMFORT LINK CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2S2	CONDENSATE OVERFLOW SWITCH	32
2S5	FAN STATUS SWITCH	36
2S7	ELECTRIC HT LOCKOUT SWITCH	23
4U4	MIXING BOX DAMPER ACTUATOR	27
5B2	MAIN COIL VALVE MOTOR	23
7K5	EXHAUST FAN CONTROL RELAY	21
7RT1	DISCHARGE AIR TEMP SENSOR	33
7RT3	OUTSIDE AIR TEMP SENSOR	35
7S6	FUSED DISCONNECT SWITCH	3
7U6	ZONE SENSOR MODULE	20
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

Four-Pipe BCXB with Tracer ZN520

- 460 volt/3 phase
- 2-position valves
- condensate overflow
- fan status switch

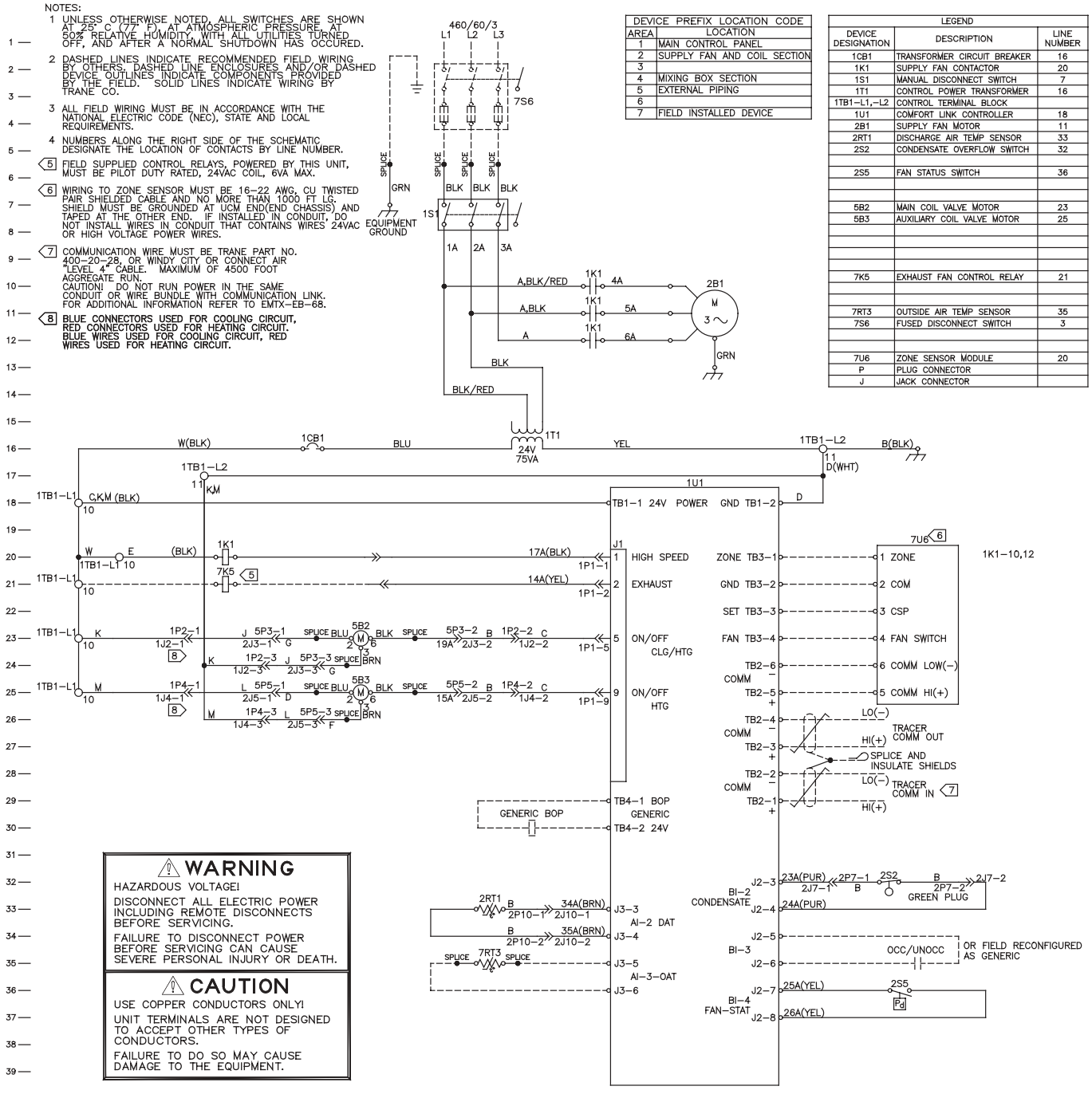


DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1S1	MANUAL DISCONNECT SWITCH	7
1T1	CONTROL POWER TRANSFORMER	16
1TB1–L1,–L2	CONTROL TERMINAL BLOCK	
1U1	COMFORT LINK CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2RT1	DISCHARGE AIR TEMP SENSOR	33
2S2	CONDENSATE OVERFLOW SWITCH	32
2S5	FAN STATUS SWITCH	36
5B2	MAIN COIL VALVE MOTOR	23
5B3	AUXILIARY COIL VALVE MOTOR	25
7K5	EXHAUST FAN CONTROL RELAY	21
7RT3	OUTSIDE AIR TEMP SENSOR	35
7S6	FUSED DISCONNECT SWITCH	3
7U6	ZONE SENSOR MODULE	20
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

