



# Installation Instructions

48TC\*D/E units for installation in the United States contain use of Carrier's Staged Air Volume (SAV™) 2-speed indoor fan control system. This complies with the U.S. Department of Energy (DOE) efficiency standard of 2018.

48TC\*D/E units for installation outside the United States may or may not contain Carrier's Staged Air Volume (SAV) 2-speed indoor fan control system as they are not required to comply with the U.S. Department of Energy (DOE) 2018 mandatory efficiency standard.

48TC\*M units for installation inside or outside the United States do not contain use of Carrier's Staged Air Volume (SAV) 2-speed indoor fan motor control system as they comply with the U.S. Department of Energy (DOE) 2018 mandatory efficiency standard without their use.

For specific details on operation of the Carrier SAV 2-speed indoor fan system refer to the Variable Frequency Drive (VFD) Factory-Installed Option 2-Speed Motor Control Installation, Setup, and Troubleshooting manual.

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## SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

It is important to recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices, which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

### WARNING

#### FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury and/or property damage.

Disconnect gas piping from unit when pressure testing at pressure greater than 0.5 psig (3450 Pa). Pressures greater than 0.5 psig will cause gas valve damage resulting in hazardous condition. If gas valve is subjected to pressure greater than 0.5 psig, it must be replaced before use. When pressure testing field-supplied gas piping at pressures of 0.5 psig or less, a unit connected to such piping must be isolated by closing the manual gas valve(s).

### DANGER

#### ELECTRICAL SHOCK HAZARD

Failure to follow this warning will result in personal injury or death.

Before performing service or maintenance operations on unit, turn off main power switch to unit and install lock(s) and lock-out tag(s). Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate. Unit may have more than one power switch.

### WARNING

#### UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-410A refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A refrigerant equipment.

### WARNING

#### PERSONAL INJURY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

### WARNING

#### CARBON-MONOXIDE POISONING HAZARD

Failure to follow instructions could result in severe personal injury or death due to carbon-monoxide poisoning, if combustion products infiltrate into the building.

Check that all openings in the outside wall around the vent (and air intake) pipe(s) are sealed to prevent infiltration of combustion products into the building.

Check that furnace vent (and air intake) terminal(s) are not obstructed in any way during all seasons.

### AVERTISSEMENT

#### RISQUE D'INTOXICATION AU MONOXYDE DE CARBONE

Si ces directives ne sont pas suivies, cela peut entraîner des blessures graves ou une intoxication au monoxyde de carbone pouvant causer la mort, si des produits de combustion s'infiltrent dans le bâtiment.

Vérifier que toutes les ouvertures pratiquées dans le mur extérieur autour du ou des tuyaux d'évent (et de la prise d'air) sont scellées de manière à empêcher l'infiltration de produits de combustion dans le bâtiment.

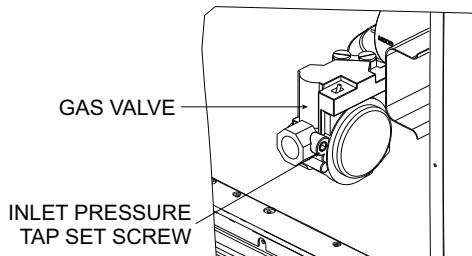
Veiller à ce que la ou les sorties de l'évent de l'appareil de chauffage (et la prise d'air) ne soient, en aucune façon, obstruées, quelle que soit la saison.

## ⚠ WARNING

### FIRE HAZARD

Failure to follow this warning could result in severe personal injury and/or property damage.

Inlet pressure tap set screw must be tightened and 1/8-in. NPT pipe plug must be installed to prevent gas leaks.

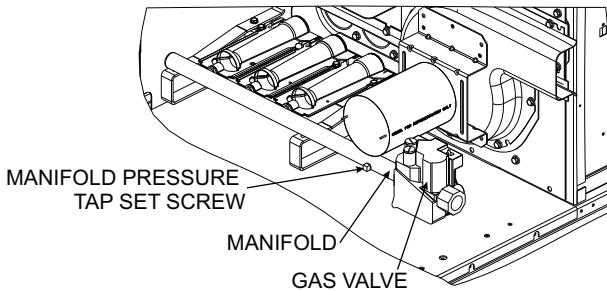


## ⚠ WARNING

### FIRE HAZARD

Failure to follow this warning could result in severe personal injury and/or property damage.

Manifold pressure tap set screw must be tightened and 1/8-in. NPT pipe plug must be installed to prevent gas leaks.



## ⚠ CAUTION

### PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning equipment.

## ⚠ WARNING

### FIRE OR EXPLOSION HAZARD

Failure to follow the safety warnings exactly could result in serious injury, death or property damage.

Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections. A fire or explosion may result causing property damage, personal injury or loss of life.

## ⚠ AVERTISSEMENT

### RISQUE D'INCENDIE OU D'EXPLOSION

Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels. Ne jamais vérifier la présence de fuites de gaz au moyen d'une flamme nue. Vérifier tous les raccords en utilisant une solution savonneuse commerciale conçue spécialement pour la détection de fuites. Un incendie ou une explosion risque de se produire, ce qui peut entraîner la mort, des blessures ou des dommages matériels.

## GENERAL

These installation instructions cover the 48TC units with gas heat and electric cooling. Units are pre-wired and pre-charged with environmentally balanced Puron® (R-410A) refrigerant at the factory.

See Fig. 1 for model number nomenclature. See Fig. 2 and 3 (size 07), Fig. 7 (size 08-12), Fig. 8 (size 14), and Fig. 9 (size 16) for unit dimensions. See Fig. 4 (size 07) and Fig. 10 (size 08-16) for service clearances. See Fig. 5 (size 07), and Fig. 15 (size 08-16) for base rail details. See Fig. 6 (size 07) for thru-the-base charts.

## ⚠ CAUTION

Ensure clearances are in accordance with local installation codes, the requirements of the gas supplier and the manufacturer's installation instructions.

## ⚠ ATTENTION

Assurez-vous que les dégagements sont conformes aux codes d'installation locaux, aux exigences du fournisseur de gaz et aux instructions d'installation du fabricant.

Installation of this unit at altitudes above 2000 ft (610 m) shall be made in accordance with the Listed High Altitude Conversion Kit available with this furnace.

L'installation de ce générateur de chaleur à des altitudes supérieures à 2000 pi (610 m) doit être effectuée conformément aux instructions accompagnant la trousse de conversion pour haute altitude fournie avec cet appareil.

## Rated Indoor Airflow (cfm)

Table 1 lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

**Table 1 — AHRI Efficiency — Rated Indoor Airflow**

MODEL NUMBER	FULL LOAD AIRFLOW (CFM)
48TC*A/B07	2,200
48TC*M08	2,400
48TC*D/E08	2,250
48TC*M09	3,000
48TC*D/E09	3,400
48TC*M12	3,400
48TC*D/E12	3,000
48TC*D/E14	3,600
48TC*D/E16	5,250

## Pre-Installation

Complete the following checks before installation.

1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.

2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

## Fig. 1 — 48TC\*\*07-16 Units Model Number Nomenclature

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Carrier  
United Technologies

DRAWING REPRESENTS PRODUCT BUILT ON AND AFTER 04/15/2019  
(STARTING WITH SERIAL NUMBER 1619 ) SEE DETAIL "F" SHT

NOTES: 1. DIMENSIONS ARE IN INCHES 2. DIMENSIONS

CONNECTION SIZES	
A	1 3/8" [35] DIA FIELD POWER SUPPLY HOLE
B	2" [50] DIA POWER SUPPLY KNOCKOUT
C	3 1/4" [44] DIA GAUGE ACCESS PLUG
D	7/8" [22] DIA FIELD CONTROL WIRING HOLE
E	3 1/4" x 14" NPT GAS CONNECTION
F	2 1/2" [64] DIA POWER SUPPLY KNOCK-OUT

THRU-THE-BASE CHART  
THESE HOLES REQUIRED FOR USE  
CBR (M)WW080401, 090400

THRU-TD CONDUIT SIZE	WIRE USE	RETD. HOLE SIZES (MAX.)
1/2"	115V	7/8" (22.2)
1 1/2"	24V	7/8" (22.2)
3 1/4"	POWER	1-1/8" (28.6)
7"	(009400) 1/2" FPT	GAS 1-1/8" (28.6)

FOR "THRU-THE-BASEPAN" FACTORY OPTION,  
FITTINGS FOR ONLY X, Y, & Z ARE PROVIDED

1.008A01 PROVIDES 3 1/4" FPT THRU CURB  
FLANGE & FITTING.

\* \*

This technical drawing illustrates a vertical air flow system. At the top, a large arrow points downwards, labeled "21-1/4 OUTSIDE AIR" and "[539]". Below this, a smaller arrow points downwards, labeled "BAROMETRIC FLOW". The system consists of a vertical duct with a filter at the top. An "OPTIONAL ECONOMIZER HOOD" is shown above the filter. A "RETURN AIR" duct is located at the bottom of the vertical duct. A "DRAFT" arrow points downwards from the bottom of the vertical duct. The vertical duct has dimensions: 10-7/8 [275] on the left, 1-1/4 [32] on the right, 25-3/4 [63] RETURN AIR, and 5-3/4 [146] on the right side. The bottom of the vertical duct is labeled "DRAFT".

**Fig. 2 — Dimensional Drawing for Units Built On and After 4/15/19 (Size 07)**

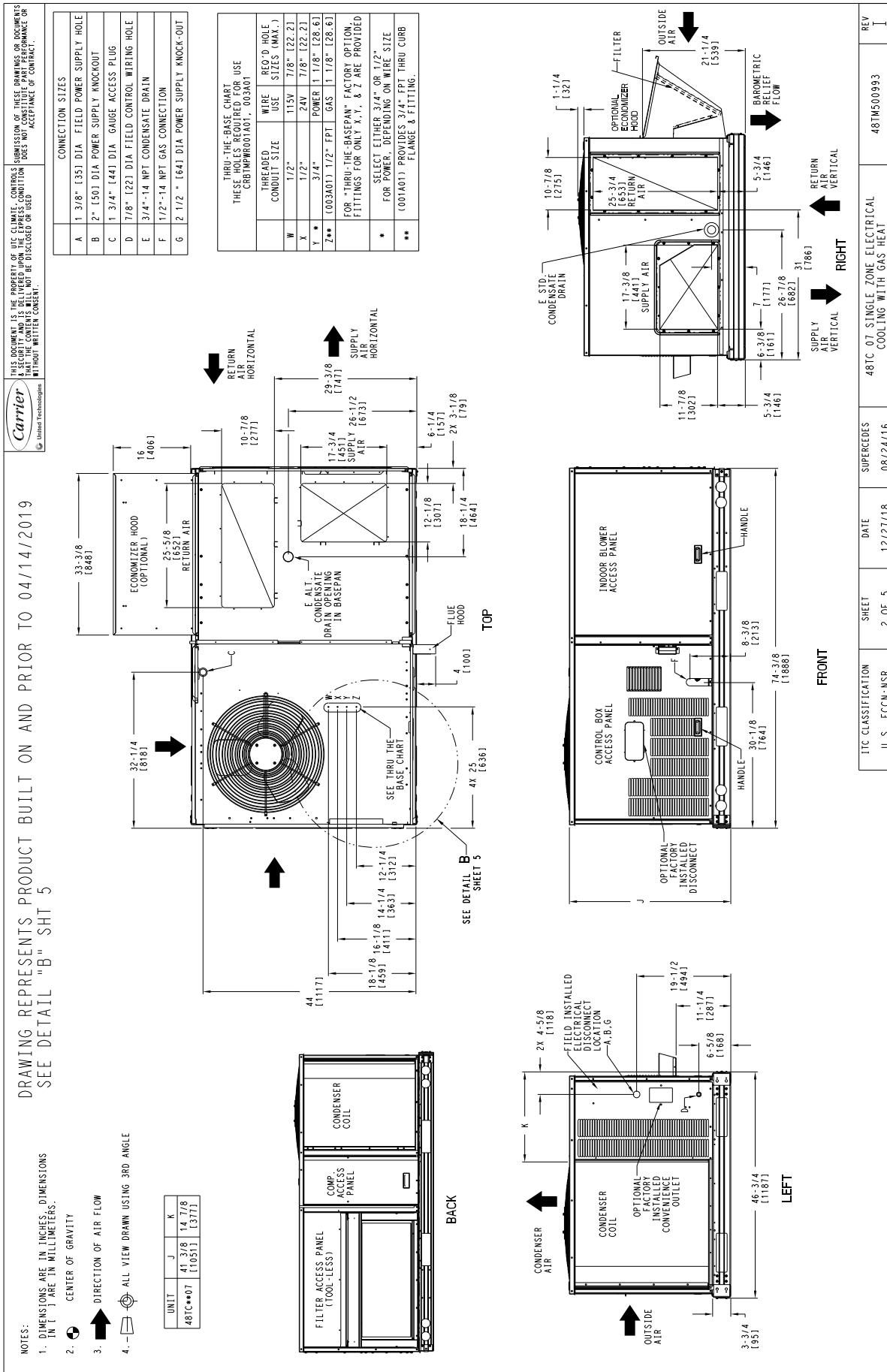
NOTES: 1. DIMENSIONS ARE IN INCHES. DIMENSIONS

**Carrier®**  
Hailed as the world's first  
air conditioner, Carrier has  
been a leader in the industry  
for over 100 years. Carrier  
products are sold in over  
100 countries and are  
backed by a network of  
over 10,000 service  
technicians worldwide.

DRAWING REPRESENTS PRODUCT BUILT ON AND PRIOR TO 04/14/2019  
SEE DETAIL "B" SHT 5

3.  DIRECTION OF AIR FLOW  
 4. -  ALL VIEW DRAWN USING 3RD ANGLE

**Fig. 3 — Dimensional Drawing for Units Built Prior To 4/15/19 (Size 07)**



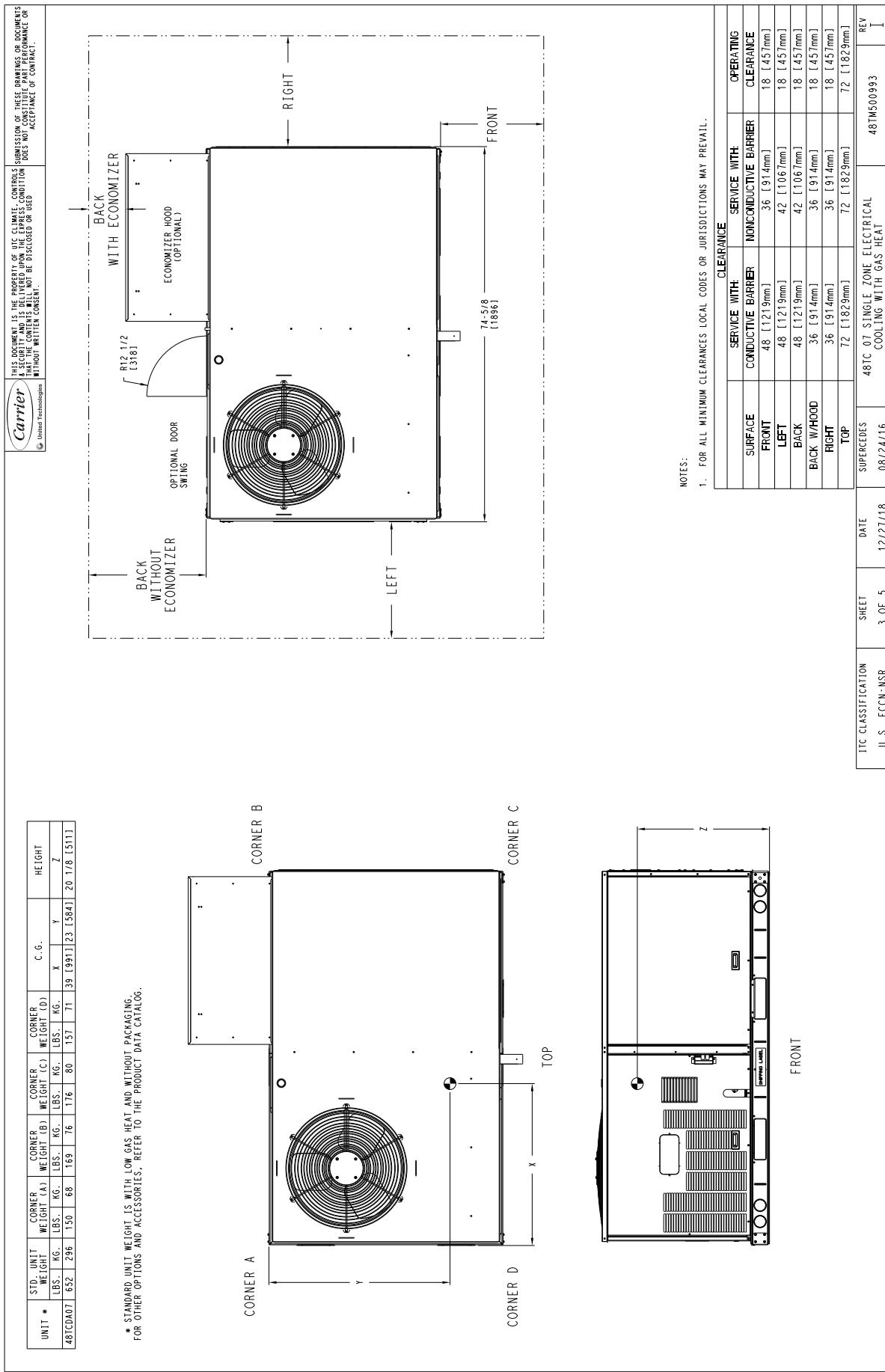
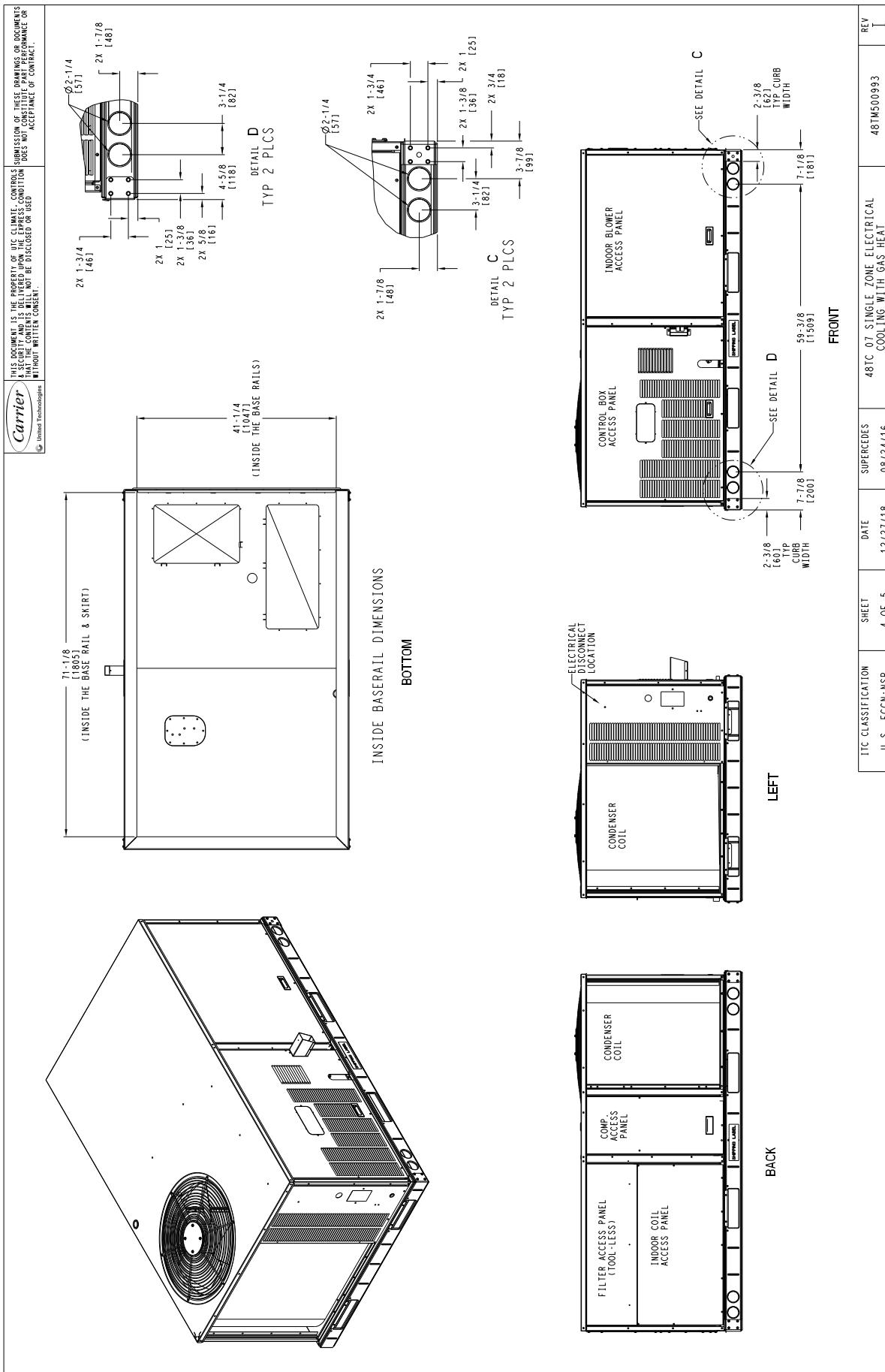


Fig. 4 — Unit Corner Weights and Clearances (Size 07)



### **Fig. 5 — Base Rail Details (Size 07)**

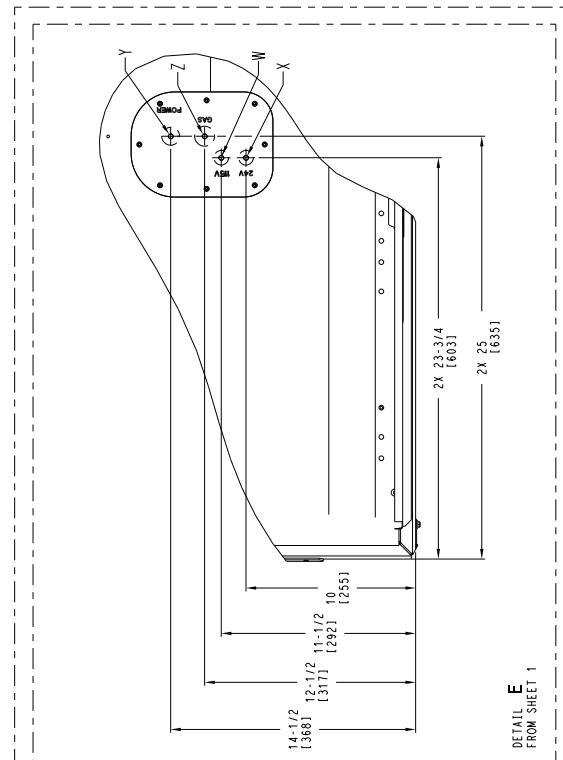
THRU-THE-BASE CHART THE SIGHT HOLES REQUIRED FOR USE OF CIR-BASE (001A01), 003A01					
		THREADED CONDUIT SIGHT HOLE SIZE		WIRE USE SIGHT HOLE SIZE MAX.	
W	X	1 1/2"	1 1/2"	1 1/2"	1 1/2"
Y *	Z **	3/4"	1 1/2"	POWER 1 1/8"	128, 61
		(003A01)	1 1/2" FPT	GAS 1 1/8"	128, 61
FOR "THRU-THE-BASESPAN" FACTORY OPTION, FITTINGS (FOR ONLY X, Y, & Z ARE PROVIDED					
SELECT EITHER 3/4" OR 1 1/2" FOR OWNER, 3 1/4" FPT THRU CURB LANE, & FITTING.					
(001A01) PROVIDES 3 1/4" FPT THRU CURB LANE, & FITTING.					