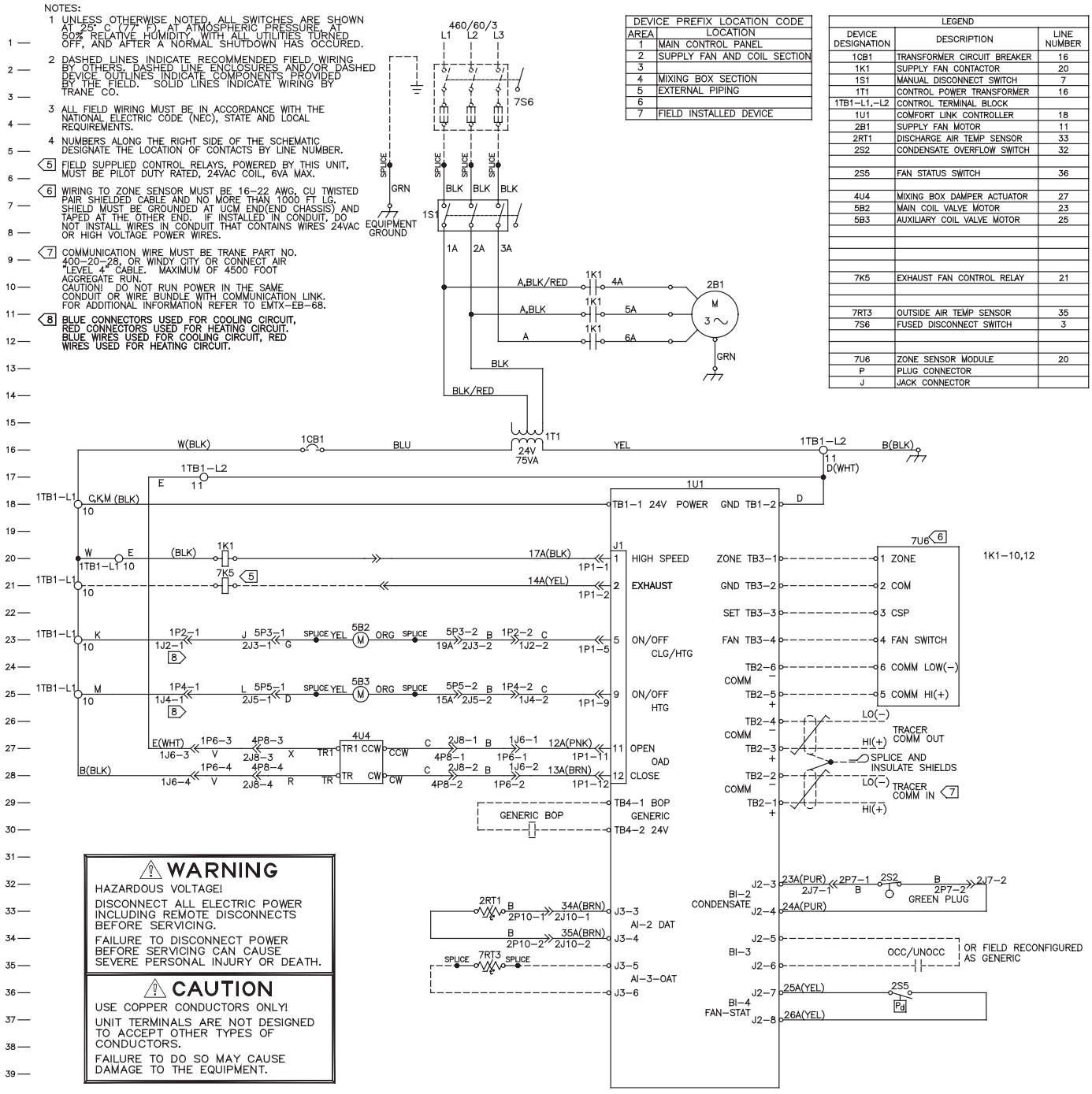
Four-Pipe BCXB with Tracer ZN520

- 460 volt/3 phase
- 2-position valves
- condensate overflow
- fan status switch



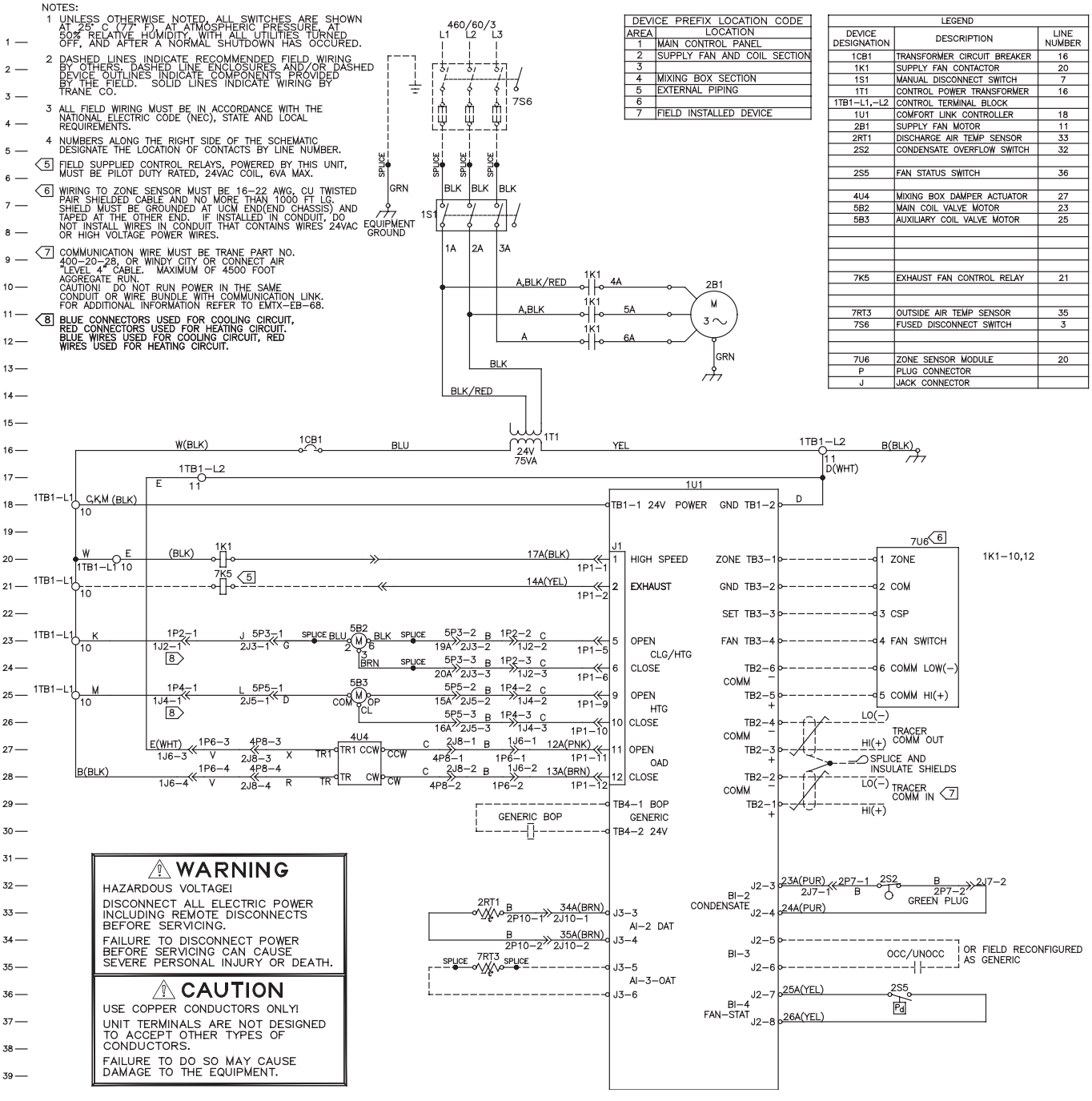
Four-Pipe BCXB with Tracer ZN520

- 460 volt/3 phase
- economizer damper
- condensate overflow
- fan status switch
- wall-mounted zone sensor



Four-Pipe BCXB with Tracer ZN520

- 460 volt/3 phase
- 3-wire floating point valves
- economizer damper
- condensate overflow
- fan status switch
- wall-mounted zone sensor

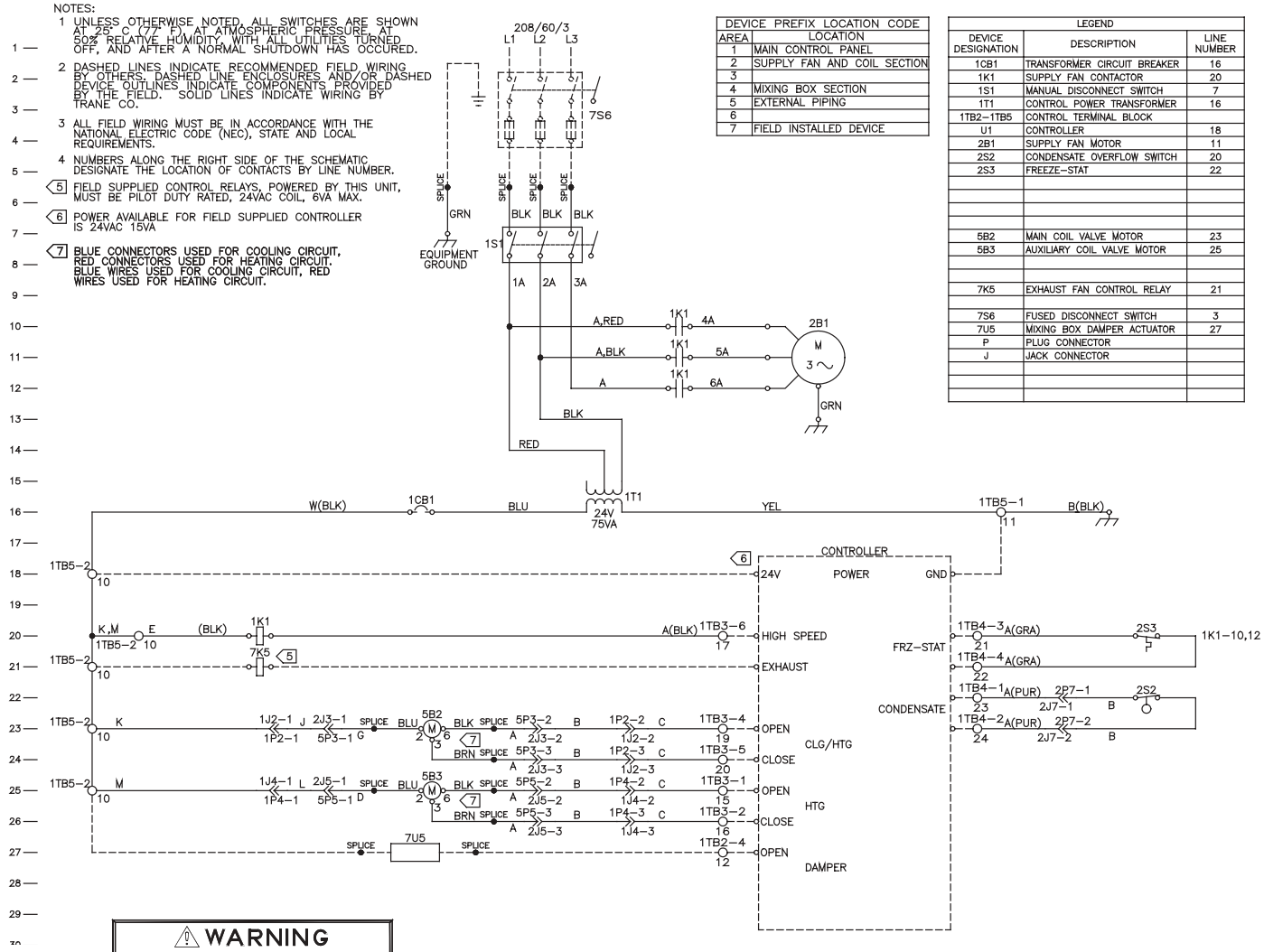


DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1S1	MANUAL DISCONNECT SWITCH	7
1T1	CONTROL POWER TRANSFORMER	16
1TB1–L1,–L2	CONTROL TERMINAL BLOCK	
1U1	COMFORT LINK CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2RT1	DISCHARGE AIR TEMP SENSOR	33
2S2	CONDENSATE OVERFLOW SWITCH	32
2S5	FAN STATUS SWITCH	36
4U4	MIXING BOX DAMPER ACTUATOR	27
5B2	MAIN COIL VALVE MOTOR	23
5B3	AUXILIARY COIL VALVE MOTOR	25
7K5	EXHAUST FAN CONTROL RELAY	21
7RT3	OUTSIDE AIR TEMP SENSOR	35
7S6	FUSED DISCONNECT SWITCH	3
7U6	ZONE SENSOR MODULE	20
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

Four-Pipe BCXB with Control interface

- 208 volt/3 phase
- 3-wire floating point valves
- 2-position damper
- low limit protection
- condensate overflow



DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1S1	MANUAL DISCONNECT SWITCH	7
1T1	CONTROL POWER TRANSFORMER	16
1TB2–1TB5	CONTROL TERMINAL BLOCK	
U1	CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2S2	CONDENSATE OVERFLOW SWITCH	20
2S3	FREEZE–STAT	22
5B2	MAIN COIL VALVE MOTOR	23
5B3	AUXILIARY COIL VALVE MOTOR	25
7K5	EXHAUST FAN CONTROL RELAY	21
7S6	FUSED DISCONNECT SWITCH	3
7U5	MIXING BOX DAMPER ACTUATOR	27
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

⚠ WARNING

HAZARDOUS VOLTAGE!

DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.