THRU THE BASE, CHART  
 THESE HOLES REQUIRED FOR USE  
 CARBONATE 008A00, 009A00

W	CONDUIT SIZE	WIRE SIZES	REO SIZES	115V	77/8"
X	1/2"	3/4"	24V	1/16"	7/8"
Y	1/2"	3/4"	POWER	1-1/16"	1-1/8"
Z*	(009A00)	1 1/2"	FPD, GAS	1-1/16"	1-1/8"

FOR "THRU THE BASE" FACTORY OR  
 FITTINGS FOR ONE Y, X, & Z ARE PROVIDED  
 008A00 PROVIDES 3/4" PTF THRU  
 ENDS

\*



THIS VIEW REPRESENTS PRODUCT BUILT ON AND PRIOR TO 04/14/2019

THIS VIEW REPRESENTS PRODUCT BUILT ON AND AFTER 04/15/2019

IIC CLASSIFICATION		SHEET	DATE	SUPERFICES	48°C 0 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	48IM50093	REV.
II S	FCFM-NSR	5, OF 5	12/27/18	08/24/18			I

**Fig. 6 — Thru-the-Base Charts (Size 07)**

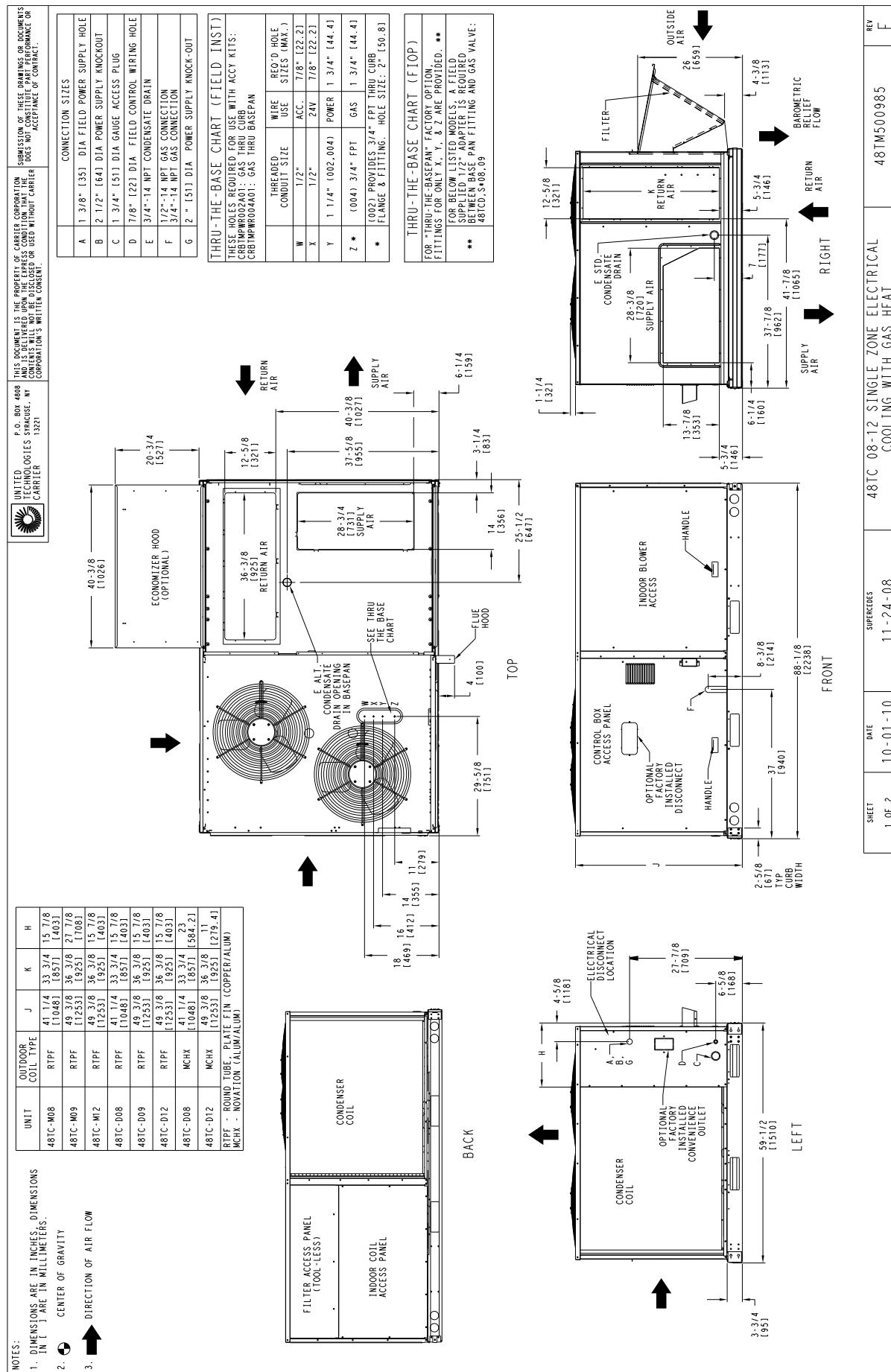


Fig. 7 — Unit Dimensional Drawing (Size 08, 09, 12)

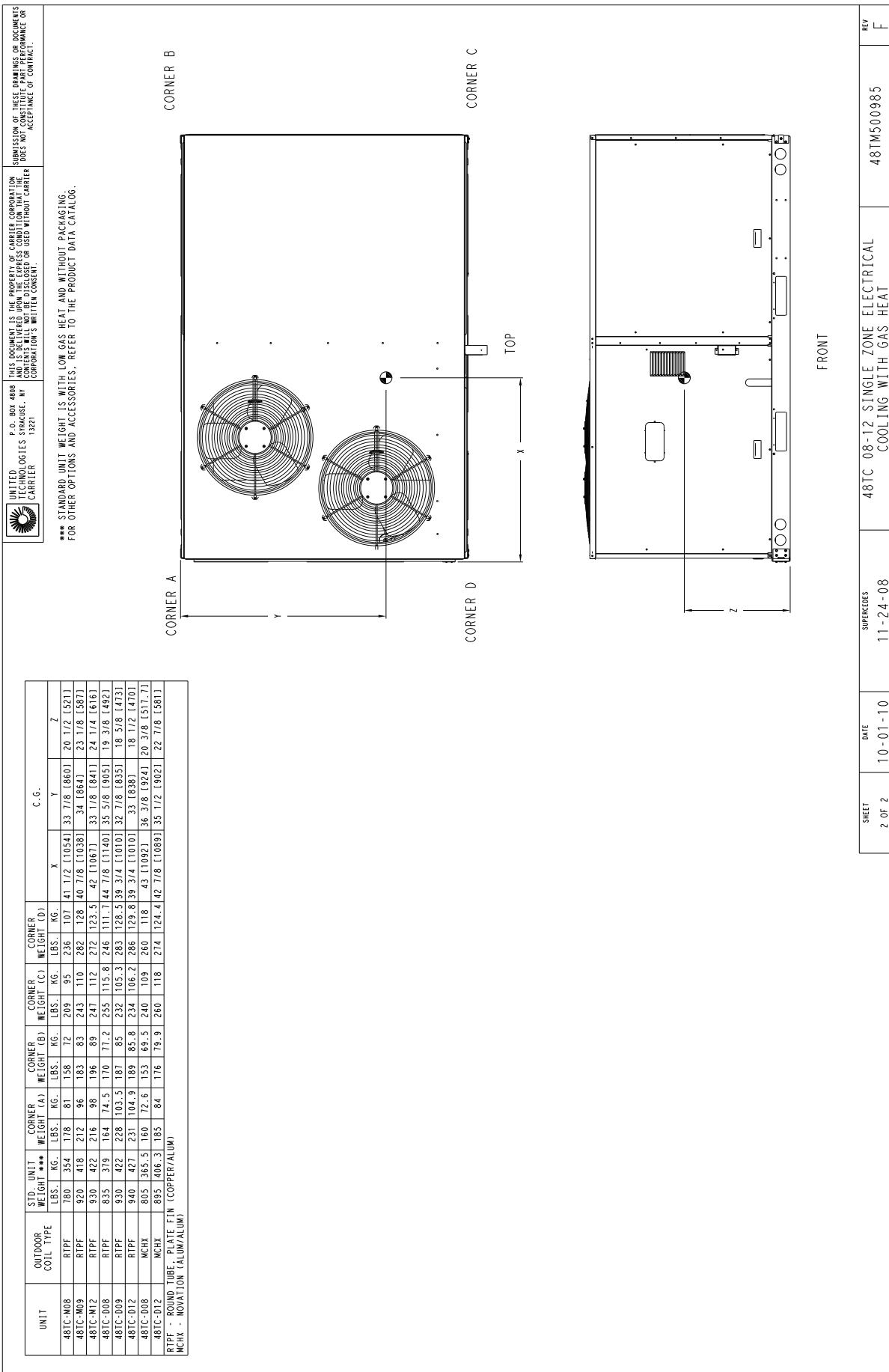


Fig. 7 — Unit Dimensional Drawing (Size 08, 09, 12)



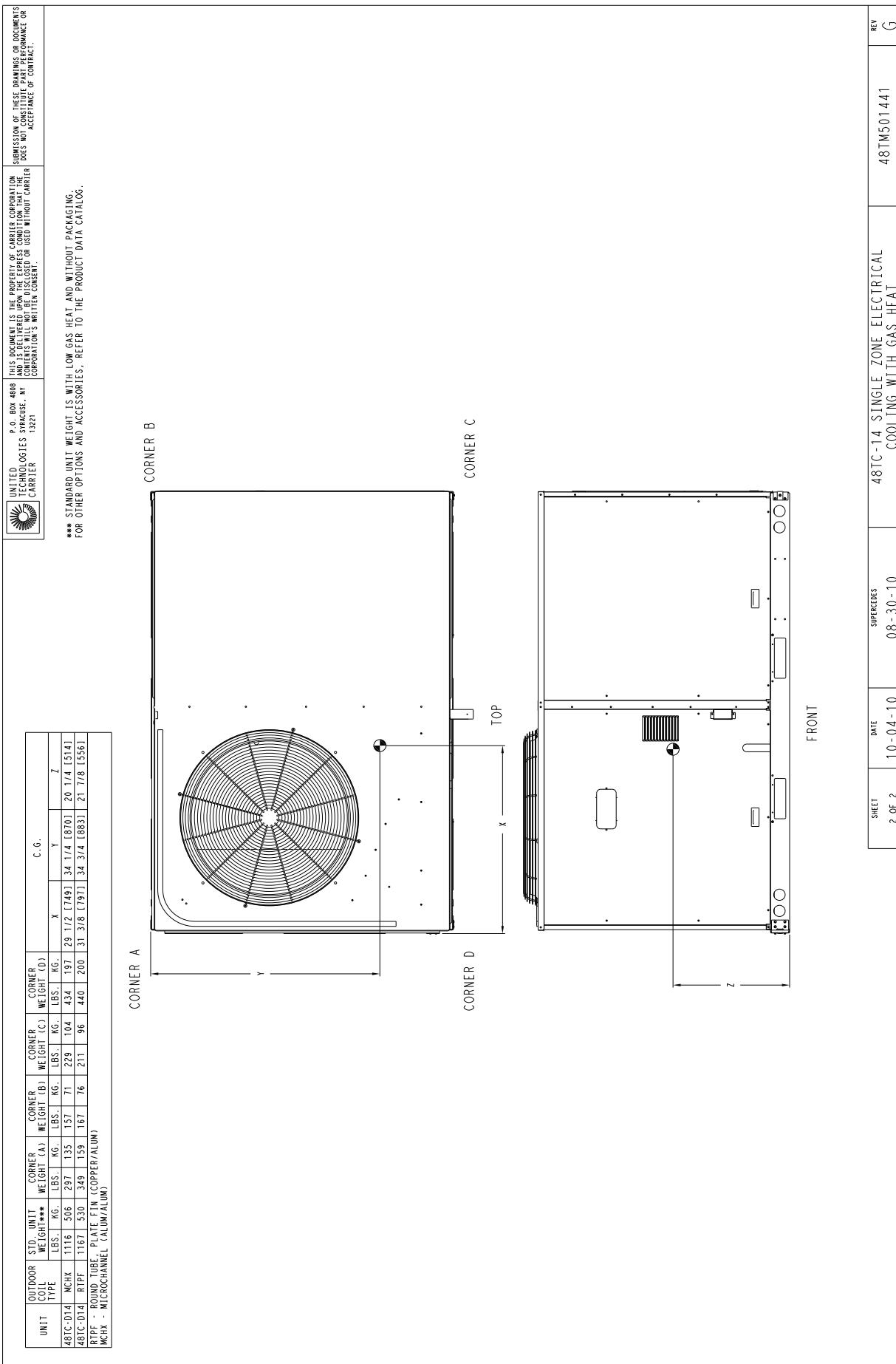


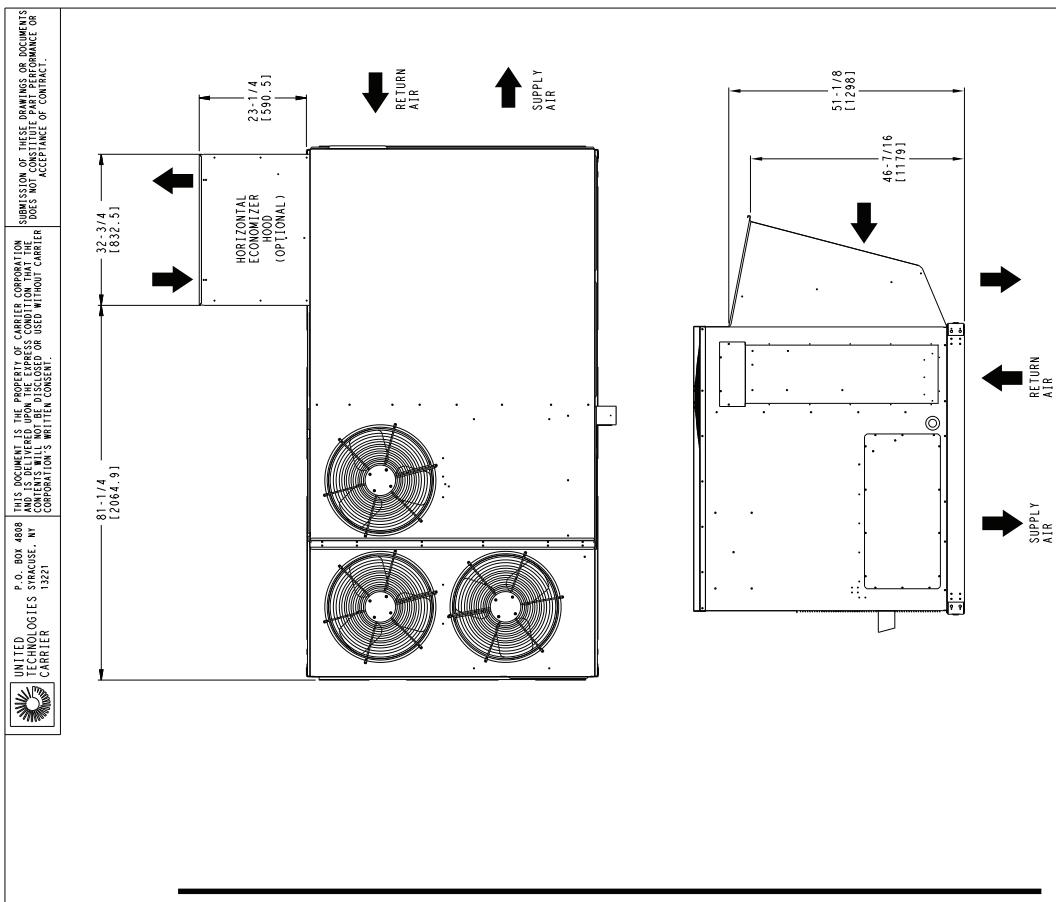
Fig. 8 — Unit Dimensional Drawing (Size 14) (cont)



UNIT	SID	UNIT WEIGHT (A)	CORNER WEIGHT (B)	CORNER WEIGHT (C)	WEIGHT (D)	C. G.
461C	6	1380	621	295	134	276
461C	6	1380	621	295	134	276

STANDARD UNIT WEIGHT IS WITH LOW HEAT & WITHOUT PACKAGING.  
FOR OPTIONS & ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.

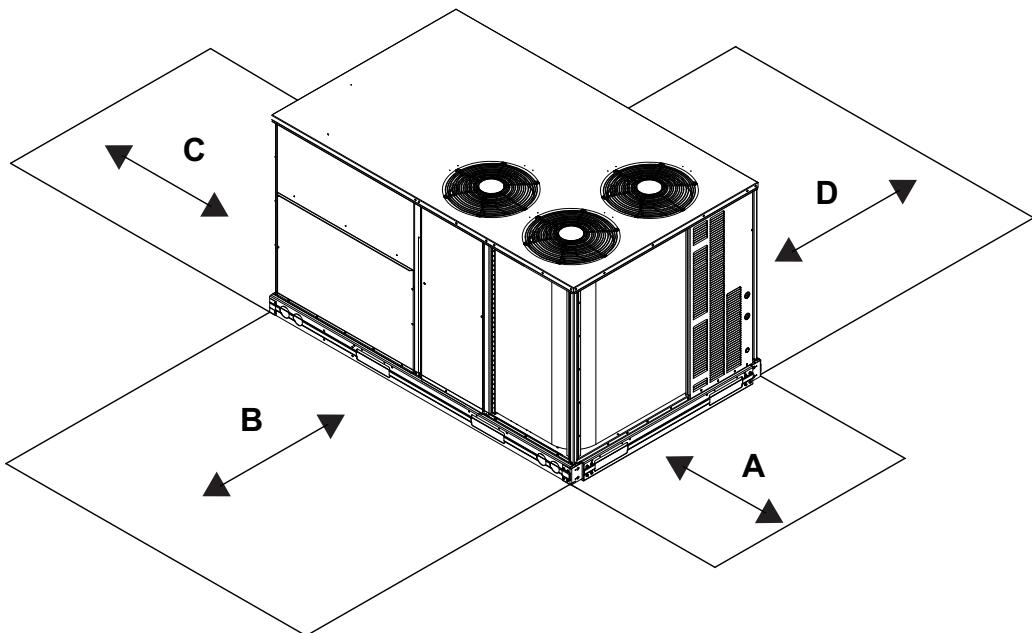
The diagram shows a rectangular frame divided into four quadrants by a central horizontal and vertical axis. The top-left quadrant is labeled 'CORNER A' and the top-right 'CORNER C'. The bottom-left is 'CORNER B' and the bottom-right is 'CORNER D'. A horizontal double-headed arrow at the bottom indicates a width of 'y'. A vertical double-headed arrow on the right indicates a height of 'x'. Three circular inductor patterns are positioned in the quadrants: a single large circle in the top-left, a double circle in the bottom-left, and a triple circle in the bottom-right. Each circle has a central hole and a small arrow pointing to the right.



## HORIZONTAL ECONOMIZER

DATE	SUPERSEDES	48TC 16 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	501M501221	REV
06/15/11	-			C

**Fig. 9 — Unit Dimensional Drawing Size 16 (cont)**



LOCATION	DIMENSION in. (mm)	CONDITION
A	48 (1219) 18 (457) 18 (457) 12 (305)	Unit disconnect is mounted on panel. No disconnect, convenience outlet option. Recommended service clearance. Minimum clearance.
B	42 (1067) 36 (914) Special	Surface behind servicer is grounded (e.g., metal, masonry wall). Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass). Check for sources of flue products within 10 ft of unit fresh air intake hood.
C	36 (914) 18 (457)	Side condensate drain is used. Minimum clearance.
D	48 (1219) 42 (1067) 36 (914) Special	No flue discharge accessory installed, surface is combustible material. Surface behind servicer is grounded (e.g., metal, masonry wall, another unit). Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass). Check for adjacent units or building fresh air intakes within 10 ft (3 m) of this unit's flue outlet.

#### NOTES:

1. Unit is not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.
2. See Fig. 4 for service clearances in units size 07.

**Fig. 10 — Service Clearances — 48TC\*\*08-16 Units**

## INSTALLATION

Installation of this unit at altitudes above 2000 ft (610 m) shall be made in accordance with the Listed High Altitude Conversion Kit available with this furnace.

L'installation de ce générateur de chaleur à des altitudes supérieures à 2000 pi (610 m) doit être effectuée conformément aux instructions accompagnant la trousse de conversion pour haute altitude fournie avec cet appareil.

### Step 1 — Plan for Unit Location

Select a location for the unit and its support system (curb or other) that provides for the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 2-10.

NOTE: Consider also the effect of adjacent units.

Be sure that unit is installed such that snow will not block the combustion intake or flue outlet.

Unit may be installed directly on wood flooring or on class A, B, or C roof-covering material when roof curb is used.

Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air. For proper unit operation, adequate combustion and ventilation air must be

provided in accordance with Section 5.3 (Air for Combustion and Ventilation) of the National Fuel Gas Code, ANSI Z223.1 (American National Standards Institute) and NFPA (National Fire Protection Association) 54 TIA-54-84-1. In Canada, installation must be in accordance with the CAN1-B149 installation codes for gas burning appliances.

Although unit is weatherproof, avoid locations that permit water from higher level runoff and overhangs to fall onto the unit.

For sizes 07-14 only, locate mechanical draft system flue assembly at least 4 ft (1.2 m) from any opening through which combustion products could enter the building, and at least 4 ft (1.2 m) from any adjacent building (or per local code). Locate the flue assembly at least 10 ft (3.05 m) from an adjacent unit's fresh air intake hood if within 3 ft (0.91 m) of same elevation (or per local code). When unit is located adjacent to public walkways, flue assembly must be at least 7 ft (2.1 m) above grade.

Select a unit mounting system that provides adequate height to allow installation of condensate trap per requirements. See Install External Condensate Trap and Line on page 30 for required trap dimensions.

### ROOF MOUNT

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 2.

## Step 2 — Plan for Sequence of Unit Installation

The support method used for this unit will dictate different sequences for the steps of unit installation. For example, on curb-mounted units, some accessories must be installed on the unit before the unit is placed on the curb. Review the following for recommended sequences for installation steps.

### CURB-MOUNTED INSTALLATION

1. Install curb
2. Install field-fabricated ductwork inside curb
3. Install accessory thru-base service connection package (affects curb and unit) (refer to accessory installation instructions for details)
4. Prepare bottom condensate drain connection to suit planned condensate line routing (see Install External Condensate Trap and Line on page 30 for details)
5. Rig and place unit
6. Install outdoor air hood
7. Install flue hood
8. Install gas piping
9. Install condensate line trap and piping
10. Make electrical connections
11. Install other accessories

### PAD-MOUNTED INSTALLATION

1. Prepare pad and unit supports
2. Check and tighten the bottom condensate drain connection plug
3. Rig and place unit
4. Convert unit to side duct connection arrangement
5. Install field-fabricated ductwork at unit duct openings
6. Install outdoor air hood
7. Install flue hood
8. Install gas piping
9. Install condensate line trap and piping
10. Make electrical connections
11. Install other accessories

### FRAME-MOUNTED INSTALLATION

Frame-mounted applications generally follow the sequence for a curb installation. Adapt as required to suit specific installation plan.

## Step 3 — Inspect Unit

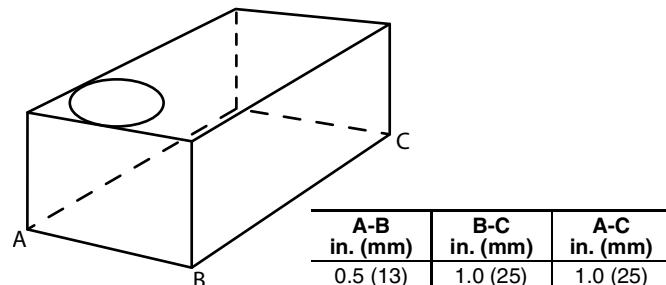
Inspect unit for transportation damage. File any claim with transportation agency. Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided.

## Step 4 — Provide Unit Support

### ROOF CURB MOUNT

Accessory roof curb details and dimensions are shown in Fig. 12-14. Assemble and install accessory roof curb in accordance with

instructions shipped with the curb. Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are shown in Fig. 11. Refer to Accessory Roof Curb Installation Instructions for additional information as required.



**Fig. 11 — Unit Leveling Tolerances**

NOTE: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket supplied with the roof curb as shown in Fig. 12-14. Improperly applied gasket can also result in air leaks and poor unit performance.

Install insulation, cant strips, roofing felt, and counter flashing as shown. Ductwork must be attached to curb and not to the unit.

**IMPORTANT:** If the unit has the factory-installed Thru-the-base option, make sure to complete installation of the option before placing the unit on the roof curb.

See the following sections:

### Factory-Option Thru-Base Connections

(Gas Connection) on page 27 for sizes 07-14 and page 28 for size 16

### Factory-Option Thru-Base Connections

(Electrical Connections) on page 35 for sizes 07-14 and page 36 for size 16

NOTE: For size 16, if gas and/or electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

### FOR SIZES 07-14 ONLY

The accessory thru-the-base power and gas connection package must be installed before the unit is set on the roof curb. If field-installed thru-the-roof curb gas connections are desired, use factory-supplied 1/2-in. pipe coupling and gas plate assembly to mount the thru-the-roof curb connection to the roof curb. Gas connections and power connections to the unit must be field installed after the unit is installed on the roof curb.

If electric and control wiring is to be routed through the basepan, attach the accessory thru-the-base service connections to the basepan in accordance with the accessory installation instructions.

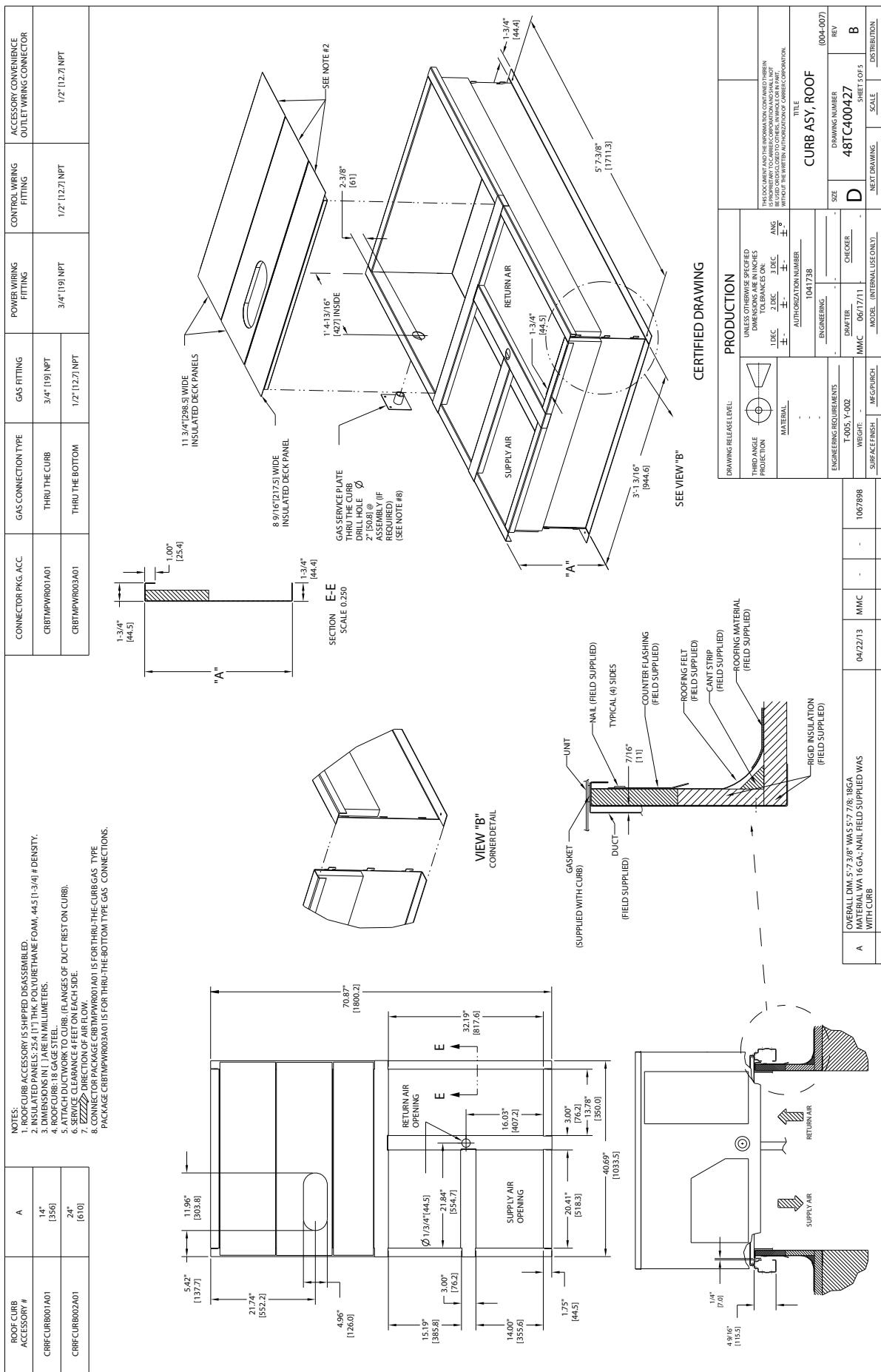
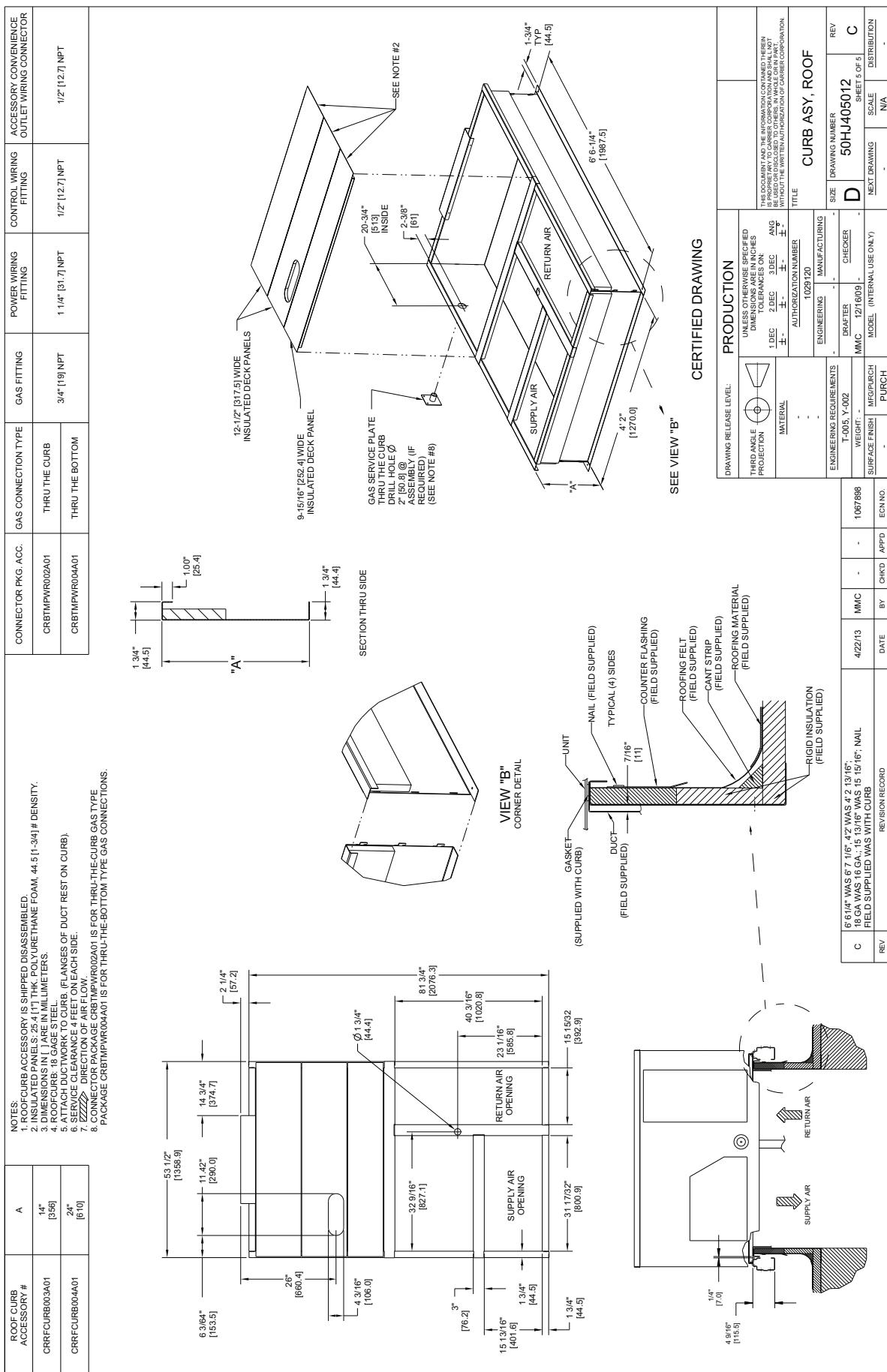
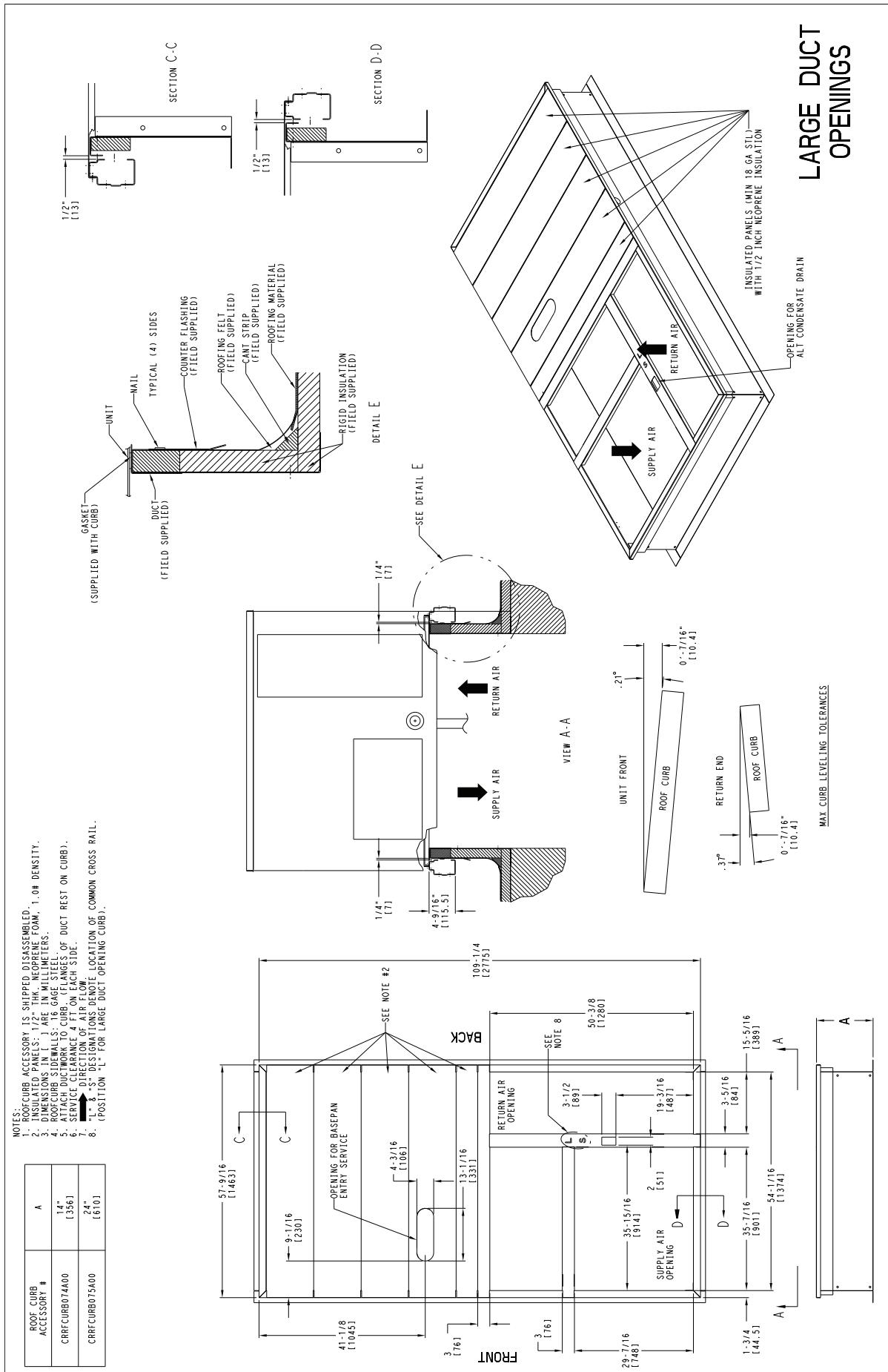