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

⚠ CAUTION

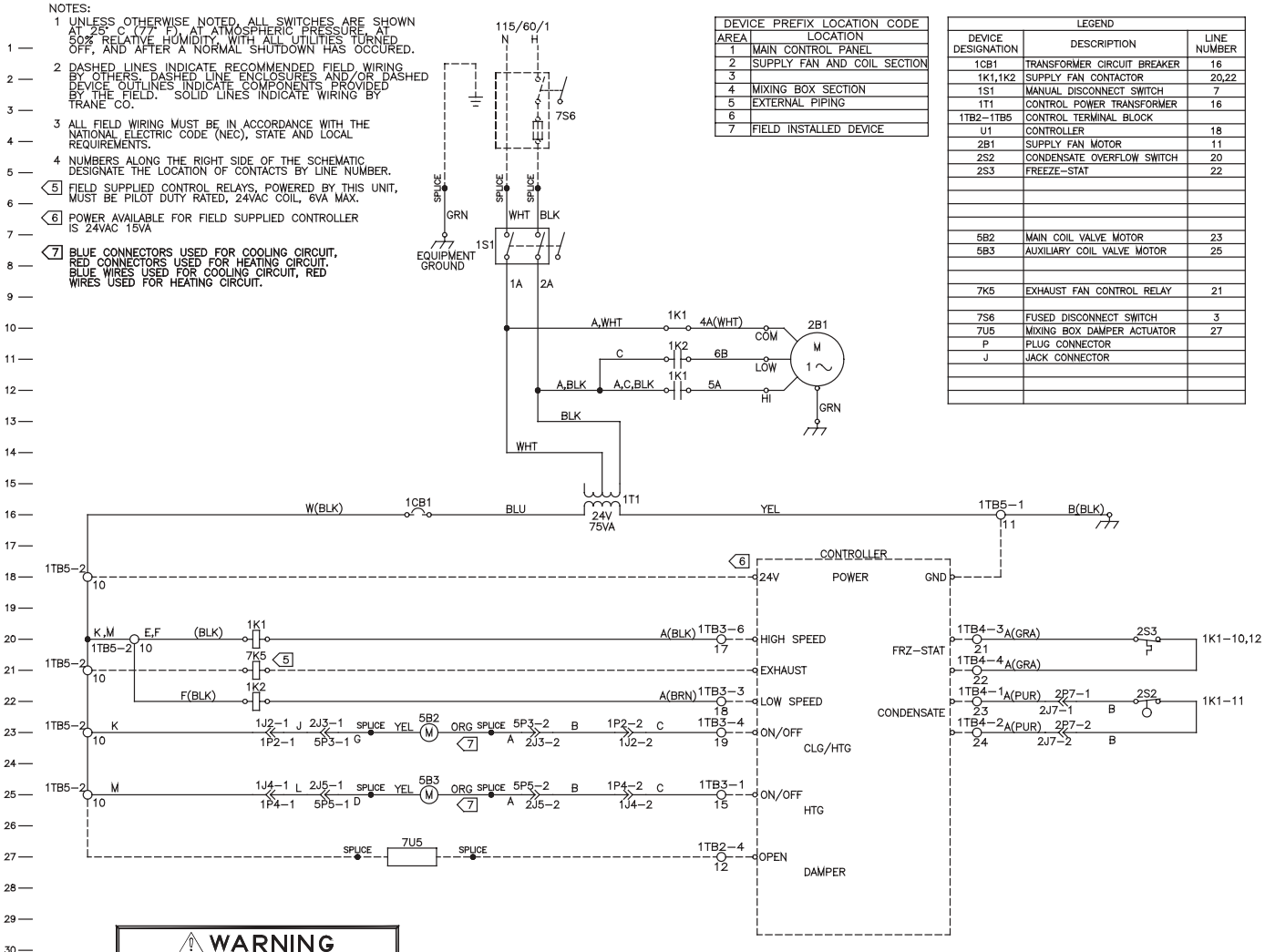
USE COPPER CONDUCTORS ONLY!

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

Four-Pipe BCXB with Control interface

- 115 volt/1 phase
- 2-position damper
- 2-speed motor
- condensate overflow
- low limit protection