Fig. 12 — 48TC\*\*07 Roof Curb Details





**Table 2 — Operating Weights**

48TC	UNITS — lb (kg)					
	07	08	09	12	14	16
48TC*A	652 (296)					
48TC*M		777 (353)	805 (365)	850 (386)		
48TC*D		900 (408)	970 (440)	980 (444)	1075 (487)	1305 (592)
<b>Economizer</b>						
<b>Vertical</b>	50 (23)	75 (34)	75 (34)	75 (34)	75 (34)	130 (47)
<b>Horizontal</b>	80 (36)	122 (55)	122 (55)	122 (55)	122 (55)	242 (110)
<b>Humidi-MiZer® System*</b>	41 (15)	80 (36)	80 (36)	80 (36)	85 (39)	90 (41)
<b>Powered Outlet</b>	35 (16)	35 (16)	35 (16)	35 (16)	35 (16)	35 (16)
<b>Curb</b>						
<b>14-in. (356 mm)</b>	110 (50)	143 (65)	143 (65)	143 (65)	143 (65)	180 (82)
<b>16-in. (610 mm)</b>	145 (66)	245 (111)	245 (111)	245 (111)	245 (111)	255 (116)

\* Humidi-MiZer is not available on 48TC\*M models.

#### SLAB MOUNT (HORIZONTAL UNITS ONLY)

Provide a level concrete slab that extends a minimum of 6-in. (150 mm) beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.

NOTE: Horizontal units may be installed on a roof curb if required.

#### ALTERNATE UNIT SUPPORT (IN LIEU OF CURB OR SLAB MOUNT)

A non-combustible sleeper rail can be used in the unit curb support area. If sleeper rails cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. (102 mm x 102 mm) pads on each side.

#### Step 5 — Field Fabricate Ductwork

NOTE: Cabinet return-air static pressure (a negative condition) shall not exceed 0.35 in. wg (87 Pa) with economizer or 0.45 in. wg (112 Pa) without economizer.

For vertical ducted applications, secure all ducts to roof curb and building structure. *Do not connect ductwork to unit.*

Fabricate supply ductwork so that the cross sectional dimensions are equal to or greater than the unit supply duct opening dimensions for the first 18-in. (458 mm) of duct length from the unit basepan.

Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through unconditioned spaces must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

A minimum clearance is not required around ductwork.

Rigging materials under unit (cardboard or wood to prevent base pan damage) must be removed PRIOR to placing the unit on the roof curb.

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight. Do this before setting the unit in place. The red drain pan can be tightened with a 1/2-in. square socket drive extension. For further details see Install External Condensate Trap and Line on page 30.

Before setting the unit onto the curb, recheck gasketing on curb.

#### ⚠ CAUTION

##### UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage. All panels must be in place when rigging. Unit is not designed for handling by fork truck when packaging is removed.

If using top crate as spreader bar, once unit is set, carefully lower wooden crate off building roof top to ground. Ensure that no people or obstructions are below prior to lowering the crate.

#### ⚠ CAUTION

##### PROPERTY DAMAGE HAZARD

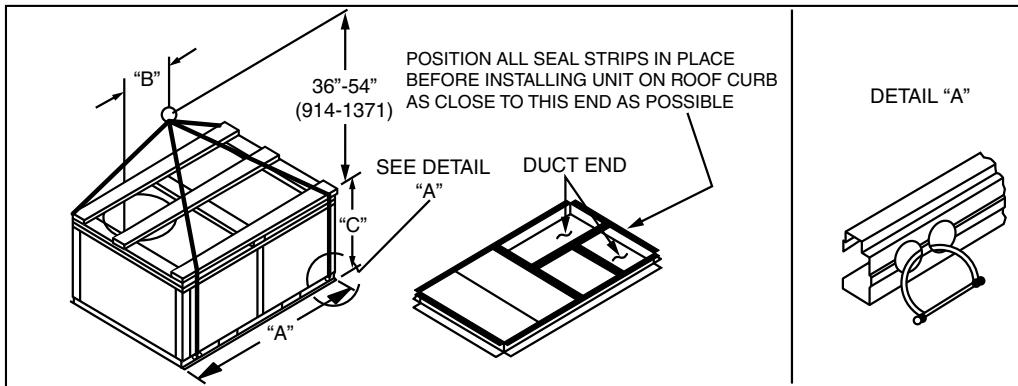
Failure to follow this caution may result in damage to roofing materials.

Membrane roofs can be cut by sharp sheet metal edges. Be careful when placing any sheet metal parts on such roof.

#### Step 6 — Rig and Place Unit

Keep unit upright and do not drop. Spreader bars are required for 07-14 size units; size 16 units do not require spreader bars. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 2 and Fig. 15 for additional information.

Lifting holes are provided in base rails as shown in Fig. 15. Refer to rigging instructions on unit.



UNIT	MAX WEIGHT		DIMENSIONS					
	LB	KG	A IN.	MM	B IN.	MM	C IN.	MM
48TC 07	1075	489	74.5	1890	39.0	990	41.5	1055
48TC-M08	1295	588	88.0	2235	42.0	1065	41.5	1055
48TC-M09	1335	606	88.0	2235	41.5	1055	49.5	1255
48TC-M12	1435	651	88.0	2235	42.5	1080	49.5	1255
48TC*D/E08	1445	657	88.0	2235	43.0	1090	41.5	1055
48TC*D/E09	1565	711	88.0	2235	42.5	1080	49.5	1255
48TC*D/E12	1605	730	88.0	2235	42.0	1065	49.5	1255
48TC*D/E14	1760	800	88.0	2235	29.5	750	53.0	1345
48TC**D/E16	2140	973	116.0	2945	60.5	1535	59.5	1510

#### NOTES:

1. SPREADER BARS REQUIRED FOR SIZES 07-14 — Top damage will occur if spreader bars are not used. Not required for size 16.
2. Dimensions in () are in millimeters.
3. Hook rigging shackles through holes in base rail, as shown in detail "A." Holes in base rails are centered around the unit center of gravity. Use wooden top to prevent rigging straps from damaging unit.

**Fig. 15 — Rigging Details**

#### POSITIONING ON CURB

##### *For Size 07-14*

Position unit on roof curb so that the following clearances are maintained:  $1/4$ -in. (6.4 mm) clearance between the roof curb and the base rail inside the front and back, 0.0-in. clearance between the roof curb and the base rail inside on the duct end of the unit. This will result in the distance between the roof curb and the base rail inside on the condenser end of the unit being approximately  $1/4$ -in. (6.4 mm).

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Flue vent discharge must have a minimum horizontal clearance of 4 ft (1220 mm) from electric and gas meters, gas regulators, and gas relief equipment. Minimum distance between unit and other electrically live parts is 48 inches (1220 mm).

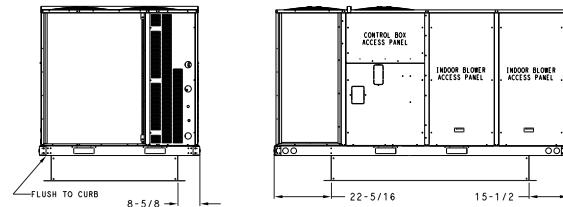
Flue gas can deteriorate building materials. Orient unit such that flue gas will not affect building materials. Locate mechanical draft system flue assembly at least 48-in. (1220 mm) from an adjacent building or combustible material.

NOTE: Installation of accessory flue discharge deflector kit will reduce the minimum clearance to combustible material to 18-in. (460 mm).

After unit is in position, remove rigging skids and shipping materials.

##### *For Size 16*

For full perimeter curbs CRRFCURB074A00 and 075A00, the clearance between the roof curb and the front and rear base rails should be  $1/4$ -in. (6.4 mm). The clearance between the curb and the end base rails should be  $1/2$ -in. (13 mm). For retrofit applications with curbs CRRFCURB003A01 and 4A01, the unit should be positioned as shown in Fig. 16. Maintain the  $15\frac{1}{2}$ -in. (394 mm) and  $8\frac{5}{8}$ -in. (220 mm) clearances and allow the  $22\frac{5}{16}$ -in. (567 mm) dimension to float if necessary.

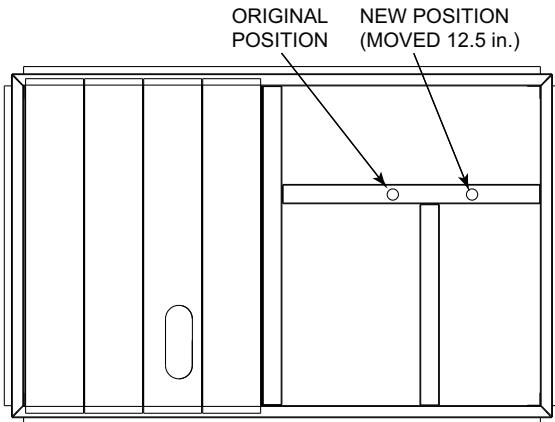


**Fig. 16 — Retrofit Installation Dimensions (Size 16 Shown)**

If the alternative condensate drain location through the bottom of the unit is used in conjunction with a retrofit curb, the hole in the curb must be moved 12.5 in. (320 mm) towards the duct end of the unit. See Fig. 17.

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

Remove all shipping materials and top skid. Remove extra center post from the condenser end of the unit so that the condenser end of the unit matches Fig. 48 and 49. Recycle or dispose of all shipping materials.



**Fig. 17 — Alternative Condensate Drain Hole Positions**

**IMPORTANT:** If the unit has the factory-installed thru-the-base option, make sure to complete installation of the option before placing the unit on the roof curb.

See the following sections:

**Factory-Option Thru-Base Connections**

(Gas Connection) on page 27 for sizes 07-14 and page 28 for size 16

**Factory-Option Thru-Base Connections**

(Electrical Connections) on page 35 for sizes 07-14 and page 36 for size 16

**NOTE:** If gas and/or electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

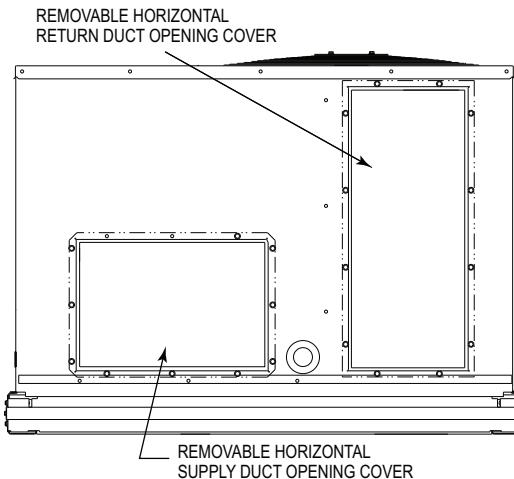
## Step 7 — Convert to Horizontal and Connect Ductwork (When Required)

### SIZES 07-14

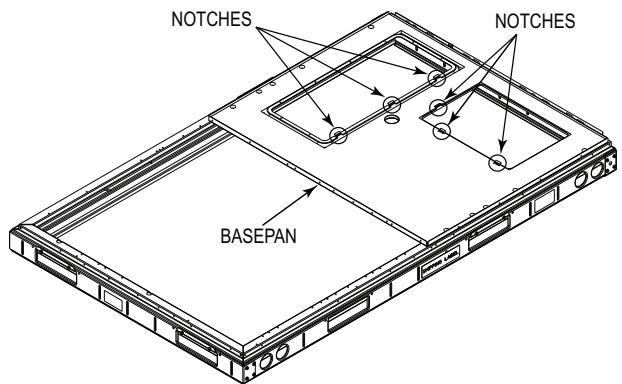
Unit is shipped in the vertical duct configuration. Unit without factory-installed economizer or return-air smoke detector option may be field-converted to horizontal ducted configuration. To convert to horizontal configuration, remove screws from side duct opening covers (see Fig. 18) and remove covers. Use the screws to install the covers on vertical duct openings with the insulation-side down. The panels must be inserted into the notches on the basepan to properly seal. The notches are covered by the tape used to secure the insulation to the basepan and are not easily seen. See Fig. 19 for position of the notches in the basepan. Seals around duct openings must be tight. Secure with screws as shown in Fig. 20. Cover seams with foil duct tape.

Field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof or building openings with counter flashing and mastic in accordance with applicable codes.

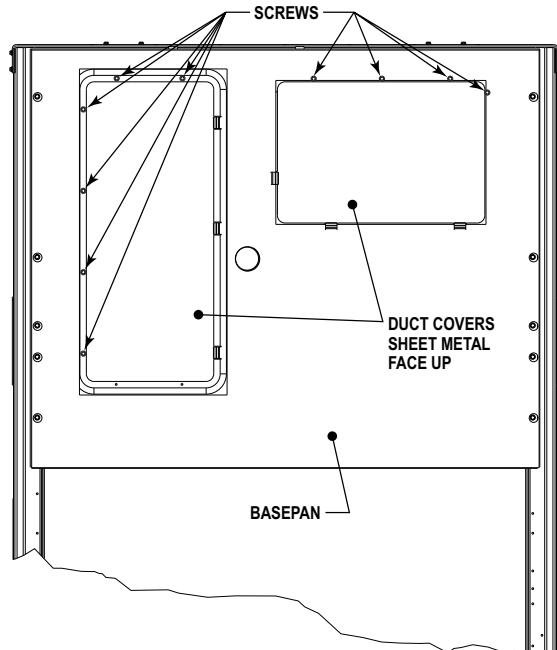
Do not cover or obscure visibility to the unit's informative data plate when insulating horizontal ductwork.



**Fig. 18 — Horizontal Conversion Panels**



**Fig. 19 — Location of Notches**



**Fig. 20 — Horizontal Duct Panels In Place**

## SIZE 16

Unit is shipped in the vertical duct configuration. Unit without factory-installed economizer or return air smoke detector option may be field-converted to horizontal ducted configuration using accessory CRDUCTCV002A00. To convert to horizontal configuration, remove screws from side duct opening covers and remove covers.

Discard the supply duct cover. Install accessory CRDUCTCV002A00 to cover the vertical supply duct opening. Use the return duct cover removed from the end panel to cover the vertical return duct opening.

### ALL UNITS

Field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof or building openings with counter flashing and mastic in accordance with applicable codes.

Do not cover or obscure visibility to the unit's informative data plate when insulating horizontal ductwork.

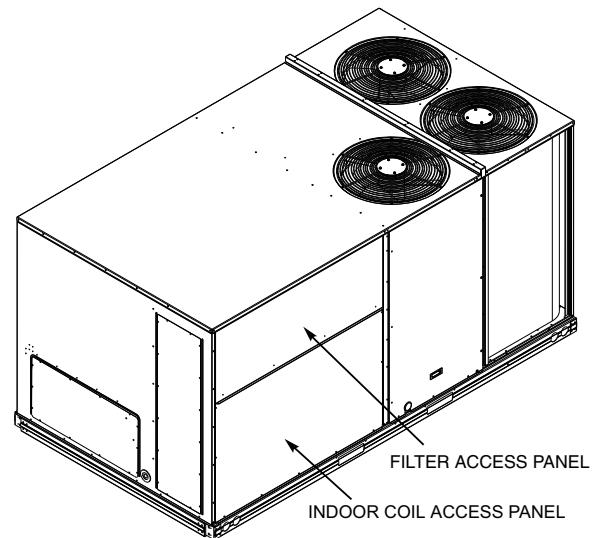
### Step 8 — Install Outside Air Hood

#### ECONOMIZER AND TWO-POSITION DAMPER HOOD PACKAGE REMOVAL (FACTORY OPTION SIZES 07-14)

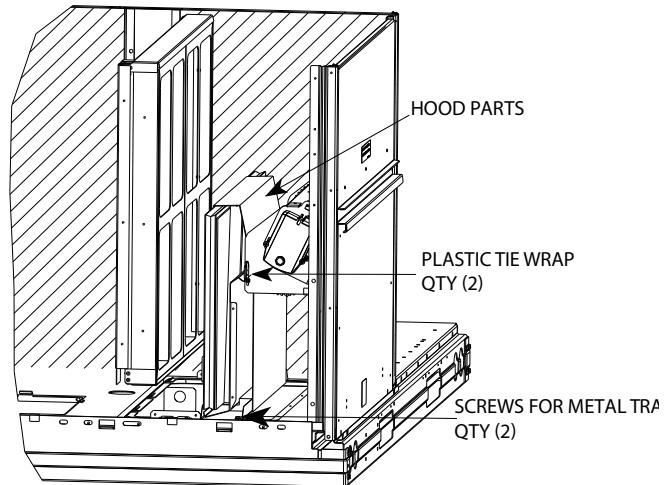
1. The hood is shipped in knock-down form and must be field assembled. The indoor coil access panel is used as the hood top while the hood sides, divider and filter are packaged together, attached to a metal support tray using plastic stretch wrap, and shipped in the return air compartment behind the indoor coil access panel. The hood assembly's metal tray is attached to the basepan and also attached to the damper using two plastic tie-wraps.
2. To gain access to the hood, remove the filter access panel. (See Fig. 21).
3. Locate the (2) screws holding the metal tray to the basepan and remove. Locate and cut the (2) plastic tie-wraps securing the assembly to the damper (see Fig. 22). Be careful to not damage any wiring or cut tie-wraps securing any wiring. The indoor coil access panel will be used as the top of the damper hood. Remove the screws along the sides and bottom of the indoor coil access panel.
4. Carefully lift the hood assembly (with metal tray) through the filter access opening and assemble per the steps outlined in *Economizer Hood and Two-Position Damper Hood Setup* (Sizes 07-14) on page 25.

#### ECONOMIZER HOOD REMOVAL (FACTORY OPTION SIZE 16)

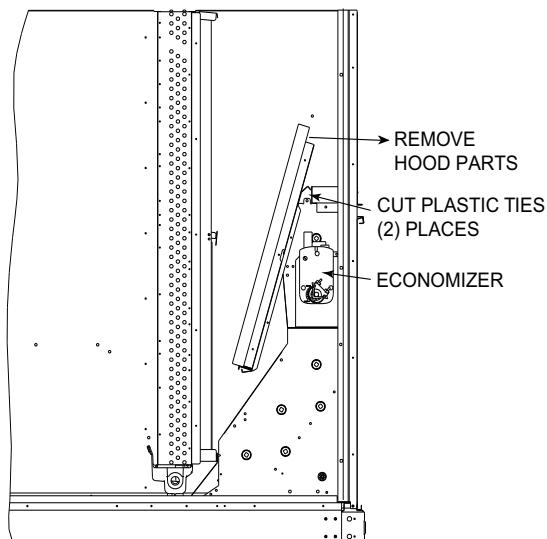
1. The hood is shipped in knock-down form and located in the return air compartment. It is attached to the economizer using two plastic tie-wraps.
2. To gain access to the hood, remove the filter access panel (see Fig. 21).
3. Locate and cut the (2) plastic tie-wraps being careful (see Fig. 23). Be careful to not damage any wiring or cut tie-wraps securing any wiring.
4. Carefully lift the hood assembly (with metal tray) through the filter access opening and assemble per the steps outlined in *Economizer and Two-Position Hood Setup, Size 16*, on page 25.



**Fig. 21 — Typical Access Panel Locations  
(Size 16 Shown)**



**Fig. 22 — Economizer and Two Position Damper Hood Package Location  
(Two Position Damper Only in Size 16)**



**Fig. 23 — Economizer Hood Package Location  
(Size 16)**

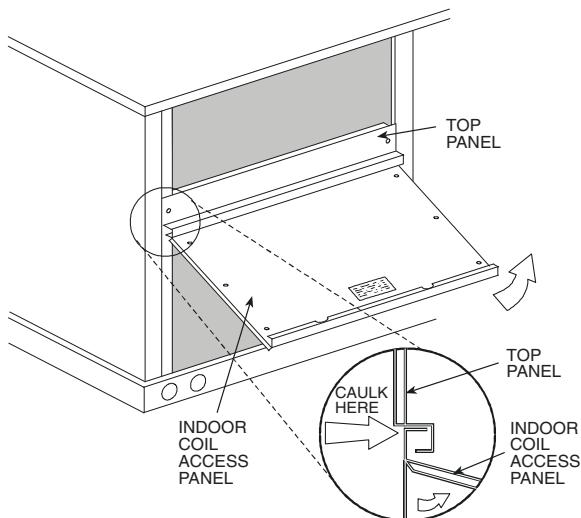
## TWO-POSITION DAMPER HOOD REMOVAL (FACTORY OPTION SIZE 16)

1. The hood is shipped in knock-down form and assembled to a metal support tray using plastic stretch wrap. Located in the return air compartment, the assembly's metal tray is attached to the basepan and also attached to the damper using two plastic tie-wraps.
2. To gain access to the hood, remove the filter access panel. See Fig. 21.
3. Locate the (2) screws holding the metal tray to the basepan and remove. In order to remove the screws, it may be necessary to remove the panel underneath the two-position damper. Remove the two screws. Locate and cut the (2) plastic tie-wraps securing the assembly to the damper. (See Fig. 23.) Be careful to not damage any wiring or cut tie-wraps securing any wiring.
4. Carefully lift the hood assembly (with metal tray) through the filter access opening and assemble per the steps outlined in *Economizer and Two-Position Damper Hood Setup, Size 16* on page 25.
5. If removed, reattach the panel under the damper.

## ECONOMIZER AND TWO-POSITION DAMPER HOOD SETUP (SIZES 07-14)

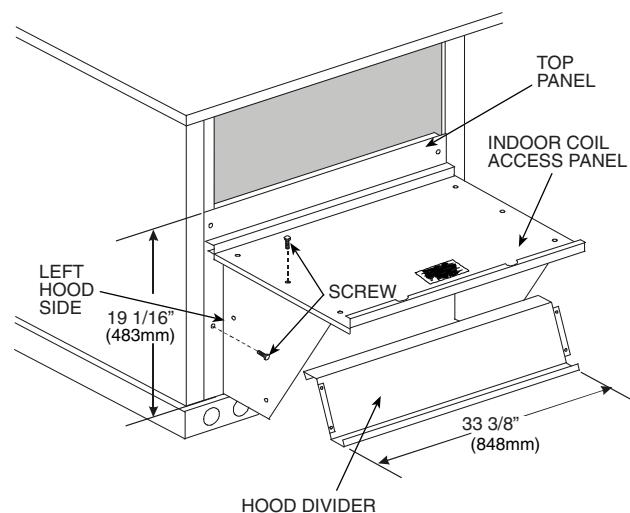
NOTE: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly.