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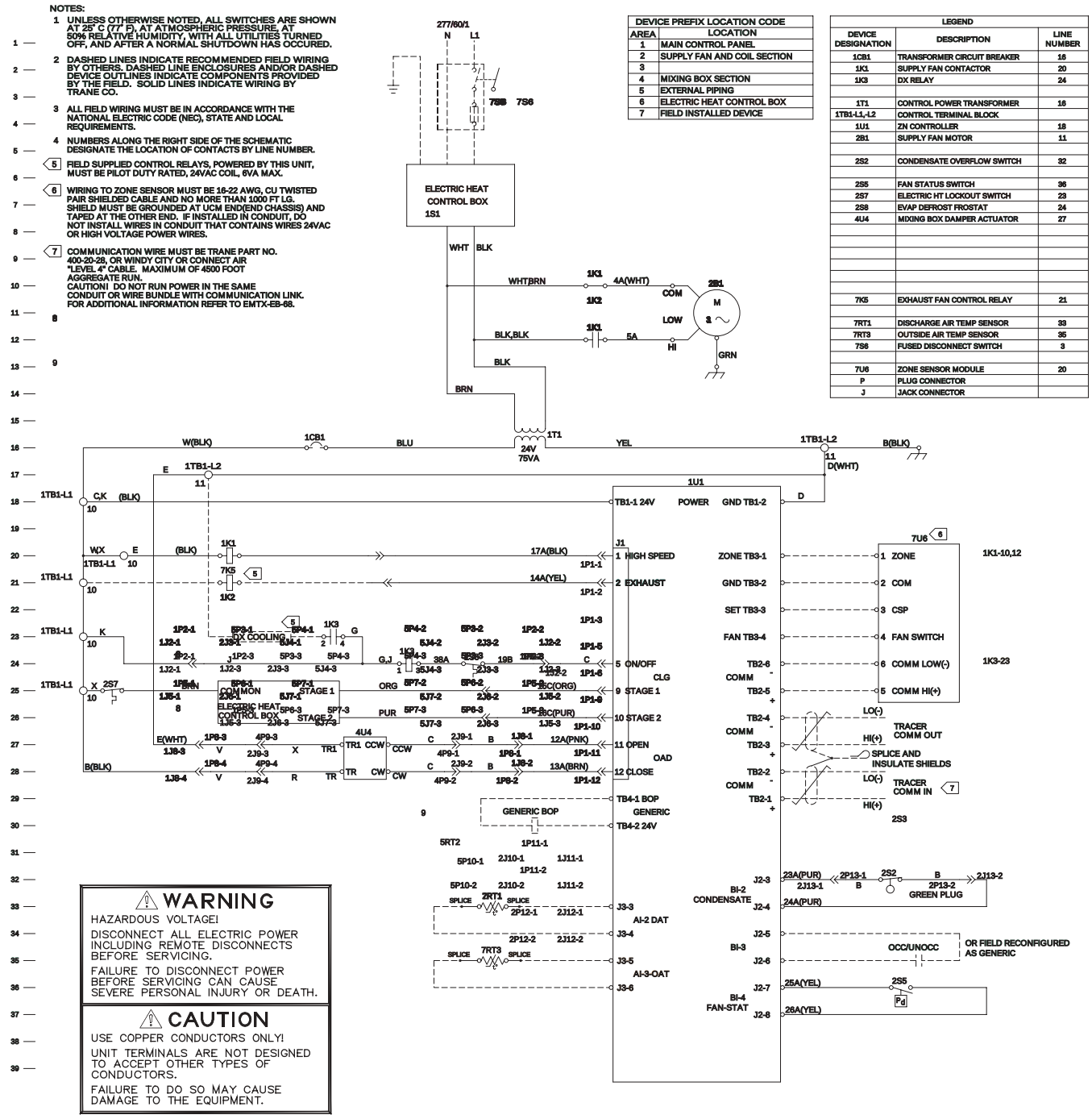
FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