1. The indoor coil access panel will be used as the top of the hood. Remove the screws along the sides and bottom of the indoor coil access panel. See Fig. 24.
2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 25.
3. Remove the shipping tape holding the economizer barometric relief damper in place (economizer only).
4. Insert the hood divider between the hood sides. See Fig. 25 and 26. Secure hood divider with 2 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
5. Open the filter clips which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. See Fig. 26.

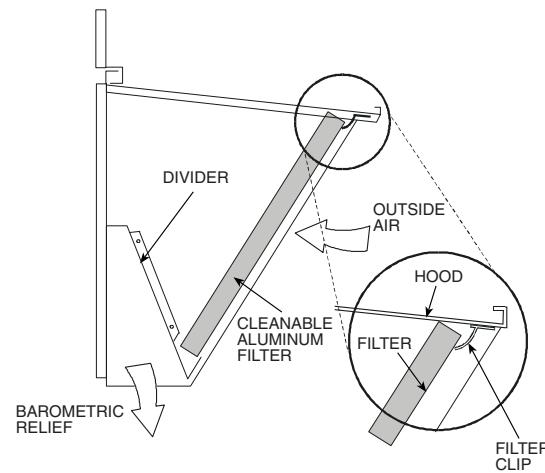


**Fig. 24 — Indoor Coil Access Panel Relocation (Size 07-14 Shown)**

6. Caulk the end of the joint between the unit top panel and the hood top.
7. Replace the filter access panel.



**Fig. 25 — Economizer Hood Construction (Size 07-14 Shown)**



**Fig. 26 — Economizer Filter Installation (Size 07-14 Shown)**

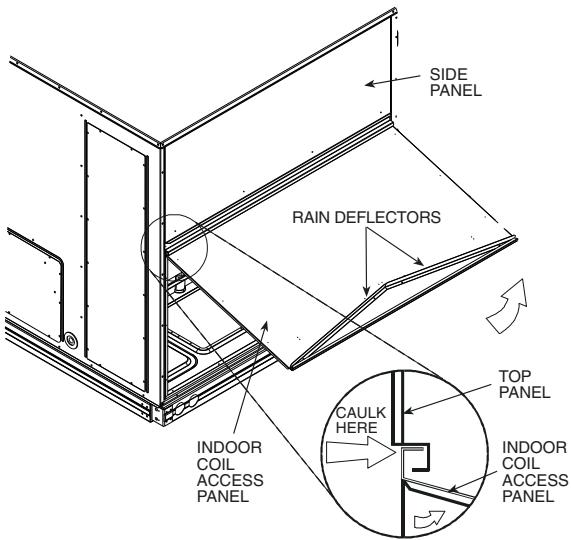
## ECONOMIZER AND TWO-POSITION DAMPER HOOD SETUP (SIZE 16)

NOTE: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly.

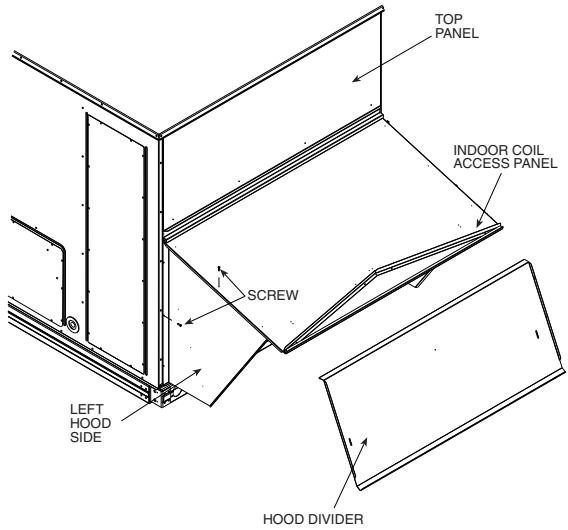
1. The indoor coil access panel will be used as the top of the hood. If the panel is still attached to the unit, remove the screws along the sides and bottom of the panels. See Fig. 27.
2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Be careful not to lift the panel too far, as it might fall out. Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 28.
3. Remove the shipping tape holding the economizer barometric relief damper in place (economizer only).
4. Insert the hood divider between the hood sides. See Fig. 28 and 29. Secure hood divider with 2 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
5. Open the filter clips, which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack

(hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. See Fig. 29.

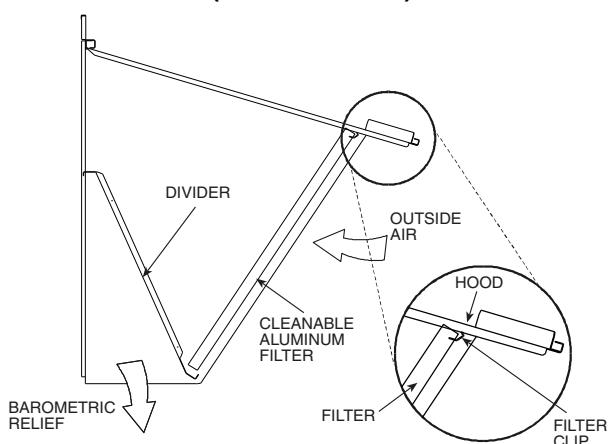
- Caulk the ends of the joint between the unit top panel and the hood top.
- Replace the filter access panel.



**Fig. 27 — Indoor Coil Access Panel Relocation (Size 16 Shown)**



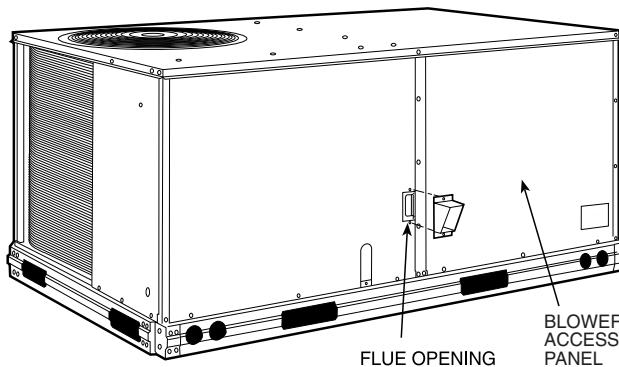
**Fig. 28 — Economizer Hood Construction (Size 16 Shown)**



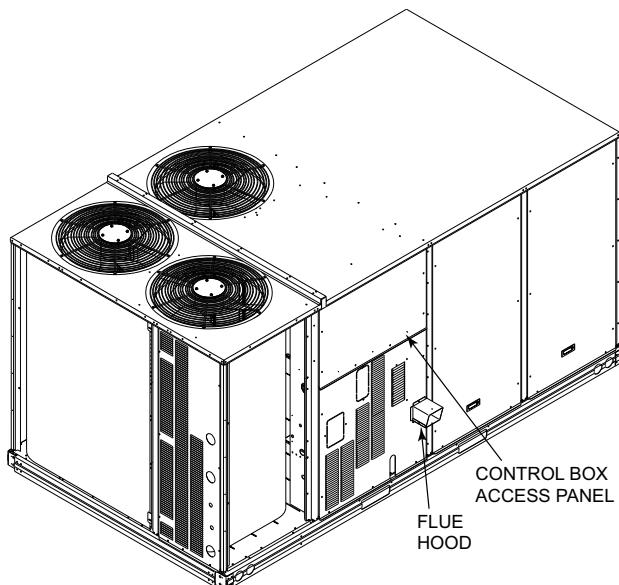
**Fig. 29 — Economizer Filter Installation (Size 16 Shown)**

## Step 9 — Install Flue Hood

Flue hood is shipped screwed to the basepan beside the burner compartment access panel. Remove from shipping location and using screws provided, install flue hood and screen in location shown in Fig. 30 for sizes 07-14 and Fig. 31 for size 16.



**Fig. 30 — Flue Hood Details (Sizes 07-14)**



**Fig. 31 — Flue Hood Details (Size 16)**

## Step 10 — Install Gas Piping

Installation of the gas piping must be in accordance with local building codes and with applicable national codes. In U.S.A., refer to NFPA 54/ANSI Z223.1 National Fuel Gas Code (NFGC). In Canada, installation must be in accordance with the CAN/CSA B149.1 and CAN/CSA B149.2 installation codes for gas-burning appliances. This unit is factory equipped for use with natural gas (NG) fuel at elevations up to 2000 ft (610 m) above sea level. Unit may be field converted for operation at elevations above 2000 ft (610 m) and/or for use with liquefied petroleum (LP) fuel. See accessory kit installation instructions regarding these accessories.

NOTE: Furnace gas input rate on rating plate is for installation up to 2000 ft (610 m) above sea level. The input rating for altitudes above 2000 ft (610 m) must be derated by 4% for each 1000 ft (305 m) above sea level.

NOTE: Installation of this furnace at altitudes above 2000 ft (610 m) shall be made in accordance with the Listed High Altitude Conversion Kit available with this furnace.

NOTE: L'installation de ce générateur de chaleur à des altitudes supérieures à 2000 pi (610 mm) doit être effectuée conformément aux instructions accompagnant la trousse de conversion pour haute altitude fournie avec cet appareil.

For natural gas applications, gas pressure at unit gas connection must not be less than 4 in. wg (996 Pa) or greater than 13 in. wg (3240 Pa) while the unit is operating for sizes 07 to 14 and less than 5 in. wg (996 Pa) or greater than 13 in. wg (3240 Pa) while the unit is operating for size 16 (see Table 3). For liquefied petroleum applications, the gas pressure must not be less than 11 in. wg (2740 Pa) or greater than 13.0 in. wg (3240 Pa) at the unit connection (see Table 4).

**Table 3 — Natural Gas Supply Line Pressure Ranges**

UNIT MODEL	UNIT SIZE	MIN.	MAX.
48TCD/E/F/S/R/T	07, 08, 09, 12, 14	4.0 in. wg (996 Pa)	13.0 in. wg (3240 Pa)
	16	5.0 in. wg (1250 Pa)	13.0 in. wg (3240 Pa)

**Table 4 — Liquid Propane Supply Line Pressure Ranges**

UNIT MODEL	UNIT SIZE	MIN.	MAX.
48TCD/E/F/S/R/T	07, 08, 09, 12, 14, 16	11.0 in. wg (2740 Pa)	13.0 in. wg (3240 Pa)

The gas supply pipe enters the unit at the burner access panel on the front side of the unit through the long slot at the bottom of the access panel. The gas connection to the unit is made to the 1/2-in. FPT gas inlet port on the unit gas valve for sizes 07-09 and 3/4-in. FPT gas inlet port on the unit gas valve for size 12-16 (see Table 5).

Manifold pressure is factory-adjusted for NG fuel use. Adjust as required to obtain best flame characteristics.

**Table 5 — Natural Gas Manifold Pressure Ranges**

UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE*
48TCD/E/F/S/R/T	07, 08, 09, 12, 14	3.5 in. wg (872 Pa)	2.0 in. wg (498 Pa)
	16	3.0 in. wg (747 Pa)	

\* LOW FIRE, 1.7 in. wg (423 Pa), applies to the following units only: 48TCD/E/F\*08 and 48TCD\*09.

Manifold pressure for LP fuel use must be adjusted to specified range (see Table 6). Follow instructions in the accessory kit to make initial readjustment.

**Table 6 — Liquid Propane Manifold Pressure Ranges**

UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE*
48TCD/E/F/S/R/T	07, 08, 09, 12, 14	10.0 in. wg (2490 Pa)	5.7 in. wg (1420 Pa)
	16		

\* LOW FIRE, 5.0 in. wg (1420 Pa), applies to the following units only: 48TCD/E/F\*08 and 48TCD\*09.

## CAUTION

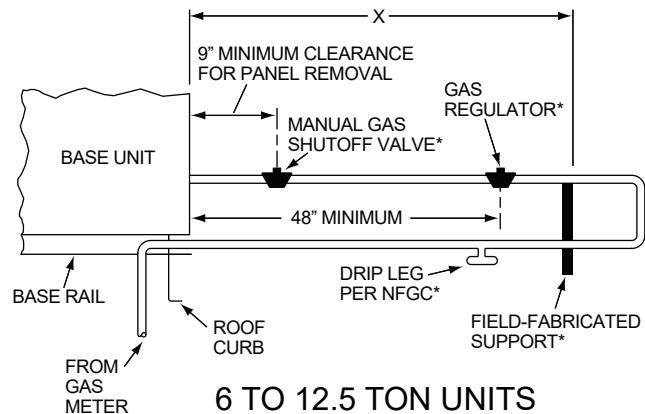
### EQUIPMENT DAMAGE

Failure to follow this caution may result in equipment damage.

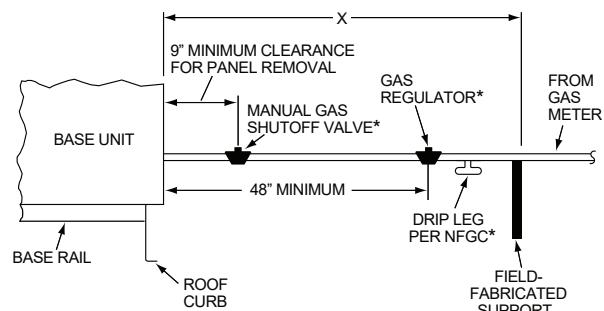
When connecting the gas line to the unit gas valve, the installer **MUST** use a backup wrench to prevent damage to the valve.

Install a gas supply line that runs to the unit heating section. Refer to the NFPA 54/NFGC or equivalent code for gas pipe sizing data. Do not use a pipe size smaller than 1/2-inch. Size the gas supply line to allow for a maximum pressure drop of 0.5 in. wg (124 Pa) between gas regulator source and unit gas valve connection when unit is operating at high-fire flow rate.

The gas supply line can approach the unit in three ways: horizontally from outside the unit (across the roof), thru-curb/under unit basepan (accessory kit required) or through unit basepan (factory option or accessory kit required). Consult accessory kit installation instructions for details on these installation methods. Observe clearance to gas line components per Fig. 32.



**6 TO 12.5 TON UNITS**



**15 TON UNIT**

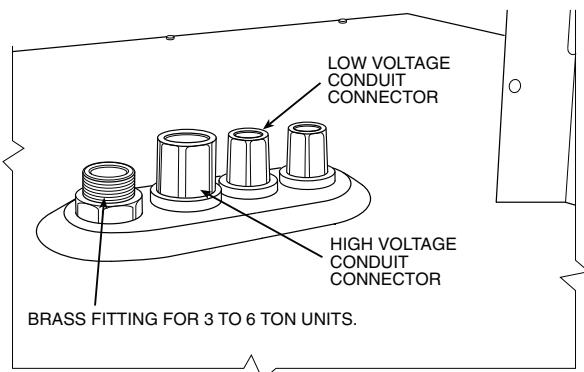
\* Field-supplied.

STEEL PIPE NOMINAL DIAMETER (in.)	SPACING OF SUPPORTS X DIMENSION (ft)
1/2	6
3/4 or 1	8
1 1/4 or larger	10

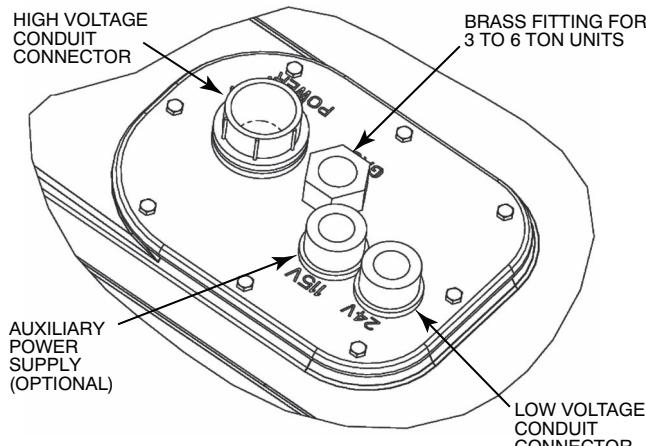
**Fig. 32 — Gas Piping Guide (with Accessory Thru-the-Curb Service Connections)**

### FACTORY-OPTION THRU-BASE CONNECTIONS (GAS CONNECTIONS) (SIZES 07-14)

This service connection kit consists of a 1/2-in. NPT gas adapter fitting (brass), a 1/2-in. electrical bulkhead connector and a 3/4-in. electrical bulkhead connector, all factory-installed in the embossed (raised) section of the unit basepan in the condenser section. See Fig. 33 and 34.



**Fig. 33 — Thru-Base Connection Fittings (Size 08-16 units and 07 units built prior to 4/15/2019)**

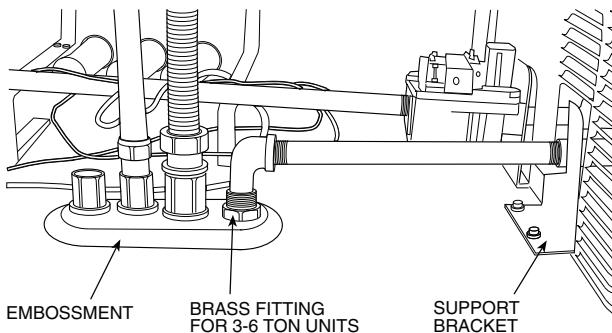


**Fig. 34 — Thru-Base Connection Fittings  
(07 units built on or after 4/15/2019)**

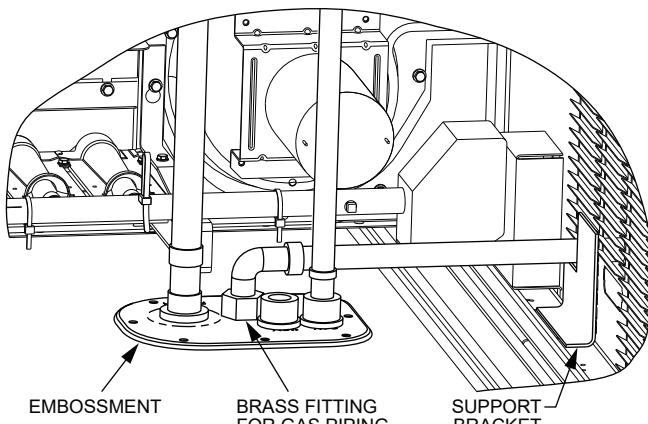
The thru-base gas connector has male and female threads. The male threads protrude above the basepan of the unit; the female threads protrude below the basepan.

Check tightness of connector lock nuts before connecting gas piping.

Install a 1/2-in. NPT street elbow on the thru-base gas fitting. Attach a 1/2-in. pipe nipple with minimum length of 16-in. (406 mm) (field-supplied) to the street elbow and extend it through the access panel at the gas support bracket. See Fig. 35 and Fig. 36.



**Fig. 35 — Gas Line Piping (Sizes 07-14)**



**Fig. 36 — Thru-Base Gas Line Piping for 48TC\*\*07 Units Built On or After 4/15/19**

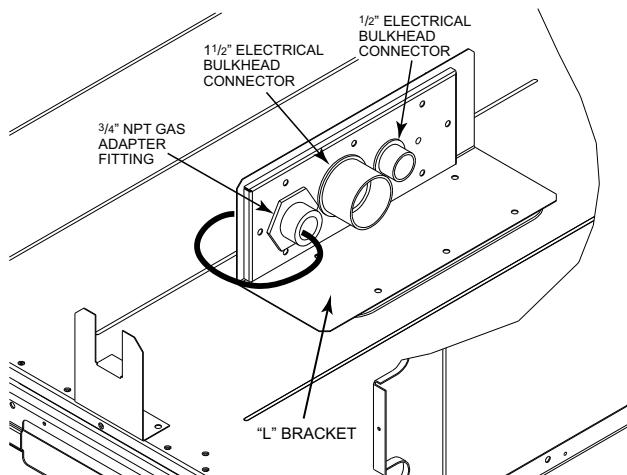
## FACTORY-OPTION THRU-BASE GAS CONNECTIONS (SIZE 16)

This service connection kit consists of a 3/4-in. NPT gas adapter fitting (stainless steel), a 1/2-in. electrical bulkhead connector and a 1 1/2-in. electrical bulkhead connector, connected to an "L" bracket covering the embossed (raised) section of the unit basepan in the condenser section. See Fig. 37.

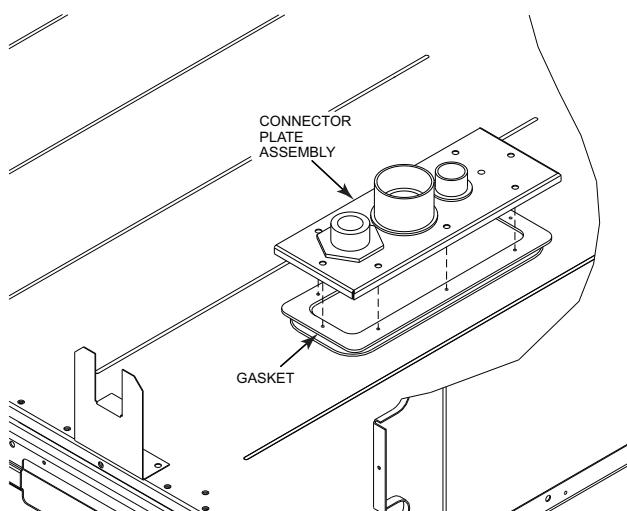
1. Remove the "L" bracket assembly from the unit (see Fig. 37).
2. Cut and discard the wire tie on the gas fitting. Hand-tighten the fitting if it has loosened in transit.
3. Remove connector plate assembly from the "L" bracket and discard the "L" bracket, but retain the washer head screws and the gasket (located between the "L" bracket and the connector plate assembly)

NOTE: Take care not to damage the gasket, as it is reused in the following step.

4. Place the gasket over the embossed area in the basepan, aligning the holes in the gasket to the holes in the basepan. See Fig. 38.
5. Install the connector plate assembly to the basepan using 8 of the washer head screws.



**Fig. 37 — Thru-Base Connection Fittings  
(Size 16 Shown)**



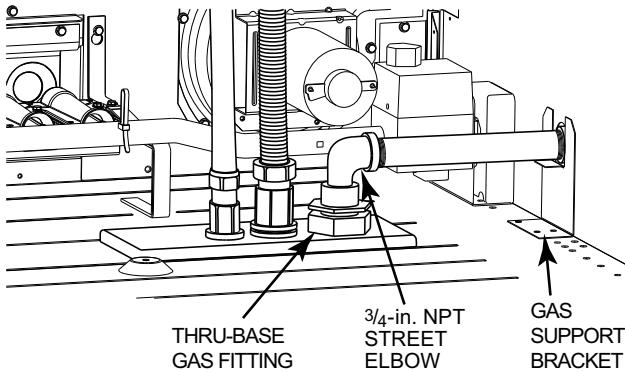
**Fig. 38 — Completing Installation of Thru-the-Base Option (Size 16 Shown)**

NOTE: If gas and/or electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.

The thru-base gas connector has male and female threads. The male threads protrude above the basepan of the unit; the female threads protrude below the basepan.

Check tightness of connector lock nuts before connecting gas piping.

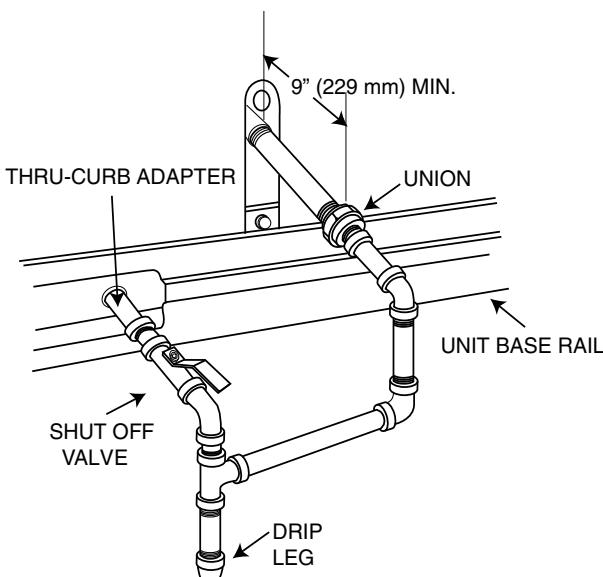
Install a 3/4-in. NPT street elbow (field-supplied) on the thru-base gas fitting. Attach a 3/4-in. pipe nipple with minimum length of 16-in. (406 mm) (field-supplied) to the street elbow and extend it through the access panel at the gas support bracket (see Fig. 39).



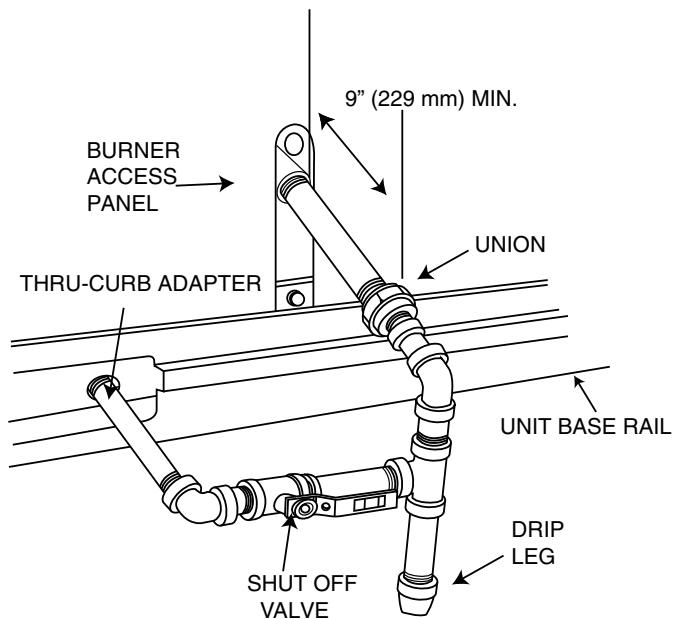
**Fig. 39 — Gas Line Piping (Size 16)**

#### ALL UNITS

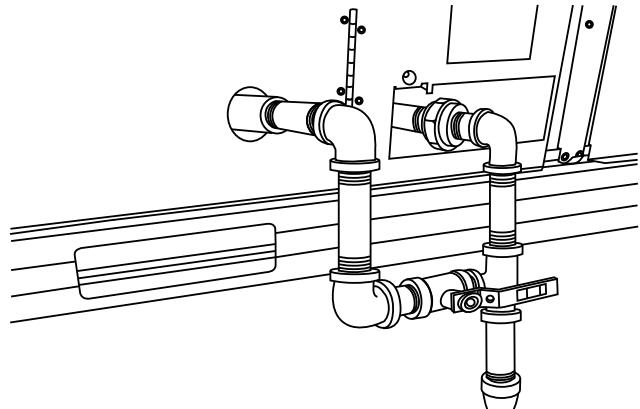
Other hardware required to complete the installation of the gas supply line will include a manual shutoff valve, a sediment trap (drip leg), and a ground-joint union. A pressure regulator valve may also be required (to convert gas pressure from pounds to inches of pressure). The manual shutoff valve must be located within 6 ft (1.83 m) of the unit. The union, located in the final leg entering the unit, must be located at least 9-in. (230 mm) away from the access panel to permit the panel to be removed for service. If a regulator valve is installed, it must be located a minimum of 4 ft (1220 mm) away from the unit's flue outlet. Some municipal codes require that the manual shutoff valve be located upstream of the sediment trap. See Fig. 40 and 41 for typical piping arrangements for gas piping that has been routed through the side-wall of the curb. See Fig. 42 for typical piping arrangement when thru-base is used. Ensure that all piping does not block access to the unit's main control box or limit the required working space in front of the control box.



**Fig. 40 — Gas Piping with Thru-Curb Accessory**



**Fig. 41 — Gas Piping with Thru-Curb Accessory (Alternate Layout)**



**Fig. 42 — Gas Piping Thru-Base Connections**

When installing the gas supply line, observe local codes pertaining to gas pipe installations. Refer to the NFPA 54/ANSI Z223.1 NFCC latest edition (in Canada, CAN/CSA B149.1). In the absence of local building codes, adhere to the following pertinent recommendations:

1. Avoid low spots in long runs of pipe. Grade all pipe  $1/4$ -in. in every 15 ft (7 mm in every 5 m) to prevent traps. Grade all horizontal runs downward to risers. Use risers to connect to heating section and to meter.
2. Protect all segments of piping system against physical and thermal damage. Support all piping with appropriate straps, hangers, etc. Use a minimum of one hanger every 6 ft (1.8 m). For pipe sizes larger than  $1/2$ -in., follow recommendations of national codes.
3. Apply joint compound (pipe dope) sparingly and only to male threads of joint when making pipe connections. Use only pipe dope that is resistant to action of liquefied petroleum gases as specified by local and/or national codes. If using PTFE (Teflon<sup>1</sup>) tape, ensure the material is Double Density type and is labeled for use on gas lines. Apply tape per manufacturer's instructions.

1. Teflon is a registered trademark of DuPont Corporation.

4. Pressure-test all gas piping in accordance with local and national plumbing and gas codes before connecting piping to unit.

NOTE: Pressure test the gas supply system after the gas supply piping is connected to the gas valve. The supply piping must be disconnected from the gas valve during the testing of the piping systems when test pressure is in excess of 0.5 psig (3450 Pa). Pressure test the gas supply piping system at pressures equal to or less than 0.5 psig (3450 Pa). The unit heating section must be isolated from the gas piping system by closing the external main manual shutoff valve and slightly opening the ground-joint union.

Check for gas leaks at the field-installed and factory-installed gas lines after all piping connections have been completed. Use soap-and-water solution (or method specified by local codes and/or regulations).

### ⚠️ WARNING

Failure to follow this warning could result in personal injury, death and/or property damage.

- Connect gas pipe to unit using a backup wrench to avoid damaging gas controls.
- Never purge a gas line into a combustion chamber.
- Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections.
- Use proper length of pipe to avoid stress on gas control manifold.

NOTE: If orifice hole appears damaged or it is suspected to have been re-drilled, check orifice hole with a numbered drill bit of correct size. Never re-drill an orifice (see Fig. 43). A burr-free and squarely aligned orifice hole is essential for proper flame characteristics.

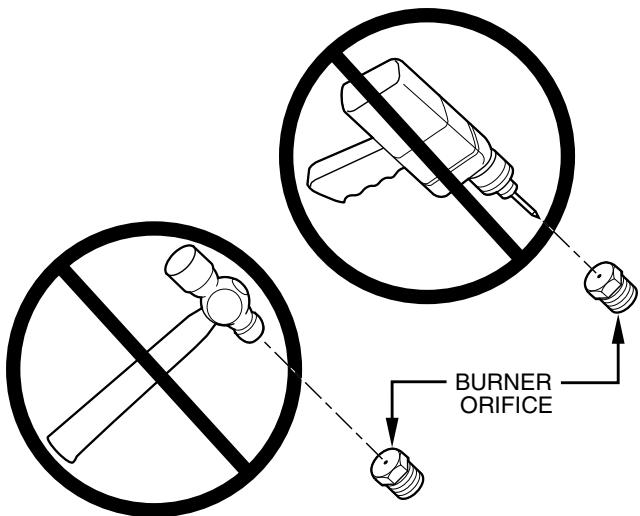


Fig. 43 — Orifice Hole

### Step 11 — Install External Condensate Trap and Line

The unit has one 3/4-in. condensate drain connection on the end of the condensate pan and an alternate connection on the bottom. See Fig. 44. Unit airflow configuration does not determine which drain connection to use. Either drain connection can be used with vertical or horizontal applications.

To use the alternate bottom drain connection, remove the red drain plug from the bottom connection (use a 1/2-in. square socket drive extension) and install it in the side drain connection.

The piping for the condensate drain and external trap can be completed after the unit is in place. See Fig. 44 and 45.

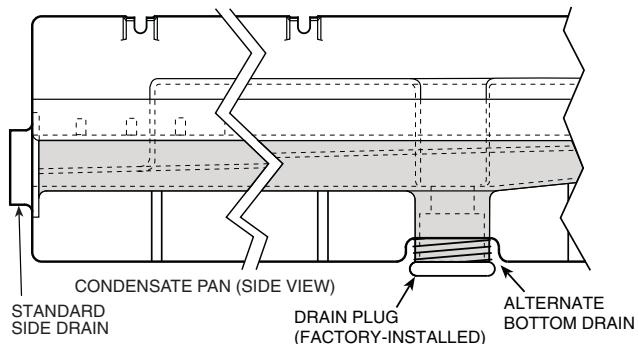
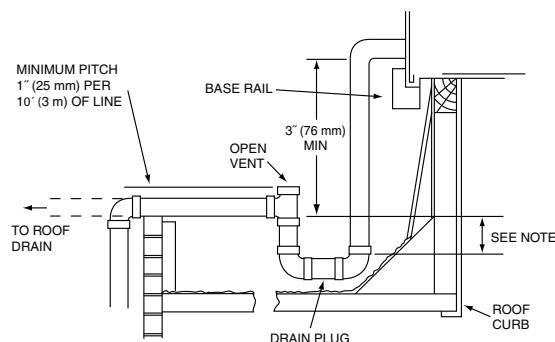


Fig. 44 — Condensate Drain Pan (Side View)

NOTE: If the alternate bottom drain is not used, check the drain plug for tightness prior to setting the unit on the roof curb.



NOTE: Trap should be deep enough to offset maximum unit static difference. A 4-in. (102 mm) trap is recommended.

Fig. 45 — Condensate Drain Piping Details

All units must have an external trap for condensate drainage. Install a trap at least 4-in. (102 mm) deep and protect against freeze-up. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1-in. per 10 ft (25 mm in 3 m) of run. Do not use a pipe size smaller than the unit connection (3/4-in.).

### Step 12 — Make Electrical Connections

### ⚠️ WARNING

Failure to follow this warning could result in personal injury or death.

Do not use gas piping as an electrical ground.

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

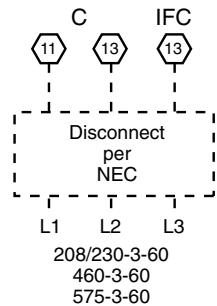
NOTE: Field-supplied wiring shall conform with the limitations of minimum 63°F (33°C) rise.

### FIELD POWER SUPPLY (SIZES 07-14)

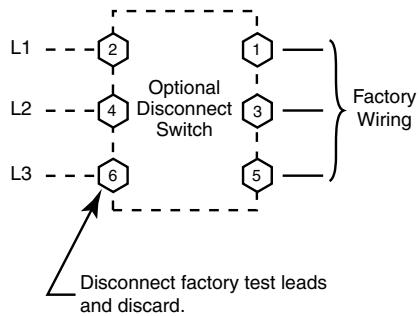
If equipped with optional powered convenience outlet: The power source leads to the convenience outlet's transformer primary are not factory connected. Installer must connect these leads according to required operation of the convenience outlet. If an always-energized convenience outlet operation is desired, connect the source leads to the line side of the unit-mounted disconnect. (Check with local codes to ensure this method is acceptable in

your area.) If a de-energize via unit disconnect switch operation of the convenience outlet is desired, connect the source leads to the load side of the unit disconnect. On a unit without a unit-mounted disconnect, connect the source leads to compressor contactor C and indoor fan contactor IFC pressure lugs with unit field power leads (see Fig. 46).

#### Units Without Disconnect Option

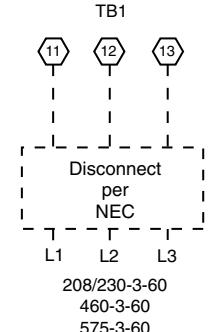


#### Units With Disconnect Option

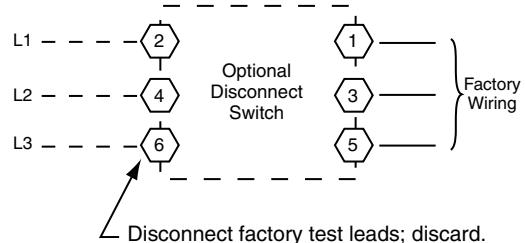


**Fig. 46 — Power Wiring Connections (Sizes 07-14)**

#### Units Without Disconnect Option



#### Units With Disconnect Option



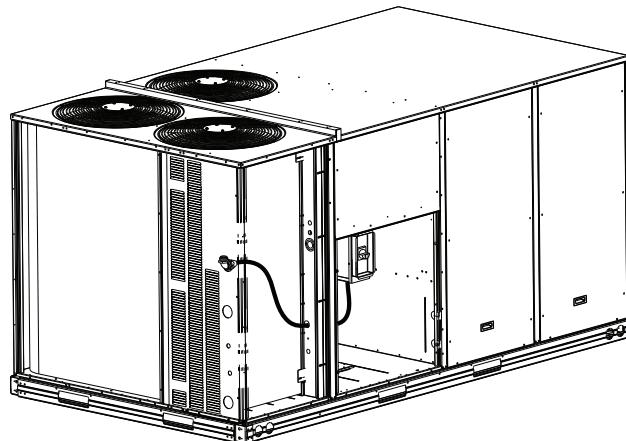
**Fig. 47 — Power Wiring Connections (Size 16)**

Field power wires are connected to the unit at line-side pressure lugs on compressor contactor C and indoor fan contactor IFC (see wiring diagram label for control box component arrangement) or at factory-installed option non-fused disconnect switch. Max wire size is #4 AWG (copper only) (sizes 07-14) and #2 AWG (copper only) (size 16).

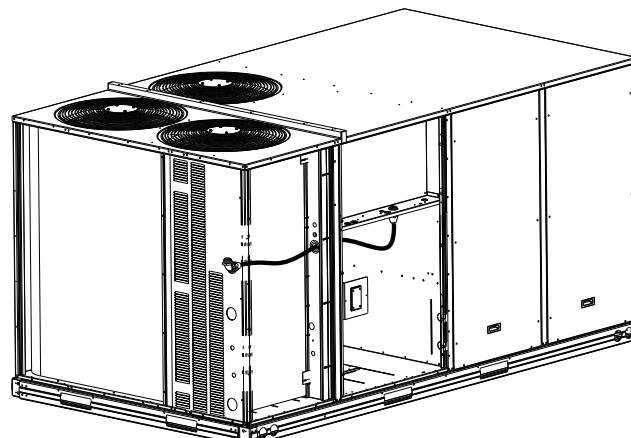
#### FIELD POWER SUPPLY (SIZE 16)

See Fig. 47. For those units without thru-the-curb power, conduit must be used to route the main power from the condenser end, via the power entry in the corner post of the unit (see Fig. 48 and 49) to either the factory option disconnect or the bottom of the control box. A 1-in. conduit is provided wrapped around compressor. A second conduit is provided with factory-installed powered convenience outlet. For those units that require conduit larger than 1-in., it must be field supplied. Fig. 48 and 49 show the wire routings.

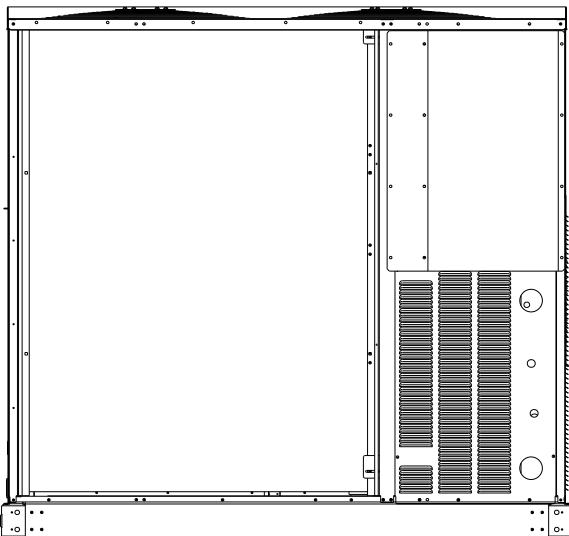
If the field disconnect is larger than 100A, it must be attached to the unit using accessory CRDISBKT001A00 — disconnect switch bracket (see Fig. 50). Follow the instructions provided with this accessory. For smaller field disconnects, be sure to use 1/2 in. screws to mount the disconnect directly to the end panel (see Fig. 51). In either case, set the disconnect vertical location on the unit so that a 90 degree fitting can be used to connect the conduit to the disconnect.



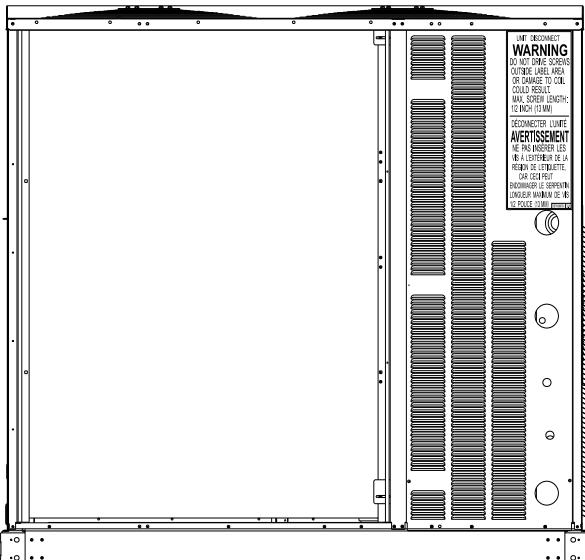
**Fig. 48 — Conduit into Factory Option Disconnect (Size 16)**



**Fig. 49 — Conduit into Control Box (Size 16)**



**Fig. 50 — Mounting Position for Field Disconnects (over 100A) (Size 16)**



**Fig. 51 — Mounting Position for Field Disconnects (up to 100A) (Size 16)**

#### ALL UNITS

Field power wires are connected to the unit at line-side pressure lugs on compressor contactor C and indoor fan contactor IFC (see wiring diagram label for control box component arrangement) or at factory-installed option non-fused disconnect switch. Max wire size is #4 AWG (copper only) (sizes 07-14) and #2 AWG (copper only) (size 16). See Fig. 46 and 47.

Refer to Table 7 for maximum wire size at connection lugs. Use copper wire only. See Fig. 46, 47, and 52.

**Table 7 — Connection Lug Min/Max Wire Sizes**

	Minimum	Maximum
TB1 In Unit Control Box	#14	#1
80A Disconnect Option	#14	#4
100A Disconnect Option	#8	1/0

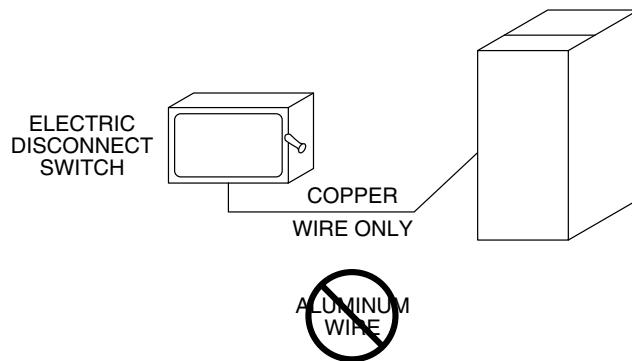
NOTE: TEST LEADS - Unit may be equipped with short leads (pigtails) on the field line connection points on contactor C or optional disconnect switch, see Fig. 46 and 47. These leads are for factory run-test purposes only; remove and discard before connecting field power wires to unit connection points. Make field power connections directly to line connection pressure lugs only.

#### WARNING

##### FIRE HAZARD

Failure to follow this warning could result in personal injury, death, or property damage.

Do not connect aluminum wire between disconnect switch and unit. Use only copper wire.

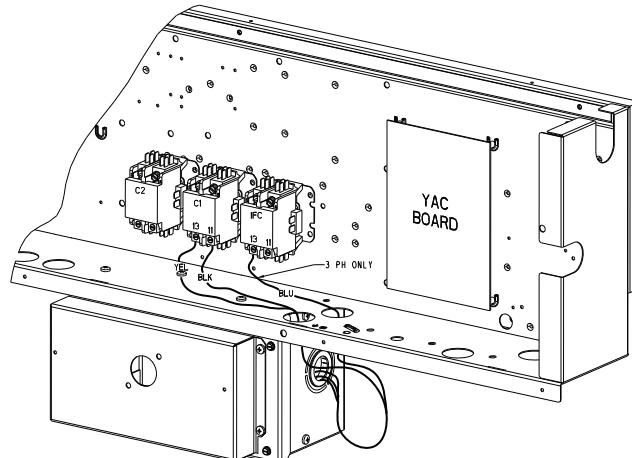


**Fig. 52 — Disconnect Switch and Unit**

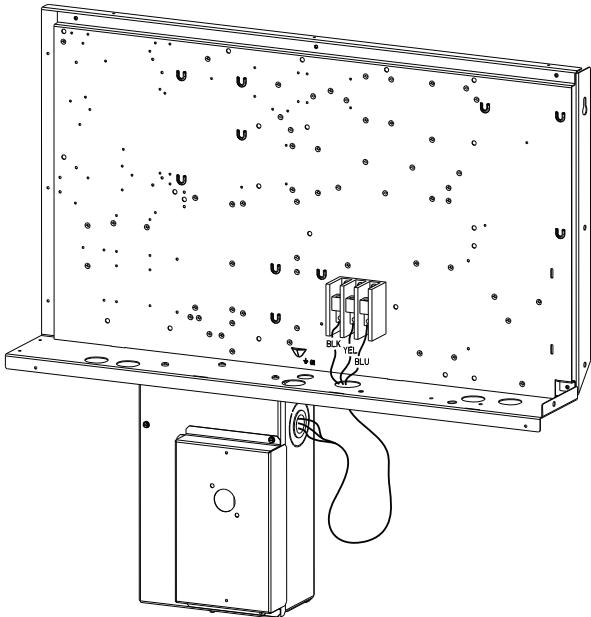
#### UNITS WITH FACTORY-INSTALLED NON-FUSED DISCONNECT

The factory-installed optional non-fused disconnect (NFD) switch is located in a weatherproof enclosure located under the main control box. The manual switch handle and shaft are shipped in the disconnect enclosure. Assemble the shaft and handle to the switch at this point. Discard the factory test leads (see Fig. 53 and 54).

Connect field power supply conductors to LINE side terminals when the switch enclosure cover is removed to attach the handle.



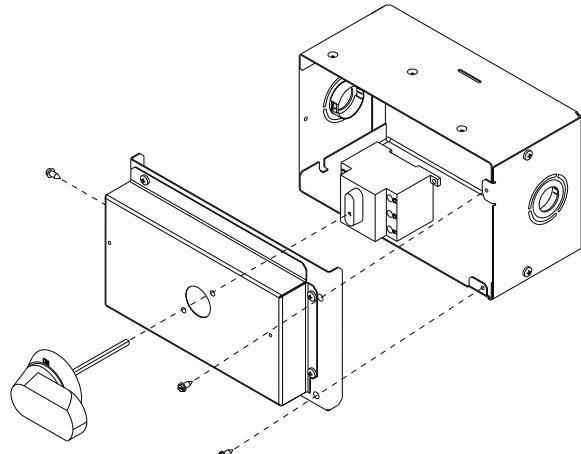
**Fig. 53 — Location of Non-Fused Disconnect Enclosure (Sizes 07-14)**



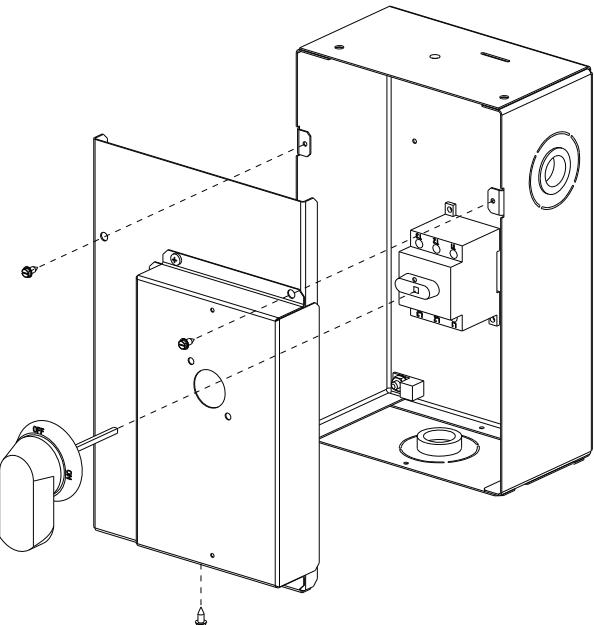
**Fig. 54 — Location of Non-Fused Disconnect Enclosure (Size 16)**

**To field install the NFD shaft and handle (see Fig. 55 or 56):**

1. Remove the unit front panel (see Fig. 2-9).
2. Remove (3) hex screws on the NFD enclosure - (2) on the face of the cover and (1) on the left side cover.
3. Remove the front cover of the NFD enclosure.
4. Make sure the NFD shipped from the factory is at OFF position (the arrow on the black handle knob is at OFF).
5. Insert the shaft with the cross pin on the top of the shaft in the horizontal position.
6. For sizes 07 to 14, measure from the tip of the shaft to the top surface of the black pointer; the measurement should be 3.75-in. to 3.88-in. (95mm to 99mm). For size 16, measure the tip of the shaft to the top surface of the pointer to be 3.75-in. to 3.88-in. (95mm to 99mm) for 80A and 100A NFD and 3.43-in. to 3.56-in. (87mm to 90mm) for 200A NFD.
7. Tighten the locking screw to secure the shaft to the NFD.
8. Turn the handle to the OFF position with red arrow pointing to OFF.
9. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
10. Secure the handle to the painted cover with (2) screws and lock washers supplied.
11. Engaging the shaft into the handle socket, re-install (3) hex screws on the NFD enclosure.
12. Re-install the unit front panel.



**Fig. 55 — Handle and Shaft Assembly for NFD (Sizes 07-14)**



**Fig. 56 — Handle and Shaft Assembly for NFD (Size 16)**

#### UNITS WITHOUT FACTORY-INSTALLED NON-FUSED DISCONNECT

When installing units, provide a disconnect switch per NEC (National Electrical Code) of adequate size. Disconnect sizing data is provided on the unit informative plate. Locate on unit cabinet or within sight of the unit per national or local codes. Do not cover unit informative plate if mounting the disconnect on the unit cabinet.

#### ALL UNITS

Field wiring must comply with NEC and all local codes. Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 46 and 47 and the unit label diagram for power wiring connections to the unit power terminal blocks and equipment ground. Maximum wire size is #2 ga AWG per pole.

Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or local codes). Refer to unit informative data plate for MOCP (Maximum Over-current Protection) device size.

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector

from the 230-v connection and moving it to the 200-v 1/4-in. male terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the following formula to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 230-3-60


  
 AB = 224 v  
 BC = 231 v  
 AC = 226 v

$$\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227$$

Determine maximum deviation from average voltage.

$$\begin{aligned} (\text{AB}) 227-224 &= 3 \text{ v} \\ (\text{BC}) 231-227 &= 4 \text{ v} \\ (\text{AC}) 227-226 &= 1 \text{ v} \end{aligned}$$

Maximum deviation is 4 v.

Determine percent of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{227} = 1.78\%$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT:** If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

## CONVENIENCE OUTLETS

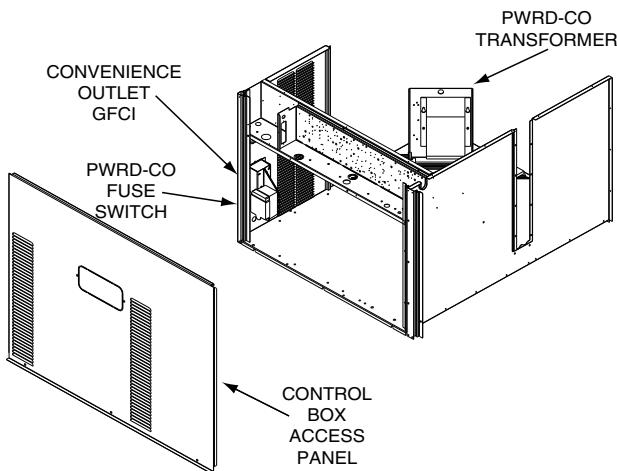
### **WARNING**

#### ELECTRICAL OPERATION HAZARD

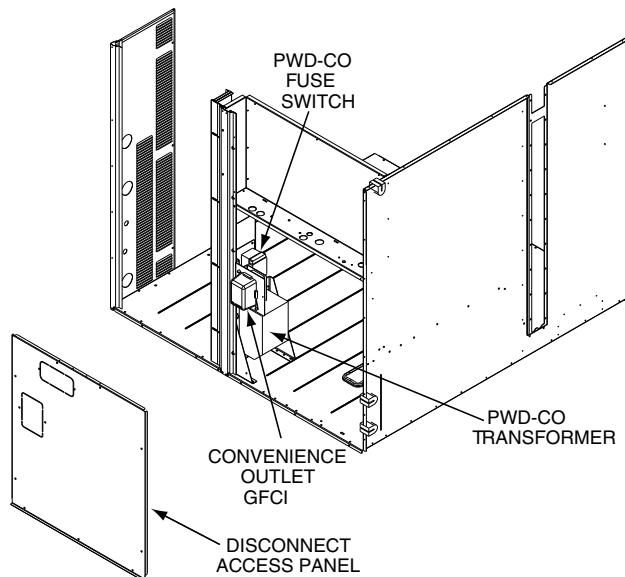
Failure to follow this warning could result in personal injury or death.

Units with convenience outlet circuits may use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate its disconnect switch, if appropriate, and open it. Lock-out and tag-out this switch, if necessary.

Two types of convenience outlets are offered on 48TC models: non-powered and unit-powered. Both types provide a 125-v GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 57 and 58.



**Fig. 57 — Convenience Outlet Location (Sizes 07-14)**



**Fig. 58 — Convenience Outlet Location (Sizes 16)**

#### *Installing Weatherproof Cover*

A weatherproof cover is now required by UL standards for the factory-installed convenience outlets. This cover cannot be factory-mounted due to its depth; it must be installed at unit installation. For shipment, the convenience outlet is covered with a blank cover plate.

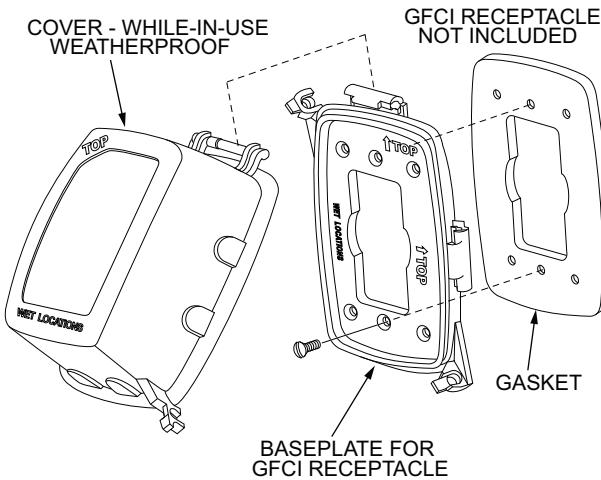
On units with electro-mechanical controls the weatherproof cover kit is shipped in the unit's control box. The kit includes the hinged cover, a backing plate and gasket. On units with a factory-installed direct digital controller (PremierLink™ or RTU Open), the weatherproof cover kit is secured to the basepan underneath the control box. See Fig. 59.