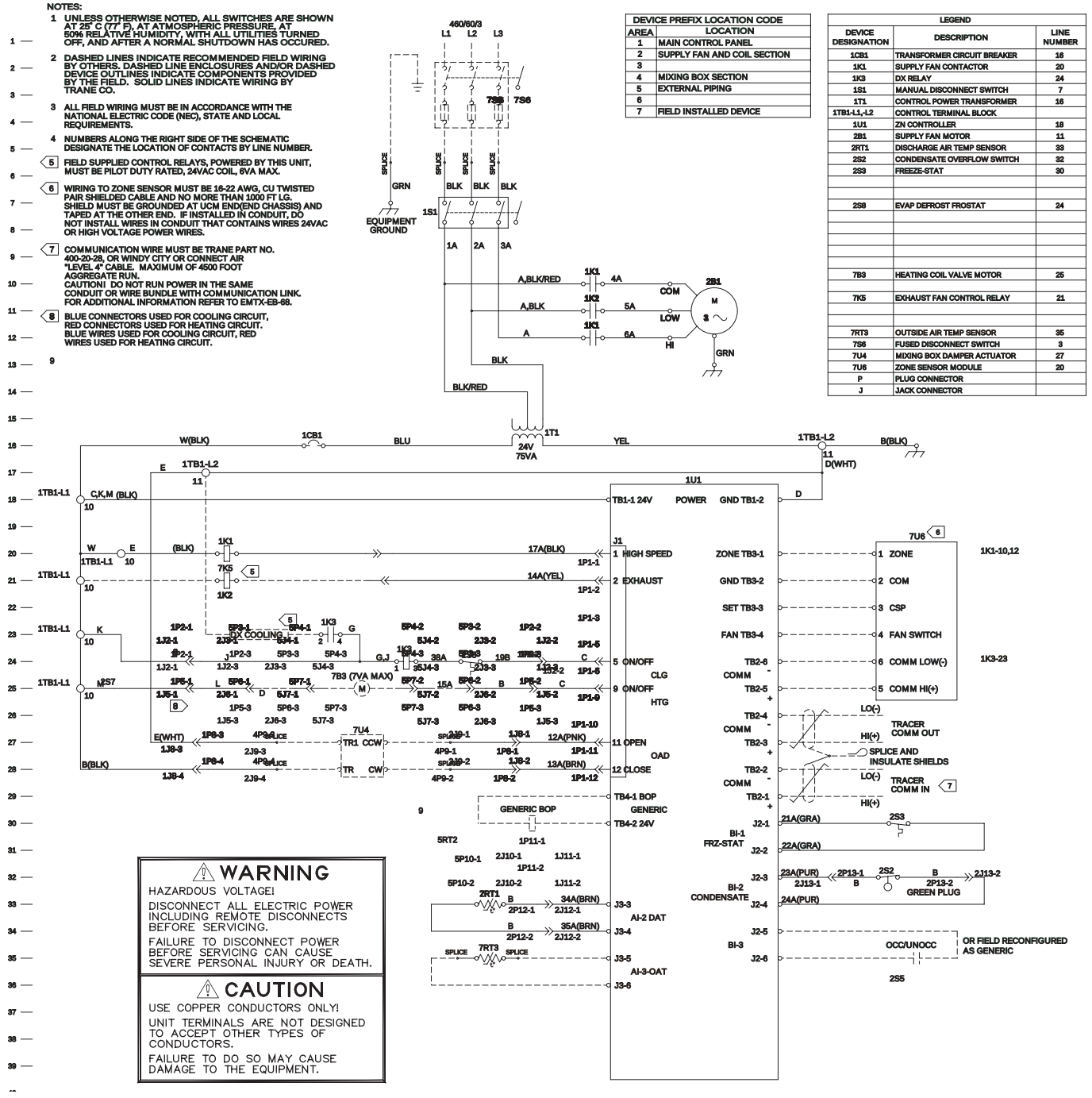
BCXB with DX coil & Tracer ZN520

- volt/3 phase
- economizer damper
- wall-mounted zone sensor
- condensate overflow



BCXB with DX coil, hydronic heating, & Tracer ZN520

- volt/3 phase
- economizer damper
- wall-mounted zone sensor
- condensate overflow



DEVICE PREFIX LOCATION CODE	
AREA	LOCATION
1	MAIN CONTROL PANEL
2	SUPPLY FAN AND COIL SECTION
3	
4	MIXING BOX SECTION
5	EXTERNAL PIPING
6	
7	FIELD INSTALLED DEVICE

LEGEND		
DEVICE DESIGNATION	DESCRIPTION	LINE NUMBER
1CB1	TRANSFORMER CIRCUIT BREAKER	16
1K1	SUPPLY FAN CONTACTOR	20
1K3	DX RELAY	24
1S1	MANUAL DISCONNECT SWITCH	7
1T1	CONTROL POWER TRANSFORMER	16
1TB1-L1,-L2	CONTROL TERMINAL BLOCK	
1U1	ZN CONTROLLER	18
2B1	SUPPLY FAN MOTOR	11
2RT1	DISCHARGE AIR TEMP SENSOR	33
2S2	CONDENSATE OVERFLOW SWITCH	32
2S3	FREEZE-STAT	30
2S8	EVAP DEFROST FROSTAT	24
7B3	HEATING COIL VALVE MOTOR	25
7K5	EXHAUST FAN CONTROL RELAY	21
7RT3	OUTSIDE AIR TEMP SENSOR	35
7S6	FUSED DISCONNECT SWITCH	3
7U4	MIXING BOX DAMPER ACTUATOR	27
7U6	ZONE SENSOR MODULE	20
P	PLUG CONNECTOR	
J	JACK CONNECTOR	

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Literature Order Number	BCXC-SVX01A-EN
File Number	PL-TD-BCXC-SVX01A-EN 0902
Supersedes	BCXB-SVX01B-EN 0901
Stocking Location	LaCrosse - Inland