#### *Disconnect All Power To Unit and Convenience Outlet. Lock-Out and Tag-Out All Power*

Remove the blank cover plate at the convenience outlet; discard the blank cover.

Loosen the two screws at the GFCI duplex outlet, until approximately 1/2-in. (13 mm) under screw heads is exposed. Press the gasket over the screw heads. Slip the backing plate over the screw heads at the keyhole slots and align with the gasket; tighten the two screws until snug (do not over-tighten).

Mount the weatherproof cover to the backing plate as shown in Fig. 59. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover. Check for full closing and latching.



**Fig. 59 — Weatherproof Cover Installation**

#### Non-powered type

Requires the field installation of a general-purpose 125-v 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size, fuse or breaker requirements and disconnect switch size and location. Route 125-v power supply conductors into the bottom of the utility box containing the duplex receptacle.

#### Unit-powered type

A unit-mounted transformer is factory-installed to step-down the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the unit's control box access panel. See Fig. 57 and 58.

The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect or HACR breaker switch; this will provide service power to the unit when the unit disconnect switch or HACR switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect or HACR switch is open. See Fig. 60. On a unit without a unit-mounted disconnect, connect the source leads to the main terminal block (TB1 for sizes 07-14, TB3 for size 16).

On size 16 units, if the convenience outlet transformer is connected to the line side of a field disconnect, the conduit provided with the unit must be used to protect the wires as they are routed from the transformer to the field disconnect. The end of the conduit with the straight connector attaches to the field disconnect. The other end does not need to connect to the transformer; however, the conduit must be routed so that all wiring is either in the conduit or behind the access panel.

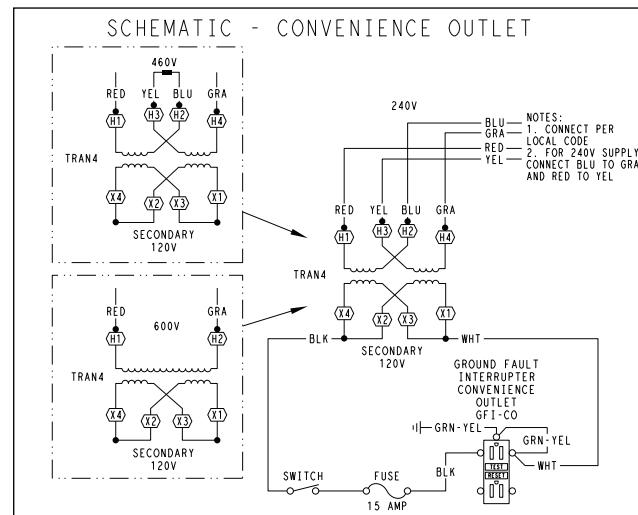
On size 16 units, if the convenience outlet transformer is connected to the line side of the factory disconnect option, route the wires through the web bushing located on the bottom of the disconnect box. For the load-side wiring to the factory option disconnect, route the wires through the hole on the right side of the disconnect. Be sure to create a drip loop at least 6 inches long.

#### ALL UNITS

Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition.

#### Unit-mounted convenience outlets

Outlets will often require that two disconnects be opened to de-energize all power to the unit. Treat all units as electrically energized until the convenience outlet power is also checked and de-energization is confirmed. Observe National Electrical Code Article 210, Branch Circuits, for use of convenience outlets.



UNIT VOLTAGE	CONNECT AS	PRIMARY CONNECTIONS	TRANSFORMER TERMINALS
208, 230	240	L1: RED+YEL L2: BLU+YEL	H1+H3 H2+H4
460	480	L1: RED Splice BLU+YEL L2: GRA	H1 H2+H3 H4
575	600	L1: RED L2: GRA	H1 H2

**Fig. 60 — Powered Convenience Outlet Wiring**

#### Fuse on power type

The factory fuse is a Bussman "Fusetron" T-15, non-renewable screw-in (Edison base) type plug fuse. See Fig. 61 for maximum continuous use amp limitations.



**Fig. 61 — Convenience Outlet Utilization Notice Label**

#### FACTORY-OPTION THRU-BASE CONNECTIONS (ELECTRICAL CONNECTIONS) (SIZE 07-14)

This service connection kit consists of a 1/2-in. NPT gas adapter fitting (brass), a 1/2 in. electrical bulkhead connector and a 3/4-in. electrical bulkhead connector, all factory-installed in the embossed (raised) section of the unit basepan in the condenser section. The 3/4 in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The 1/2 in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan. See Fig. 33.

Check tightness of connector lock nuts before connecting electrical conduits.

Field-supplied and field-installed liquid tight conduit connectors and conduit may be attached to the connectors on the basepan. Pull correctly rated high voltage through appropriate conduits. Connect the power conduit to the internal disconnect (if unit is so

equipped) or to the external disconnect (through unit side panel). A hole must be field cut in the main control box bottom on the left side so the 24-v control connections can be made. Connect the control power conduit to the unit control box at this hole.

#### Units Without Thru-Base Connections

1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 60.

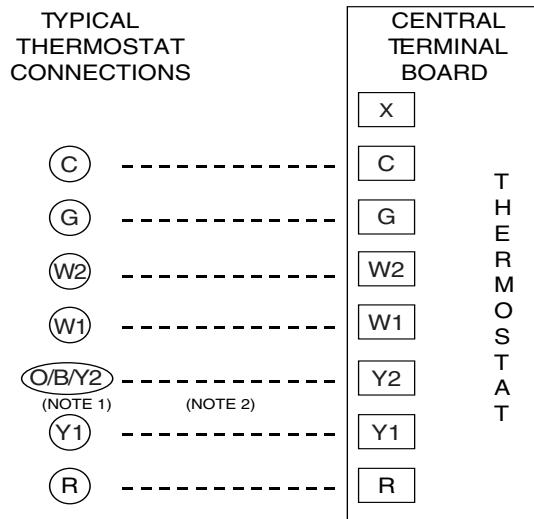
Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula on page 33 to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

#### Field Control Wiring

The 48TC unit requires an external temperature control device. This device can be a thermostat (field-supplied) or a PremierLink controller (available as factory-installed option or as field-installed accessory, for use on a Carrier Comfort Network® or as a stand-alone control) or the RTU Open Controller for Building Management Systems using non-CCN protocols (RTU Open is available as a factory-installed option only).

#### Thermostat

Install a Carrier-approved accessory 2-stage thermostat according to installation instructions included with the accessory. For complete economizer function and 2-stage compressor operation, select a two-stage cooling thermostat. If a 2-stage cooling thermostat is not available, use a single stage cooling thermostat instead, but note that this will limit cooling to just 1 stage. Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions. If the thermostat contains a logic circuit requiring 24-v power, use a thermostat cable or equivalent single leads of different colors with minimum of seven leads (see Fig. 62). If the thermostat does not require a 24-v source (no "C" connection required), use a thermostat cable or equivalent with minimum of six leads. Check the thermostat installation instructions for additional features which might require additional conductors in the cable. For wire runs up to 50 ft. (15 m), use no. 18 AWG (American Wire Gage) insulated wire [35°C (95°F) minimum]. For 50 to 75 ft. (15 to 23 m), use no. 16 AWG insulated wire [35°C (95°F) minimum]. For over 75 ft. (23 m), use no. 14 AWG insulated wire [35°C (95°F) minimum]. All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.



#### NOTES:

1. Typical multi-function marking. Follow manufacturer's configuration instructions to select Y2. Do not configure for O output.
2. Y2 to Y2 connection required on single-stage cooling units when integrated economizer function is desired.

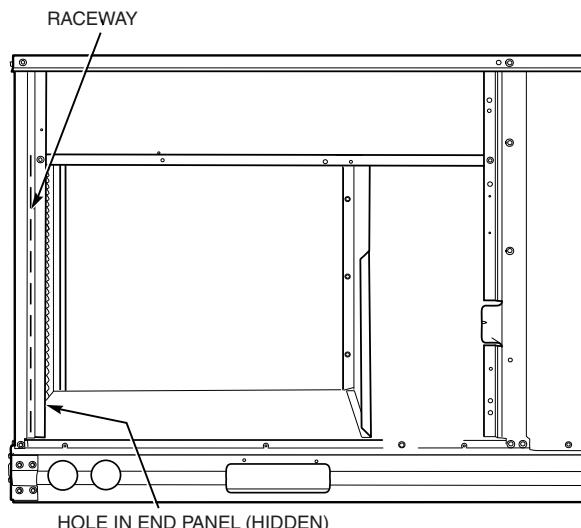
— Field-Wiring

**Fig. 62 — Low-Voltage Connections**

#### Unit Without Thru-Base Connection Kit

Pass the thermostat control wires through the hole provided in the corner post; then feed the wires through the raceway built into the corner post to the control box. Pull the wires over to the terminal strip on the upper-left corner of the Controls Connection Board. See Fig. 63.

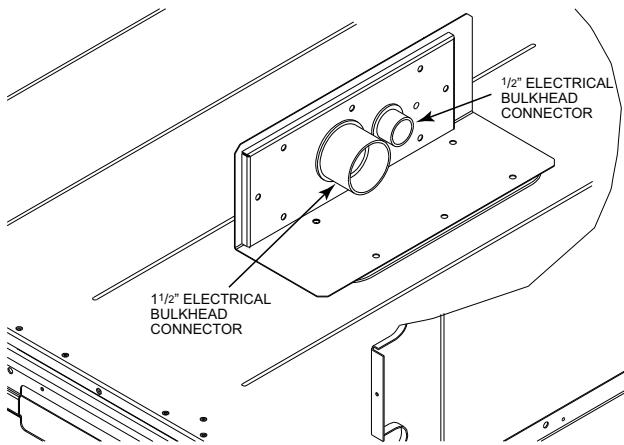
NOTE: If thru-the-bottom connections accessory is used, refer to the accessory installation instructions for information on routing power and control wiring.



**Fig. 63 — Field Control Wiring Raceway (Sizes 07-14 Only)**

#### FACTORY-OPTION THRU-BASE CONNECTIONS (ELECTRICAL CONNECTIONS) (SIZE 16)

This service connection kit consists of a  $1\frac{1}{2}$ -in. electrical bulkhead connector and a  $1\frac{1}{2}$ -in. electrical bulkhead connector, connected to an "L" bracket covering the embossed (raised) section of the unit basepan in the condenser section. See Fig. 64. The  $1\frac{1}{2}$ -in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The  $1\frac{1}{2}$ -in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan.



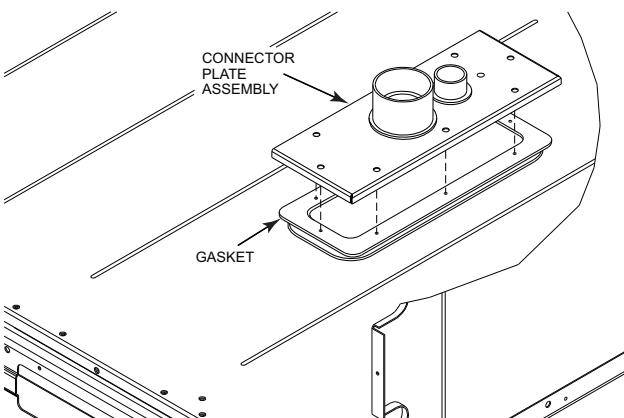
**Fig. 64 — Thru-the-Base Option, Shipping Position (Size 16)**

1. Remove the "L" bracket assembly from the unit.
2. Remove connector plate assembly from the "L" bracket and discard the "L" bracket, but retain the washer head screws and the gasket (located between the "L" bracket and the connector plate assembly).

NOTE: Take care not to damage the gasket, as it is reused in the following step.

3. Place the gasket over the embossed area in the basepan, aligning the holes in the gasket to the holes in the basepan. See Fig. 65.
4. Install the connector plate assembly to the basepan using 8 of the washer head screws.

NOTE: If electrical connections are not going to occur at this time, tape or otherwise cover the fittings so that moisture does not get into the building or conduit in the interim.



**Fig. 65 — Completing Installation of Thru-the-Base Option (Size 16)**

Check tightness of connector lock nuts before connecting electrical conduits.

Field-supplied and field-installed liquid tight conduit connectors and conduit may be attached to the connectors on the basepan. Pull correctly rated high voltage through appropriate conduits. Connect the power conduit to the internal disconnect (if unit is so equipped) or to the external disconnect (through unit side panel). A hole must be field cut in the main control box bottom on the left side so the 24-v control connections can be made.

Connect the control power conduit to the unit control box at this hole.

#### **Units Without Thru-Base Connections**

1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.

2. Install power lines to terminal connections as shown in Fig. 47.

#### **Field Control Wiring**

The 48TC\*\*16 requires an external temperature control device. This device can be a thermostat (field-supplied) or a PremierLink™ controller (available as factory-installed option or as field-installed accessory, for use on a Carrier Comfort Network® or as a stand-alone control) or the RTU Open Controller for Building Management Systems using non-CCN protocols (RTU Open is available as a factory-installed option only).

#### **Thermostat**

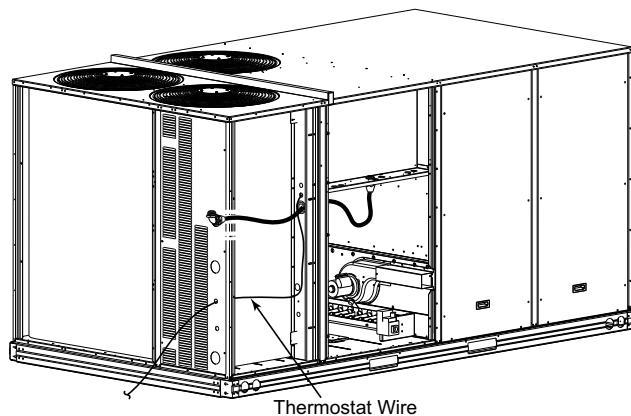
Install a Carrier-approved accessory 2-stage Cooling/Heating thermostat according to installation instructions included with the accessory. If using an electronic thermostat, configure it for "non-heat pump" operation. Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions.

If the thermostat contains a logic circuit requiring 24-v power, use a thermostat cable or equivalent single leads of different colors with minimum of seven leads. If the thermostat does not require a 24-v source (no "C" connection required), use a thermostat cable or equivalent with minimum of six leads. Check the thermostat installation instructions for additional features which might require additional conductors in the cable. For wire runs up to 50 ft. (15 m), use no. 18 AWG (American Wire Gage) insulated wire 95°F (35°C minimum).

For 50 to 75 ft. (15 to 23 m), use no. 16 AWG insulated wire (35°C minimum). For over 75 ft. (23 m), use no. 14 AWG insulated wire (35°C minimum). All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

#### **Unit without Thru-Base Connection Kit**

Pass the thermostat control wires through the bushing on the unit end panel. Route the wire through the snap-in wire tie and up to the web bushing near the control box. Route the wire through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Use a connector at the control box to protect the wire as it passes into the control box. Pull the wires over to the terminal strip at the upper left corner of the Central Terminal Board (CTB). Use the connector at the control box and the wire tie to take up any slack in the thermostat wire to ensure that it will not be damaged by contact with the condenser coil. See Fig. 66.



**Fig. 66 — Thermostat Wire Routing (Size 16)**

NOTE: If thru-the-bottom connections accessory is used, refer to the accessory installation instructions for information on routing power and control wiring.

#### **Heat Anticipator Settings**

Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating, when available.

## HUMIDI-MIZER® CONTROL CONNECTIONS

### ***Humidi-MiZer – Space RH Controller***

NOTE: The Humidi-MiZer is a factory installed option.

The Humidi-MiZer dehumidification system requires a field-supplied and field-installed space relative humidity control device. This device may be a separate humidistat control (contact closes on rise in space RH above control set point) or a combination thermostat-humidistat control device such as Carrier's Edge® Pro Thermidistat with isolated contact set for dehumidification control (see Fig. 67 and 68). The humidistat is normally used in applications where a temperature control is already provided (units with PremierLink™ control).

#### To Connect the Carrier Humidistat (HL38MG029) for Sizes 07-14:

1. Route the humidistat 2-conductor cable (field-supplied) through the hole provided in the unit corner post.
2. Feed wires through the raceway built into the corner post (see Fig. 63) to the 24-v barrier located on the left side of the control box. The raceway provides the UL-required clearance between high-voltage and low-voltage wiring.
3. Use wire nuts to connect humidistat cable to two PINK leads in the low-voltage wiring as shown in Fig. 69.

#### To Connect the Carrier Humidistat (HL38MG029) for Sizes 16:

1. Route the humidistat 2-conductor cable (field-supplied) through the bushing the unit's louvered end panel.
2. Route the cable through the snap-in wire tie and up to the web bushing near the control box.
3. Feed the cable through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Use a connector to protect the cable as it enters the control box.
4. Use the connector and the wire tie to reduce any slack in the humidistat cable to ensure that it will not be damaged by contact with the condenser coil.
5. Use wire nuts to connect humidistat cable to two PINK leads in the low-voltage wiring as shown in Fig. 70.

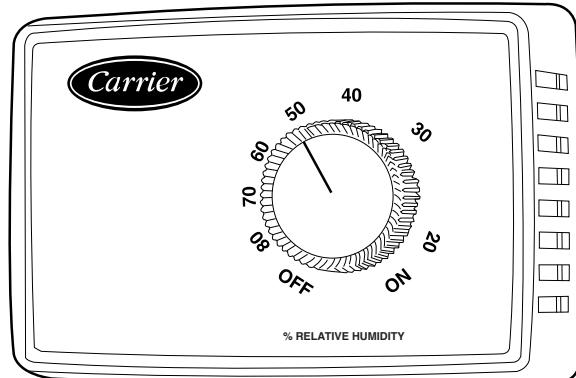
#### To connect the Thermidistat device (33CS2PPRH-01) for Size 07-14:

1. Route the Thermidistat multi-conductor thermostat cable (field-supplied) through the hole provided in the unit corner post.
2. Feed wires through the raceway built into the corner post (see Fig. 63) to the 24-v barrier located on the left side of the control box. The raceway provides the UL-required clearance between high-voltage and low-voltage wiring.
3. The Thermidistat has dry contacts at terminals D1 and D2 for dehumidification operation (see Fig. 71). The dry contacts must be wired between CTB terminal R and the PINK lead to the LTLO switch with field-supplied wire nuts. Refer to the installation instructions included with the Carrier Edge Thermidistat device for more information.

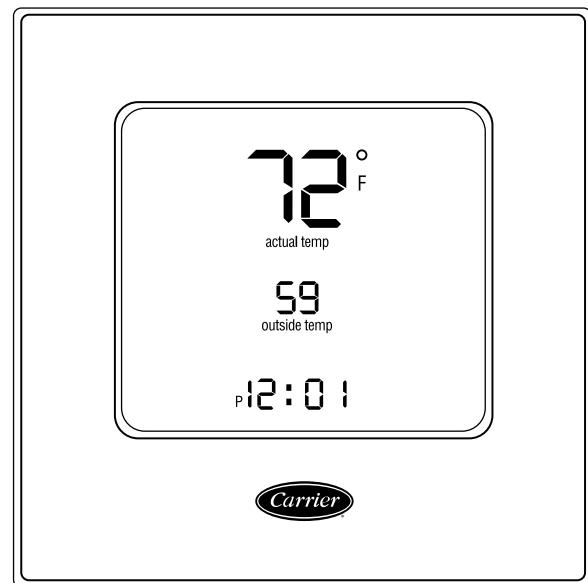
#### To connect the Thermidistat device (33CS2PPRH-01) for Size 16:

1. Route the Thermidistat multi-conductor thermostat cable (field-supplied) through the bushing the unit's louvered end panel.
2. Route the cable through the snap-in wire tie and up to the web bushing near the control box.
3. Feed the cable through the bushing and into the bottom left side of the control box after removing one of the two knockouts in the corner of the box. Use a connector to protect the cable as it enters the control box.

4. Use the connector and the wire tie to reduce any slack in the thermostat cable to ensure that it will not be damaged by contact with the condenser coil.
5. The Thermidistat has dry contacts at terminals D1 and D2 for dehumidification operation (see Fig. 71). The dry contacts must be wired between CTB terminal R and the PINK lead to the LTLO switch with field-supplied wire nuts. Refer to the installation instructions included with the Carrier Edge Thermidistat device for more information.



**Fig. 67 — Accessory Field-Installed Humidistat**



**Fig. 68 — Edge® Pro Thermidistat**

#### Low Ambient Control (Factory Option)

If the unit comes with Electro-Mechanical (EM) control, then no adjustment is necessary. If the unit comes with PremierLink™ or RTU Open control option, then refer to its installation control manual for details on adjusting "Cooling Lock-Out" setting and configure for your specific job requirements.

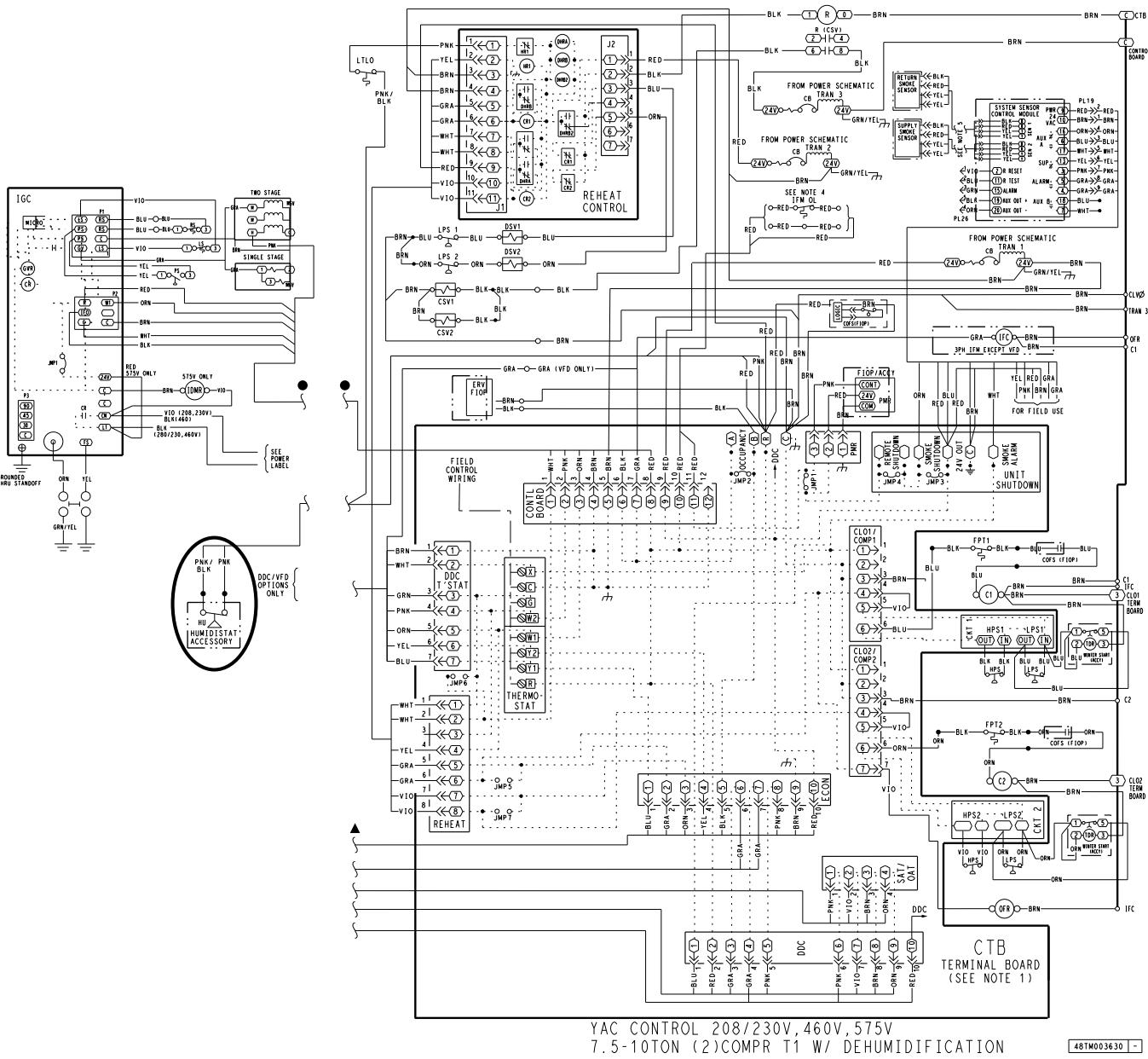
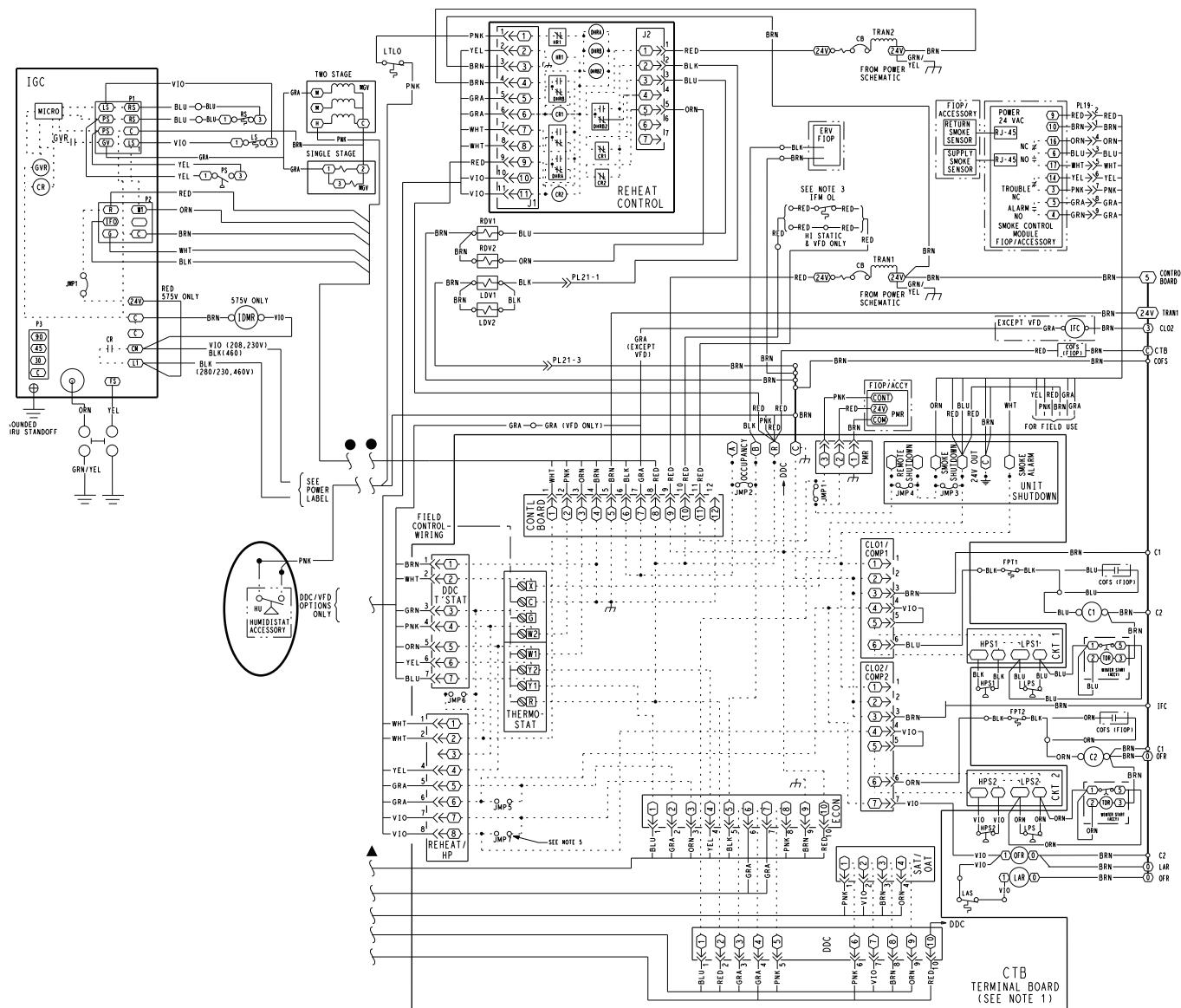
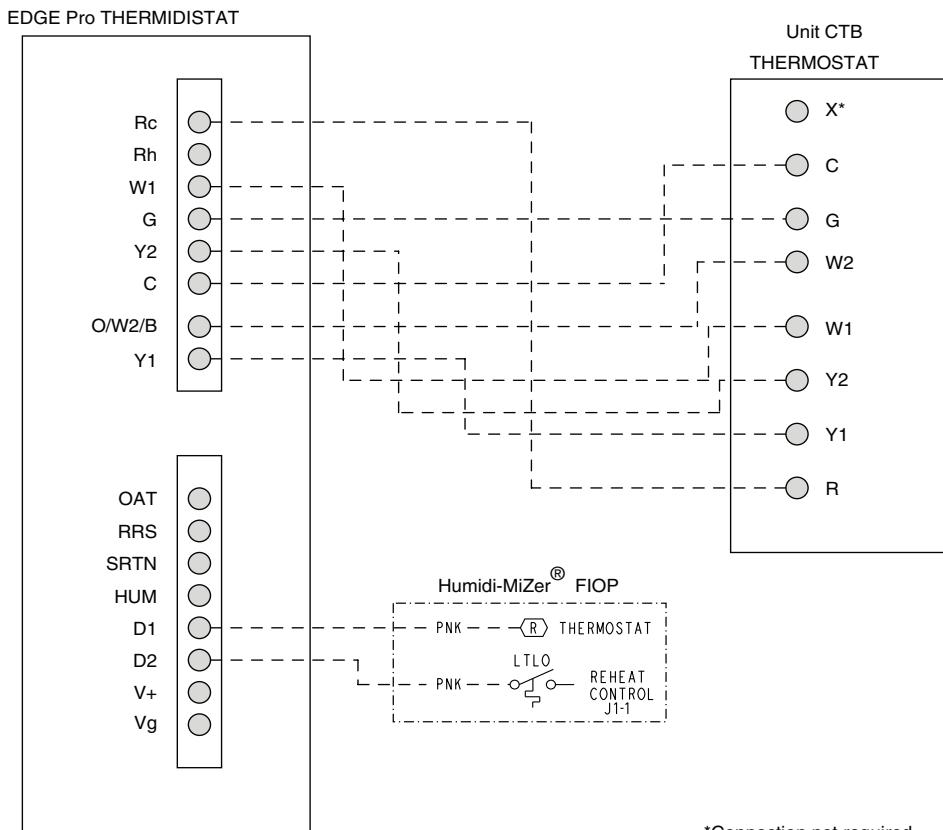


Fig. 69 — 48TC\*\*07-14, Typical Humidi-MiZer® Adaptive Dehumidification System Humidistat Wiring



**Fig. 70 — 48TC\*\*16, Typical Humidi-MiZer® Adaptive Dehumidification System Humidistat Wiring**



\*Connection not required.

**Fig. 71 — 48TC\*\*07-16 Unit with Humidi-MiZer Adaptive Dehumidification System with Edge® Pro Thermidistat Device**

## EconoMi\$er® X (Factory-Installed Option)

### PRODUCT DESCRIPTION

The EconoMi\$er X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 72). The W7220 module can be configured with optional sensors.



**Fig. 72 — W7220 Economizer Module**

The W7220 economizer module can be used as a stand-alone economizer module wired directly to a commercial set-back space thermostat and sensors to provide outside air dry-bulb economizer control.

The W7220 economizer module can be connected to optional sensors for single or differential enthalpy control. The W7220 economizer module provides power and communications for the sensors.

The W7220 economizer module automatically detects sensors by polling to determine which sensors are present. If a sensor loses communications after it has been detected, the W7220 economizer controller indicates a device fail error on its LCD.

### SYSTEM COMPONENTS

The EconoMi\$er X system includes an economizer module, 20k mixed air sensor, damper actuator, and either a 20k outdoor air temperature sensor or S-Bus enthalpy sensors.

#### Economizer Module

The module is the core of the EconoMi\$er X system. The module is mounted in the unit's control box, and includes the user interface for the system. The W7220 economizer module provides the basic inputs and outputs to provide simple economizer control. When used with the optional sensors, the economizer module provides more advanced economizer functionality.

#### S-Bus Enthalpy Control Sensors

The sensor is a combination temperature and humidity sensor which is powered by and communicates on the S-Bus. Up to three sensors may be configured with the W7220 economizer module.

#### CO<sub>2</sub> Sensor (optional)

The sensor can be added for Demand Controlled Ventilation (DCV).

### SPECIFICATIONS

#### W7220 Economizer Module

The module is designed for use with 2 to 10 vdc or bus communicating actuator. The module includes terminals for CO<sub>2</sub> sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with bus sensors.

#### User Interface

Provides status for normal operation, setup parameters, checkout tests, and alarm and error conditions with a 2-line 16 character LCD display and four button keypad.

## Electrical

Rated Voltage — 20 to 30 vac RMS, 50/60 Hz

Transformer — 100 va maximum system input

Nominal Power Consumption (at 24 vac, 60 Hz) — 11.5 VA without sensors or actuators

Relay Digital Output Rating at 30 vac (maximum power from Class 2 input only) — 1.5A run:

3.5A inrush at 0.45PF (200,000 cycles) or

7.5A inrush at 0.45PF (100,000 cycles)

External Sensors Power Output — 21 vdc  $\pm$  5% at 48mA

**IMPORTANT:** All inputs and outputs must be Class 2 wiring.

## INPUTS

### Sensors

NOTE: A Mixed Air (MA) analog sensor is required on all W7220 units; either an Outdoor Air (OA) sensor for dry bulb change over or an OA bus sensor for outdoor enthalpy change over is required in addition to the MA sensor. An additional Return Air (RA) bus sensor can be added to the system for differential enthalpy or dry bulb changeover. For differential dry bulb changeover, a 20k ohm sensor is required in the OA and a bus sensor in the RA. DIP switch on RA bus sensor must be set in the RA position.

Dry Bulb Temperature (optional) and Mixed Air (required), 20k NTC

2-wire (18 to 22 AWG);

Temperature range  $-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ )

Temperature accuracy  $-0^{\circ}\text{F}/+2^{\circ}\text{F}$

Temperature and Humidity, C7400S1000 (optional)

S-Bus; 2-wire (18 to 22 AWG)

Temperature: range  $-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ )

Temperature accuracy  $-0^{\circ}\text{F}/+2^{\circ}\text{F}$

Humidity: range 0 to 100% RH with 5% accuracy.

NOTE: Up to three (3) S-Bus sensors may be connected to the W7220 economizer module. For outdoor air (OA), return air (RA) and discharge (supply) air (DA).

### 4 Binary Inputs

1-wire 24 vac + common GND (see page 44 for wiring details).

### 24 vac power supply

20 to 30 vac 50/60Hz; 100 VA Class 2 transformer.

## OUTPUTS

### Actuator Signal:

2-10 vdc; minimum actuator impedance is 2k ohm; bus two-wire output for bus communicating actuators.

### Exhaust fan, Y1, Y2 and AUX1 O:

All Relay Outputs (at 30 vac):

Running: 1.5A maximum

Inrush: 7.5A maximum

## ENVIRONMENTAL

### Operating Temperature:

$-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ )

Exception of display operation down to  $-4^{\circ}\text{F}$  ( $-20^{\circ}\text{C}$ ) with full recovery at  $-4^{\circ}\text{F}$  ( $-20^{\circ}\text{C}$ ) from exposure to  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ )

### Storage Temperature:

$-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ )

### Shipping Temperature:

$-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ )

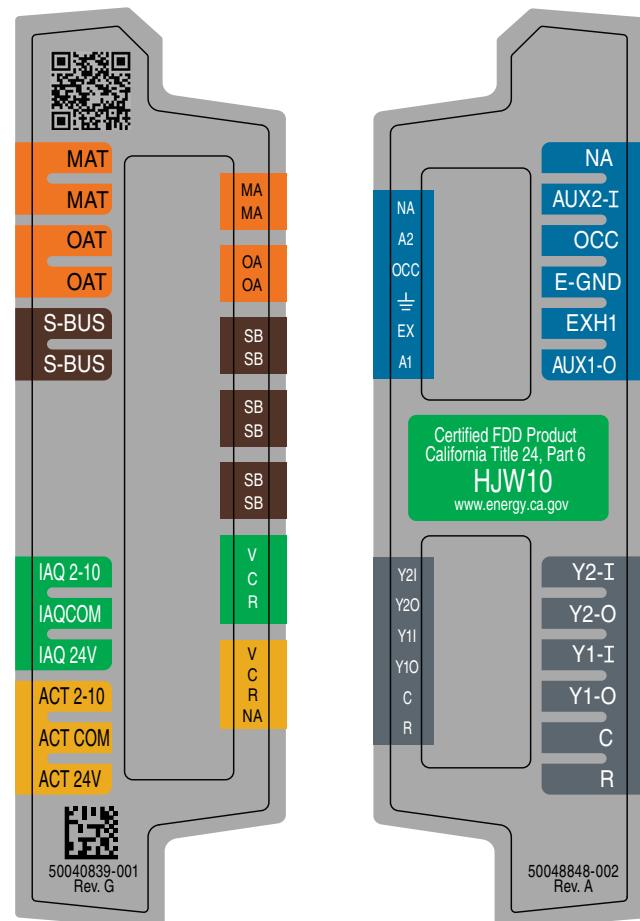
## Relative Humidity:

5% to 95% RH non-condensing

## ECONOMIZER MODULE WIRING DETAILS

Use Fig. 73 and Tables 8 and 9 to locate the wiring terminals for the Economizer module.

NOTE: The four terminal blocks are removable. You can slide out each terminal block, wire it, and then slide it back into place.



**Fig. 73 — W7220 Wiring Terminals**

**Table 8 — Economizer Module - Left Hand Terminal Blocks**

LABEL	TYPE	DESCRIPTION
<b>Top Left Terminal Block</b>		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (Polarity Insensitive Connection)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity Insensitive Connection)
S-BUS S-BUS	S-BUS (Sylk* Bus)	Enthalpy Control Sensor (Polarity Insensitive Connection)
<b>Bottom Left Terminal Block</b>		
IAQ 2-10	2-10 vdc	Air Quality Sensor Input (e.g. CO <sub>2</sub> sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 vac	Air Quality Sensor 24 vac Source
ACT 2-10	2-10 vdc	Damper Actuator Output (2-10 vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24-v	24 vac	Damper Actuator 24 vac Source

\*Sylk is a trademark of Honeywell International Inc.

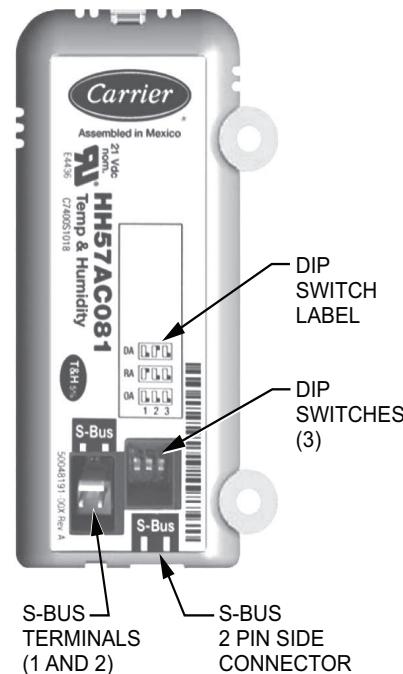
**Table 9 — Economizer Module - Right Hand Terminal Blocks**

LABEL	TYPE	DESCRIPTION
<b>Top Right Terminal Blocks</b>		
AUX2 I	24 vac IN	The first terminal is not used.
OCC	24 vac IN	Shut Down (SD) or HEAT (W) Conventional only and Heat Pump Changeover (O-B) in Heat Pump mode.
E-GND	E-GND	Occupied/Unoccupied Input
EXH1	24 vac OUT	Exhaust Fan 1 Output
AUX1 O	24 vac OUT	Programmable: Exhaust fan 2 output or ERV or System alarm output
<b>Bottom Right Terminal Blocks</b>		
Y2-I	24 vac IN	Y2 in - Cooling Stage 2 Input from space thermostat
Y2-O	24 vac OUT	Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling
Y1-I	24 vac IN	Y1 in - Cooling Stage 2 Input from space thermostat
Y1-O	24 vac OUT	Y1 out - Cooling Stage 2 Output to stage 2 mechanical cooling
C	COM	24 vac Common
R	24 vac	24 vac Power (hot)

#### S-BUS SENSOR WIRING

The labels on the sensors and controller are color coded for ease of installation. Orange labeled sensors can only be wired to orange terminals on the controller. Brown labeled sensors can only be wired to S-bus (brown) terminals. Use Fig. 74 and Table 10 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 74 and Table 10 to locate the wiring terminals for each enthalpy control sensor.



**Fig. 74 — S-Bus Sensor DIP Switches**

**Table 10 — HH57AC081 Sensor Wiring Terminations**

TERMINAL	NUMBER	LABEL	TYPE	DESCRIPTION
	1	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)
	2	S-BUS	S-BUS	S-BUS Communications (Enthalpy Control Sensor Bus)

Use Fig. 74 and Table 11 to set the DIP switches for the desired use of the sensor.

**Table 11 — HH57AC081 Sensor DIP Switch**

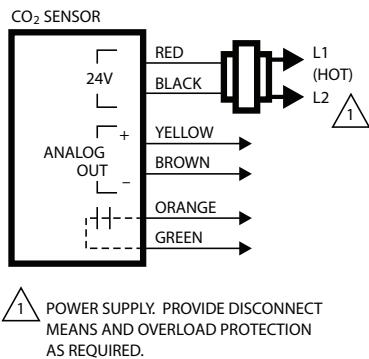
USE	DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3		
	1	2	3
DA	OFF	ON	OFF
RA	ON	OFF	OFF
OA	OFF	OFF	OFF

NOTE: When a S-Bus sensor is connected to an existing network, it will take 60 minutes for the network to recognize and auto-configure itself to use the new sensor.

During the 60 minute setup period, no alarms for sensor failures (except SAT) will be issued and no economizing function will be available.

#### CO<sub>2</sub> SENSOR WIRING

When using a CO<sub>2</sub> sensor, the black and brown common wires are internally connected and only one is connected to "IAQ COM" on the W7220. Use the power from the W7220 to power the CO<sub>2</sub> sensor OR make sure the ground for the power supplies are common. See Fig. 75 for CO<sub>2</sub> sensor wiring.



**Fig. 75 — CO<sub>2</sub> Sensor Wiring**

## INTERFACE OVERVIEW

This section describes how to use the EconoMi\$er® X user interface for:

- Keypad and menu navigation
- Settings and parameter changes
- Menu structure and selection

## USER INTERFACE

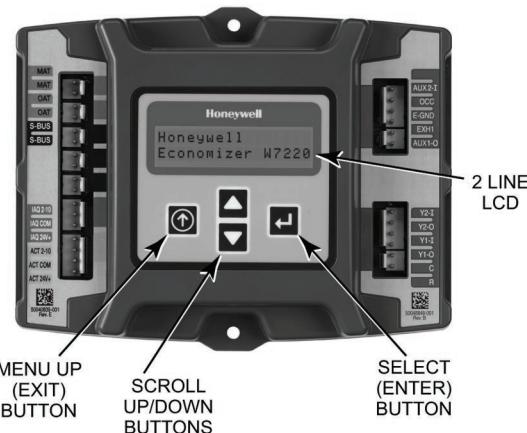
The user interface consists of a 2-line LCD display and a 4-button keypad on the front of the economizer controller.

### KEYPAD

The four navigation buttons (see Fig. 76) are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

To use the keypad when working with menus:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↲ (Enter) button to display the first item in the currently displayed menu.



**Fig. 76 — W7220 Controller Navigation Buttons**

Press the ↲ (Menu Up/Exit) button to exit a menu's item and return to the list of menus. To use the keypad when working with Set Points, System and Advanced Settings, Checkout tests and Alarms:

1. Navigate to the desired menu.
2. Press the ↲ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press the ↲ (Enter) button to display the value of the currently displayed item.

5. Press the ▲ button to increase (change) the displayed parameter value.

6. Press the ▼ button to decrease (change) the displayed parameter value.

NOTE: When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

7. Press the ↲ (Enter) button to accept the displayed value and store it in nonvolatile RAM.

8. "CHANGE STORED" displays.

9. Press the ↲ (Enter) button to return to the current menu parameter.

10. Press the ↲ (Menu Up/Exit) button to return to the previous menu.

## MENU STRUCTURE

Table 12 illustrates the complete hierarchy of menus and parameters for the EconoMi\$er® X system.

The Menus in display order are:

- STATUS
- SET POINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

**IMPORTANT:** Table 12 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration.

For example, if you do not have a DCV (CO<sub>2</sub>) sensor, then none of the DCV parameters appear and only MIN POS will display. If you have a CO<sub>2</sub> sensor, the DCV MIN and DCV MAX will appear AND if you have 2 speed fan DCV MIN (high and low speed) and DCV MAX (high and low speed will appear).

NOTE: Some parameters in the menus use the letters MA or MAT, indicating a mixed air temperature sensor location before the cooling coil. This unit application has the control sensor located after the cooling coil, in the fan section, where it is designated as (Cooling) Supply Air Temperature or SAT sensor.

## SETUP AND CONFIGURATION

Before being placed into service, the W7220 economizer module must be setup and configured for the installed system.

**IMPORTANT:** During setup, the economizer module is live at all times.

The setup process uses a hierarchical menu structure that is easy to use. Press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the button to select and confirm setup item changes.

## TIME-OUT AND SCREENSAVER

When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.

**Table 12 — Menu Structure\***

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT <sup>†</sup>	NOTES
STATUS	ECONO AVAIL	NO	YES/NO	FIRST STAGE COOLING DEMAND (Y1-IN) YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	FIRST STAGE COOLING RELAY OUTPUT YES = outside air being used for 1 stage cooling
	OCCUPIED	NO	YES/NO	OCCUPIED YES = OCC signal received from space thermostat or unitary controller YES = 24 vac on terminal OCC NO = 0 vac on terminal OCC
	HEAT PUMP	N/A**	COOL HEAT	HEAT PUMP MODE Displays COOL or HEAT when system is set to heat pump (Non-conventional)
	COOL Y1-IN	OFF	ON/OFF	FIRST STAGE COOLING DEMAND (Y1-IN) Y1-I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 vac on terminal Y1-I OFF = 0 vac on terminal Y1-I
	COOL Y1-OUT	OFF	ON/OFF	FIRST STAGE COOLING RELAY OUTPUT Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1-OUT terminal)
	COOL Y2-IN	OFF	ON/OFF	SECOND STAGE COOLING DEMAND (Y2-IN) Y2-I signal from space thermostat or unitary controller for second stage cooling. ON = 24 vac on terminal Y2-I OFF = 0 vac on terminal Y2-I
	COOL Y2-OUT	OFF	ON/OFF	SECOND STAGE COOLING RELAY OUTPUT Cool Stage 2 Relay Output to mechanical cooling (Y2-OUT terminal)
	MA TEMP	— . — F	0°F to 140°F (-18°C to 60°C)	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed air from MAT sensor. Displays — . — F if not connected, short or out-of-range.
	DA TEMP	— . — F	0°F to 140°F (-18°C to 60°C)	DISCHARGE AIR TEMPERATURE, after Heating section Displays when Discharge Air sensor is connected and displays measured discharge temperature. Displays — . — F if sensor sends invalid value, if not connected, short or out-of-range.
	OA TEMP	— . — F	-40°F to 140°F (-40°C to 60°C)	OUTSIDE AIR TEMP Displays measured value of outdoor air temperature. Displays — . — F if sensor sends invalid value, short or out-of-range.
	OA HUM	— %	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA sensor. Displays — % if not connected, short, or out-of-range.
	RA TEMP	— . — F	0°F to 140°F (-18°C to 60°C)	RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT sensor. Displays — . — F if sensor sends invalid value, if not connected, short or out-of-range
	RA HUM	— %	0 to 100%	RETURN AIR RELATIVE HUMIDITY Displays measured value of return air humidity from RA sensor. Displays — % if sensor sends invalid value, if not connected, short or out-of-range
	IN CO2	— . — ppm	0 to 2000 ppm	SPACE/RETURN AIR CO <sub>2</sub> Displays value of measured CO <sub>2</sub> from CO <sub>2</sub> sensor. Invalid if not connected, short or out-of-range
	DCV STATUS	N/A	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS Displays ON if above set point and OFF if below set point, and ONLY if a CO <sub>2</sub> sensor is connected.
	DAMPER OUT	2.0v	2.0 to 10.0v	Displays voltage output to the damper actuator.
	ACT POS	N/A	0 to 100%	Displays actual position of outdoor air damper actuator
	ACT COUNT	N/A	1 to 65535	Displays number of times actuator has cycled. 1 cycles equals 180 deg. of actuator movement in any direction.
	ACTUATOR	N/A	OK/Alarm (on Alarm menu)	Displays ERROR if voltage or torque is below actuator range.
	EXH1 OUT	OFF	ON/OFF	EXHAUST STAGE 1 RELAY OUTPUT Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX terminal; displays only if AUX = EXH2
	ERV	OFF	ON/OFF	ENERGY RECOVERY VENTILATOR Output of AUX terminal; displays only if AUX = ERV
	MECH COOL ON or HEAT STAGES ON	0	0, 1, or 2	Displays stage of mechanical cooling that is active. Displays the stage of heat pump heating that is active.
	FAN SPEED	N/A	LOW or HIGH	SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit.
	W (HEAT ON)	N/A	ON/OFF	HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.

**Table 12 — Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT <sup>†</sup>	NOTES
SET POINTS	MAT SET	53F	38°F to 65°F (3°C to 18°C); increment by 1°F	SUPPLY AIR set point Set point determines where the economizer will modulate the OA damper to maintain the mixed air temperature.
	LOW T LOCK	32F	-45°F to 80°F (-43°C to 27°C); increment by 1°F	COMPRESSOR LOW TEMPERATURE LOCKOUT Set point determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout.
	DRYBLB SET	63F	48°F to 80°F (9°C to 27°C); increment by 1°F	OA DRY BULB TEMPERATURE CHANGEOVER SET POINT Set point determines where the economizer will assume outdoor air temperature is good for free cooling; e.g., at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.
	ENTH CURVE	ES3	ES1,ES2,ES3,ES4, or ES5	ENTHALPY CHANGEOVER CURVE Enthalpy boundary "curves" for economizing using single enthalpy.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION Displays only if CO <sub>2</sub> sensor is connected. Set point for Demand Controlled Ventilation of space. Above the set point, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the set point.
	MIN POS	2.8 V	2 to 10 vdc	VENTILATION MINIMUM POSITION Displays ONLY if a CO <sub>2</sub> sensor is NOT connected.
	VENTMAX	2.8 V With 2-speed fan units VENT-MAX L (low speed fan) and VENTMAX H (high speed fan) settings are required	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Vbz (ventilation max cfm) set point. Displays 2 to 10 V if <3 sensors (RA,OA, and MA). In AUTO mode dampers controlled by CFM.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 vdc	With 2-speed fan units VENT L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V
	VENTMIN	2.25 V With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) set	2 to 10 vdc or 100 to 9990 cfm increment by 10	DCV MINIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Ba (ventilation min cfm) set point. Displays 2 to 10 V if <3 sensors (RA, OA, and MA). Va is only set if DCV is used. This is the ventilation for less than maximum occupancy of the space. In AUTO mode dampers controlled by CFM.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 vdc	With 2-speed fan units VENTMIN L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for VENTMIN L is 3.2V and VENTMIN H is 2.8V
	ERV OAT SP <sup>††</sup>	32°F	0°F to 50°F (-18°C to 10°C); increment by 1°F	ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SET POINT Only when AUX1 O = ERV
	EXH1 SET	50% With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SET POINT Set point for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	INSTALL		01/01/10	N/A Display order = MM/DD/YY Setting order = DD, MM, then YY.
SYSTEM SETUP	UNITS DEG	F	F or C	Sets economizer controller in degrees Fahrenheit or Celsius
	EQUIPMENT	CONV	Conventional or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller. See Menu Note 4.
	AUX2 IN	W	SD/W or HP(O)/ HP(B)	In CONV mode: SD + Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in 2-speed fan mode. See Menu Note 4. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN SPEED	2 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In. See Menu Note 4.
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVAL ENA = AUTO The value is found on the nameplate label for the specific unit.
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	Select OUTPUT for AUX1 O relay • NONE = not configured (output is not used) • ERV = Energy Recovery Ventilator <sup>††</sup> • EXH2 = second damper position relay closure for second exhaust fan • SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	OCCUPIED MODE BY EXTERNAL SIGNAL When using a setback thermostat with occupancy out (24 vac), the 24 vac is input as "INPUT" to the OCC terminal. If no occupancy output from the thermostat, then change program to "ALWAYS" OR add a jumper from terminal R to OCC terminal.

**Table 12 — Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	NOTES
SYSTEM SETUP (cont)	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values. NOTE: RECHECK AUX2 IN and FANTYPE for required 2-speed values.
ADVANCED SETUP	MA LO SET	45 F	35°F to 55°F (2°C to 13°C); Incremented by 10°F	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to achieve Freeze Protection (close damper and alarm if temperature falls below setup value).
	FREEZE POS	CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; Increment by 10	CO <sub>2</sub> ppm level to match CO <sub>2</sub> sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 10	CO <sub>2</sub> ppm span to match CO <sub>2</sub> sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF	COOLING STAGE 3 DELAY Delay after stage 2 cool has been active. Turns on second stage of cooling when economizer is first stage and mechanical cooling is second stage. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.
	DA LO ALM	45 F (7 C)	35°F to 65°F (2°C to 18°C); Incremented by 5°F	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.
	DA HI ALM	80 F (27 C)	70°F to 180°F (21°C to 82°C); Incremented by 5°F	Used for alarm for when the DA air temperature is too high. Set upper range of alarm, above this temperature the alarm will show on the display.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all 3 RA, OA, and MA sensors.
	MATT CAL	0.0 F	±2.5°F	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OAST CAL	0.0 F	±2.5°F	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	±10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	RAT CAL	0.0 F	±2.5°F	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	±10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	DAT CAL	0.0 F	±2.5°F	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON SECOND STAGE ECONOMIZING When in economizing mode this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.
CHECKOUT	DAMPER MINIMUM POSITION	N/A	N/A	The checkout for the damper minimum position is based on the system. See Table 13.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	N/A	N/A	Positions damper to the fully closed position
	CONNECT Y1-O	N/A	N/A	Closes the Y1-O relay (Y1-O)
	CONNECT Y2-O	N/A	N/A	Closes the Y2-O relay (Y2-O)
	CONNECT AUX1-O	N/A	N/A	Energizes the AUX output. If Aux setting is: • NONE — no action taken • ERV — 24 vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation.†† • SYS — 24 vac out. Issues a system alarm
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 2 relay (EXH1)
ALARMS	Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen			
	MAT SENS ERR	N/A	N/A	SUPPLY AIR TEMPERATURE SENSOR ERROR Mixed air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	CO2 SENS ERR	N/A	N/A	CO <sub>2</sub> SENSOR ERROR CO <sub>2</sub> sensor has failed, gone out of range or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SYLK T ERR	N/A	N/A	OUTSIDE AIR S-BUS SENSOR ERROR Outdoor air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SYLK H ERR	N/A	N/A	

**Table 12 — Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT <sup>†</sup>	NOTES
ALARMS (cont)	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	RA SYLK H ERR	N/A	N/A	
	DA SYLK T ERR	N/A	N/A	DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring, then replace if the alarm continues.
	ACT ERROR	N/A	N/A	ACTUATOR ERROR Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6-v and 26.4-v. Check actuator count on STATUS menu.
	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on set point menu. Check if Mixed air temperature on STATUS menu is below the Lo Set point on Advanced menu. When conditions are back in normal range, then the alarm will go away.
	SHUTDOWN ACTIVE	N/A	N/A	AUX2 IN is programmed for SHUTDOWN and 24-v has been applied to AUX2 IN terminal.
	DMP CAL RUNNING	N/A	N/A	DAMPER CALIBRATION ROUTINE RUNNING If DCV Auto enable has been programmed, when the W7220 is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up in the Advanced setup menu.
	DA SENS ALM	N/A	N/A	DISCHARGE AIR TEMPERATURE SENSOR ALARM Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.
	SYS ALARM	N/A	N/A	When AUX1-0 is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-0 terminal has 24 vac out.
	ACT UNDER V	N/A	N/A	ACTUATOR VOLTAGE LOW Voltage received by actuator is above expected range.
	ACT OVER V	N/A	N/A	ACTUATOR VOLTAGE HIGH Voltage received by actuator is below expected range.
	ACT STALLED	N/A	N/A	ACTUATOR STALLED Actuator stopped before achieving commanded position.

**LEGEND**

<b>CLO</b>	— Compressor Lockout
<b>ERV</b>	— Energy Recovery Ventilator
<b>LCD</b>	— Liquid Crystal Display
<b>MA</b>	— Mixed Air
<b>MAT</b>	— Mixed Air Temperature
<b>N/A</b>	— Not Applicable
<b>OA</b>	— Outdoor Air
<b>OAT</b>	— Outdoor Air Temperature
<b>OCC</b>	— Occupied
<b>RA</b>	— Return Air
<b>RAT</b>	— Return Air Temperature
<b>RTU</b>	— Rooftop Unit
<b>SYS</b>	— System

\* Table 12 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO<sub>2</sub>) sensor, then none of the DCV parameters appear.

† When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

\*\* N/A = Not Applicable.

†† ERV Operation: When in cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode, the ERV terminal will be energized when the OA is below the ERV OAT set point in the set point menu.

**NOTES:**

1. STATUS —> OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at CTB terminal G. This signal passes through the Central Terminal Board's OCCUPIED jumper JMP1 to the ECONO connector and to the W7220's OCC input terminal. An external timerclock or relay is required to implement an Occupancy schedule on the economizer damper position.
2. STATUS —> MA TEMP, SETPOINTS —> MAT SET — The W7220 menu parameters and labels include designations MA, MAT, and Mixed Air for the economizer cooling control sensor. On these rooftop units, the economizer control sensor is located downstream of the evaporator/indoor coil in the supply fan section where this sensor is designated as Supply Air Temperature (SAT) sensor.
3. SETPOINTS —> DRYBLB SET — This point is not displayed if a Return Air (differential) temperature sensor or an Outdoor Air enthalpy sensor is connected.
4. SYSTEM SETUP parameters must be configured as noted for 2-Speed unit operation:  
EQUIPMENT = CONV  
AUX2 I = W  
FAN SPEED = 2SPEED

For damper minimum position settings and checkout menu readings, see Table 13. For dry bulb operation with a 1-speed indoor fan, with or without DCV, see Tables 14 and 15. For enthalpy operation with a 1-speed indoor fan, with or without DCV, see Tables 16 and 17. For dry bulb operation with a 2-speed indoor fan, with or without DCV, see Tables 18 and 19. For enthalpy operation with a 2-speed indoor fan, with or without DCV, see Tables 20 and 21.

**Table 13 — Damper Minimum Position Settings and Readings on Checkout Menu**

DEMAND CONTROLLED VENTILATION (CO <sub>2</sub> SENSOR)	SET POINTS	FAN SPEED	CHECKOUT
NO	MIN POS	1	VMAX-HS
	N/A	1	N/A
	MIN POS H	2	VMAX-HS
	MIN POS L	2	VMAX-LS
YES	VENT MIN	1	VMAX-HS
	VENT MAX	1	VMAX-HS
	VENT MIN H	2	VMAX-HS
	VENT MAX H	2	VMAX-LS
	VENT MIN L	2	N/A
	VENT MAX L	2	N/A

**Table 14 — Dry Bulb Operation without DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	NO	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
	YES	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 15 — Dry Bulb Operation with DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 16 — Enthalpy Operation without DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	NO	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
	YES	OFF	OFF	HIGH	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 17 — Enthalpy Operation with DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	HIGH	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	HIGH	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 18 — Dry Bulb Operation without DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	NO	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
	YES	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 19 — Dry Bulb Operation with DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 20 — Enthalpy Operation without DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NO CO <sub>2</sub> SENSOR	NO	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	24v/On	0v/Off	MIN POS	Closed
		ON	ON	HIGH	24v/On	24v/On	MIN POS	Closed
	YES	OFF	OFF	LOW	0v/Off	0v/Off	MIN POS	Closed
		ON	OFF	LOW	0v/Off	0v/Off	MIN POS to Full Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	MIN POS to Full Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 21 — Enthalpy Operation with DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
Below CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
Above CO <sub>2</sub> Set	No	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	24v/On	0v/Off	VENTMIN to VENTMAX	Closed
		ON	ON	HIGH	24v/On	24v/On	VENTMIN to VENTMAX	Closed
	Yes	OFF	OFF	LOW	0v/Off	0v/Off	VENTMIN to VENTMAX	Closed
		ON	OFF	LOW	0v/Off	0v/Off	VENTMIN to Full-Open	Closed to Full-Open
		ON	ON	HIGH	24v/On	0v/Off*	VENTMIN to Full-Open	Closed to Full-Open

\*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

**Table 22 — Single Enthalpy and Dual Enthalpy High Limit Curves**

ENTHALPY CURVE	TEMP. DRY BULB (°F)	TEMP. DEWPOINT (°F)	ENTHALPY (btu/lb/da)	POINT P1		POINT P2	
				TEMP. (°F)	HUMIDITY (%RH)	TEMP. (°F)	HUMIDITY (%RH)
ES1	80	60	28.0	80	36.8	66.3	80.1
ES2	75	57	26.0	75	39.6	63.3	80.0
ES3	70	54	24.0	70	42.3	59.7	81.4
ES4	65	51	22.0	65	44.8	55.7	84.2
ES5	60	48	20.0	60	46.9	51.3	88.5
HL	86	66	32.4	86	38.9	72.4	80.3

#### ENTHALPY SETTINGS

When the OA temperature, enthalpy and dew point are below the respective set points, the Outdoor Air can be used for economizing. Figure 77 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (set points ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 22 for ENTH CURVE set point values.

The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA enthalpy sensor. When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When all of the OA conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

Figure 77 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

Table 22 provides the values for each boundary limit.

#### TWO-SPEED FAN OPERATION

The W7220 controller has the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed

of the supply fan and controls the OA damper to the required position (see Table 23).

**Table 23 — Fan Speed**

STATE	FAN SPEED
OCC	Low
Y1	Low
Y2	High
W	High

The W (heating mode) is not controlled by the W7220 but it requires the status to know where to position the OA damper for minimum position for the fan speed.

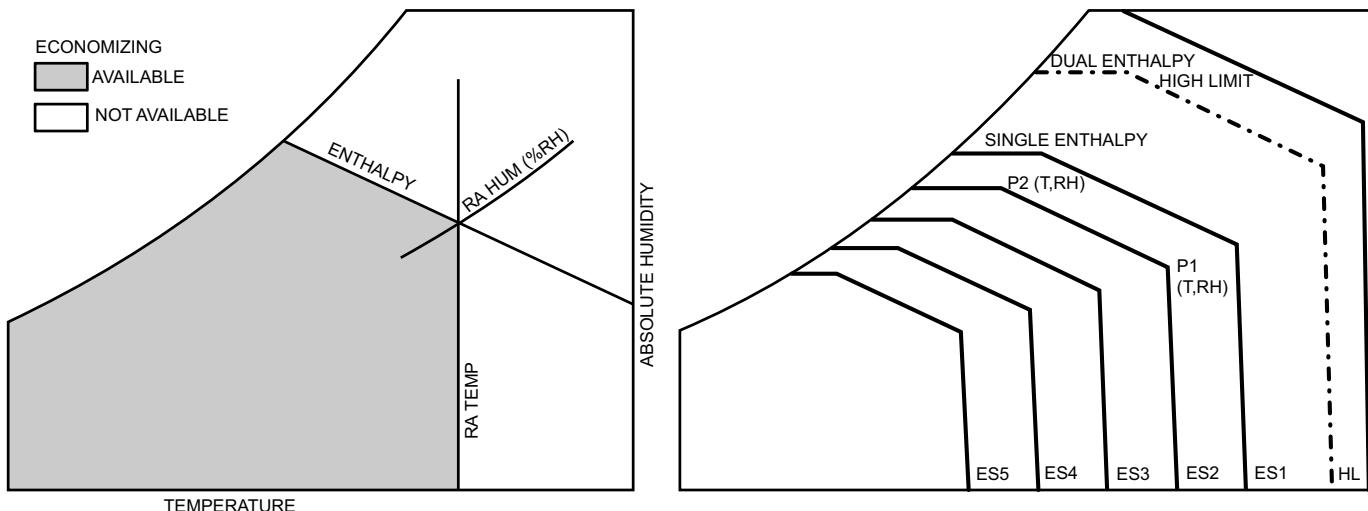
The 2-speed fan delay is available when the system is programmed for 2-speed fan (in the System Setup menu item). The 2-speed fan delay is 5 minutes by default and can be changed in the Advanced Setup menu item. When the unit has a call for Y1 In and in the free cooling mode there is a call for Y2 In, the 2-speed fan delay starts, the OA damper will modulate 100% open, and the supply fan should be set to high speed by the unit controller.

After the delay, one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off.

OR

- If the call for additional cooling in the space has not been satisfied, then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.



**Fig. 77 — Single Enthalpy Curve Boundaries**

## CHECKOUT

Inspect all wiring connections at the economizer module's terminals, and verify compliance with the installation wiring diagrams. For checkout, review the Status of each configured parameter and perform the Checkout tests.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 44.

## WARNING

### ELECTRIC SHOCK HAZARD

Failure to follow this warning could result in personal injury, property damage, or death.

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

If any wiring changes are required, first be sure to remove power from the economizer module before starting work. Pay particular attention to verifying the power connection (24 vac).

## Power Up

After the W7220 module is mounted and wired, apply power.

## Initial Menu Display

On initial start up, Honeywell displays on the first line and Economizer W7220 on the second line. After a brief pause, the revision of the software appears on the first line and the second line will be blank.

## Power Loss (Outage or Brownout)

All set points and advanced settings are restored after any power loss or interruption.

NOTE: All settings are stored in non-volatile flash memory.

## Status

Use the Status menu (see Table 12) to check the parameter values for the various devices and sensors configured.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 44.

## Checkout Tests

Use the Checkout menu (on page 47) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 44.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the **▲** and **▼** buttons.
2. Press the **↔** (Enter) button to select the item.
3. RUN? appears.
4. Press the **↔** (Enter) button to start the test.
5. The unit pauses and then displays IN PROGRESS.
6. When the test is complete, DONE appears.
7. When all desired parameters have been tested, press the **⊕** (Menu Up) button to end the test.

The Checkout tests can all be performed at the time of installation or at any time during the operation of the system as a test that the system is operable.

## TROUBLESHOOTING

### Alarms

The economizer module provides alarm messages that display on the 2-line LCD.

NOTE: Upon power up, the module waits 60 minutes before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational. The exception is the SAT sensor which will alarm immediately.

If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.

You can also navigate to the Alarms menu at any time.

### Clearing Alarms

Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor), the alarm can be cleared from the display.

To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the **↔** (Enter) button.
3. ERASE? displays.
4. Press the **↔** (Enter) button.
5. ALARM ERASED displays.
6. Press the **⊕** (Menu up/Exit) button to complete the action and return to the previous menu.

NOTE: If the alarm still exists after clearing it, it is redisplayed within 5 seconds.

## ⚠ CAUTION

### EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage. Be sure to allow enough time for compressor start-up and shutdown between checkout tests so that you do not short-cycle the compressors.

### PremierLink™ Control

For details on operating units equipped with the factory-installed PremierLink controller option, refer to the *PremierLink Retrofit Rooftop Controller Version 3.x Installation, Start-Up, and Configuration Instructions* manual.

### RTU Open Control System

For details on operating units equipped with the factory-installed RTU Open controller, refer to the *“Factory-Installed RTU Open Multi-Protocol Controller Control, Start-Up, Operation and Troubleshooting”* manual.

### SMOKE DETECTORS

Smoke detectors are available as factory-installed options on 48TC models. Smoke detectors may be specified for supply air only, for return air without or with economizer, or in combination of supply air and return air. All components necessary for operation are factory-provided and mounted. The unit is factory-configured for immediate smoke detector shutdown operation; additional wiring or modifications to unit terminal board may be necessary to complete the unit and smoke detector configuration to meet project requirements.

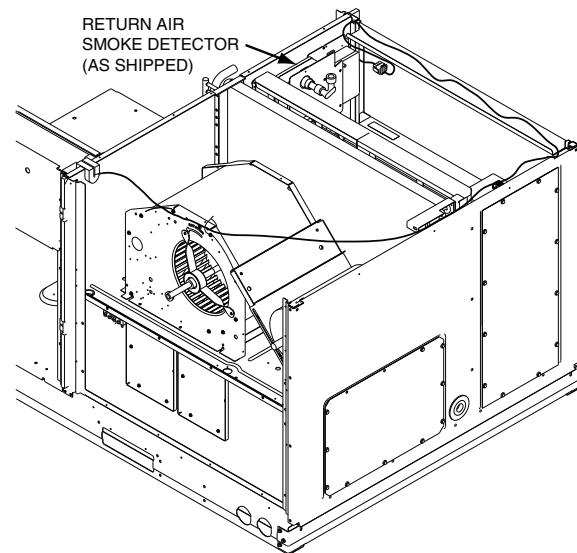
Units equipped with factory-optional return-air smoke detectors require a relocation of the sensor module at unit installation. See Fig. 78 for the as-shipped location.

### COMPLETING INSTALLATION OF RETURN-AIR SMOKE SENSOR

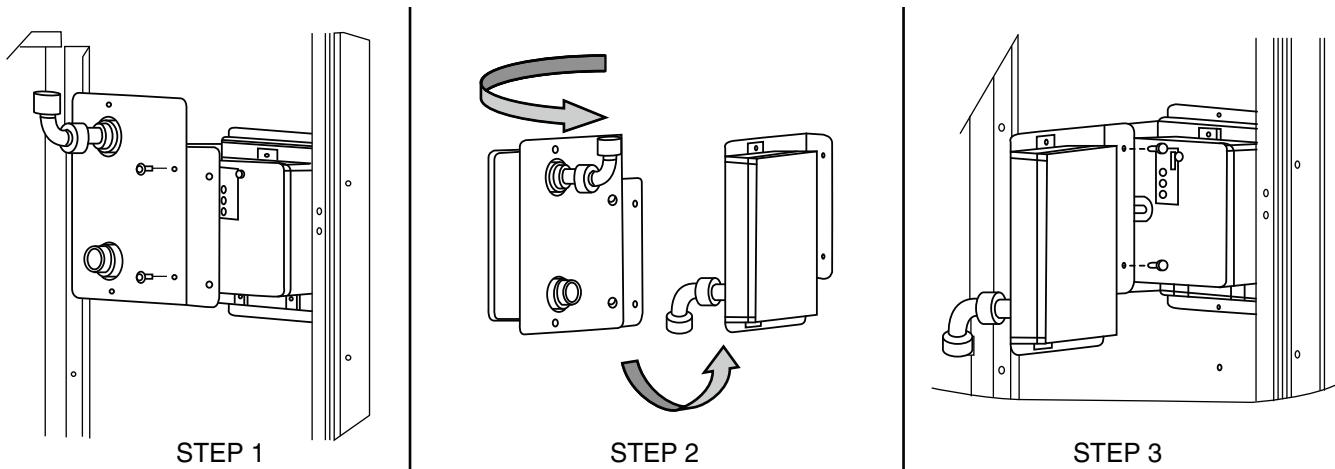
1. Unscrew the two screws holding the return-air smoke detector assembly. See Fig. 79, Step 1.
2. Save the screws.
3. Turn the assembly 90 degrees and then rotate end to end. Make sure that the elbow fitting is pointing down. See Fig. 79, Step 2.
4. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 79, Step 3.
5. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

### ADDITIONAL APPLICATION DATA

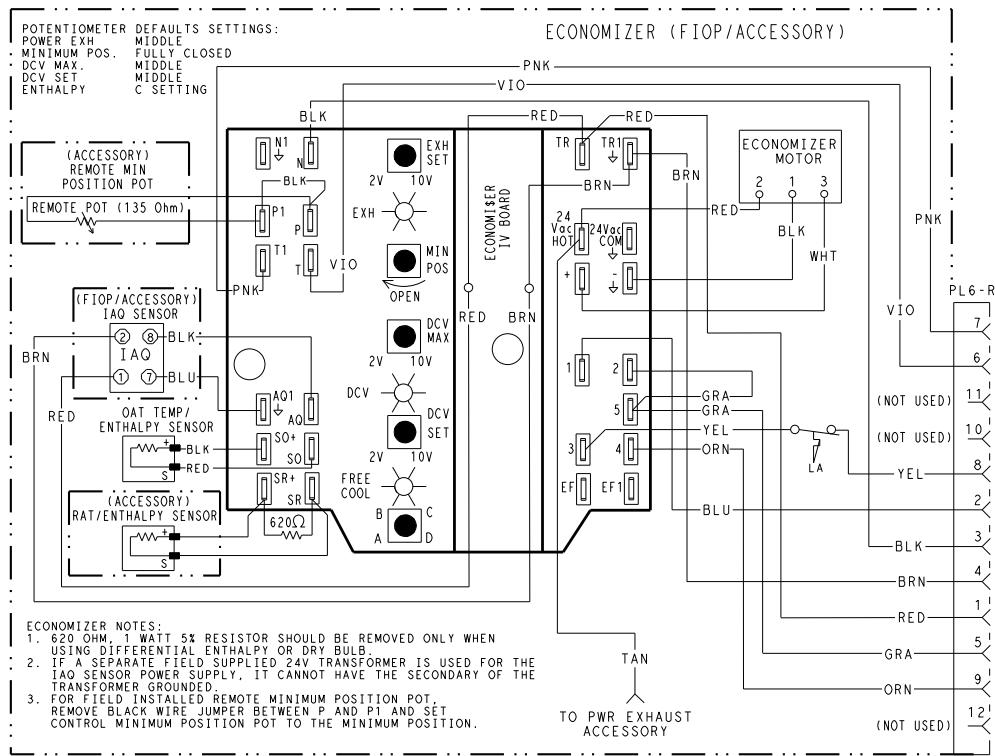
Refer to the application data sheet titled “*Factory-Installed Smoke Detector, for Small and Medium Rooftop Units 2 to 25 Tons*” for discussions on additional control features of these smoke detectors including multiple unit coordination.



**Fig. 78 — Return Air Smoke Detector; Shipping Position**



**Fig. 79 — Completing Installation of Return Air Smoke Sensor**



**Fig. 80 — EconoMi\$er® IV Wiring**

### Step 13 — Adjust Factory-Installed Options

#### SMOKE DETECTORS

Smoke detector(s) will be connected at the Controls Connections Board, at terminals marked "Smoke Shutdown." Cut jumper JMP 3 when ready to energize unit.

#### ECONOMI\$ER IV OCCUPANCY SWITCH

Refer to Fig. 80 for general EconoMi\$er IV wiring. External occupancy control is managed through a connection on the Controls Connections Board.

If external occupancy control is desired, connect a time clock or remotely controlled switch (closed for Occupied, open for Unoccupied sequence) at terminals marked OCCUPANCY. Cut jumper JMP 2 to complete the installation.

### Step 14 — Install Accessories

Available accessories include:

- Roof curb
- Thru-base connection kit (must be installed before unit is set on curb)
- LP conversion kit
- Flue discharge deflector
- Manual outside air damper
- Two-position motorized outside air damper
- EconoMi\$er IV (with control)
- EconoMi\$er2 (without control/for external signal)
- Power exhaust
- Differential dry-bulb sensor (EconoMi\$er IV)
- Outdoor enthalpy sensor
- Differential enthalpy sensor
- CO<sub>2</sub> sensor
- DDC interface (PremierLink™ controller)
- Louvered hail guard
- Motormaster® head pressure controls

- Phase monitor control

Refer to separate installation instructions for information on installing these accessories.

### Step 15 — Check Belt Tension

Measure the belt span length as shown in Fig. 81. Calculate the required deflection by multiplying the belt span length by  $1/64$ . For example, if the belt span length is 32 inches:

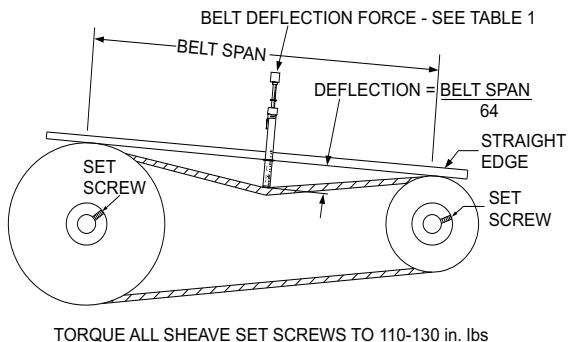
$$32 \times 1/64 = 1/2\text{-in. deflection.}$$

#### BELT FORCE — DEFLECTION METHOD

Check the belt tension with a spring-force belt force deflection gage (available from drive belt manufacturer).

1. Place a straightedge along the belt between the two pulleys. Measure the distance between the motor shaft and the blower shaft.
2. Set the tension gage to the desired tension (see Table 1 in Fig. 81). Place the large O-ring at that point.
3. Press the tension checker downward on the belt until the large O-ring is at the bottom of the straightedge.
4. Adjust the belt tension as needed.

Adjust belt tension by loosening the motor mounting plate front bolts and rear bolt (see Fig. 82) and slide the plate towards the fan (to reduce tension) or away from the fan (to increase tension). Ensure the blower shaft and motor shaft are parallel to each other (pulleys aligned). Tighten all bolts securely when finished.



TORQUE ALL SHEAVE SET SCREWS TO 110-130 in. lbs

BELT CROSS SECTION	SMALLEST SHEAVE DIAMETER	BELT DEFLECTION FORCE (LBS)			
		UNNOTCHED BELTS		NOTCHED BELTS	
		USED	NEW	USED	NEW
A, AX	3.0-3.6	3.7	5.5	4.1	6.1
	3.8-4.8	4.5	6.8	5.0	7.4
	5.0-7.0	5.4	8.0	5.7	8.4
B, BX	3.4-4.2	—	—	4.9	7.2
	4.4-5.6	5.3	7.9	7.1	10.5
	5.8-8.6	6.3	9.4	8.5	12.6

Table 1

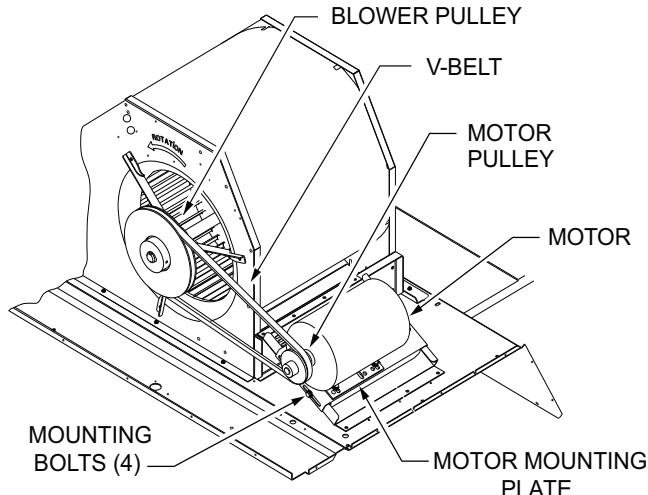
BELT CONDITION	TENSION FORCE IN BELT (LBS)
New	100
Used	80

Table 2

**Fig. 81 — V-Belt Force Label**

#### BELT TENSION METHOD

Requires belt tension gage that measures tension in belt in units of lbs force.



**Fig. 82 — Belt Drive Motor Mounting**

#### Pre-Start and Start-Up

This completes the mechanical installation of the unit. Refer to the unit's Service Manual for detailed Pre-Start and Start-Up instructions. Download the latest versions from HVAC Partners ([www.hvacpartners.com](http://www.hvacpartners.com)).

#### Troubleshooting the Ultra Tech™ Compressor

The Ultra Tech<sup>1</sup> compressor's molded plug should be used at all times. The maximum power is 5A.

#### MODULATION CONTROL INPUT SPECIFICATIONS

The compressor will modulate from part load to full load when the voltage supplied to the molded plug is 18 to 28vdc or 18 to 28 vac rectified to vdc. The compressor will modulate from full load to part load when the current in the circuit drops below 0.9 MA. See Table 24 and Fig. 83 for details.

1. UltraTech™ is a trademark of Emerson Climate Technologies, Inc.

**Table 24 — Troubleshooting Ultra Tech Compressor**

STAGE	CAPACITY	METERING	LIQUID LINE SOLENOID	COMPRESSOR UNLOADER	FOR ULTRA TECH COMPRESSOR TROUBLESHOOTING (COMPRESSOR CURRENT)	FOR LIQUID LINE SOLENOID VALVE TROUBLESHOOTING (TOP EVAPORATOR COIL TEMPERATURE)
Y1	Part Load (66%)	TXV	Closed (De-energized)	De-energized	Approx. 80% or less	Top section of the evaporator coil will not be cold (U-bend tubes)
Y1+Y2	Full Load (100%)	TXV+Fixed	Open (Energized)	Energized	100%	Top section of the evaporator coil will be cold (U-bend tubes)

Stage	Capacity (%)	Metering	Solenoid	SHR
Y'	Part Load (67%)	TXV	Closed (De-energized)	.74
Y1 & Y2	Full Load (100%)	TXV & Fixed	Open (Energized)	.74

Face Split Evaporator coil  
1/3 rd

TXV  
Non-adjustable balanced port

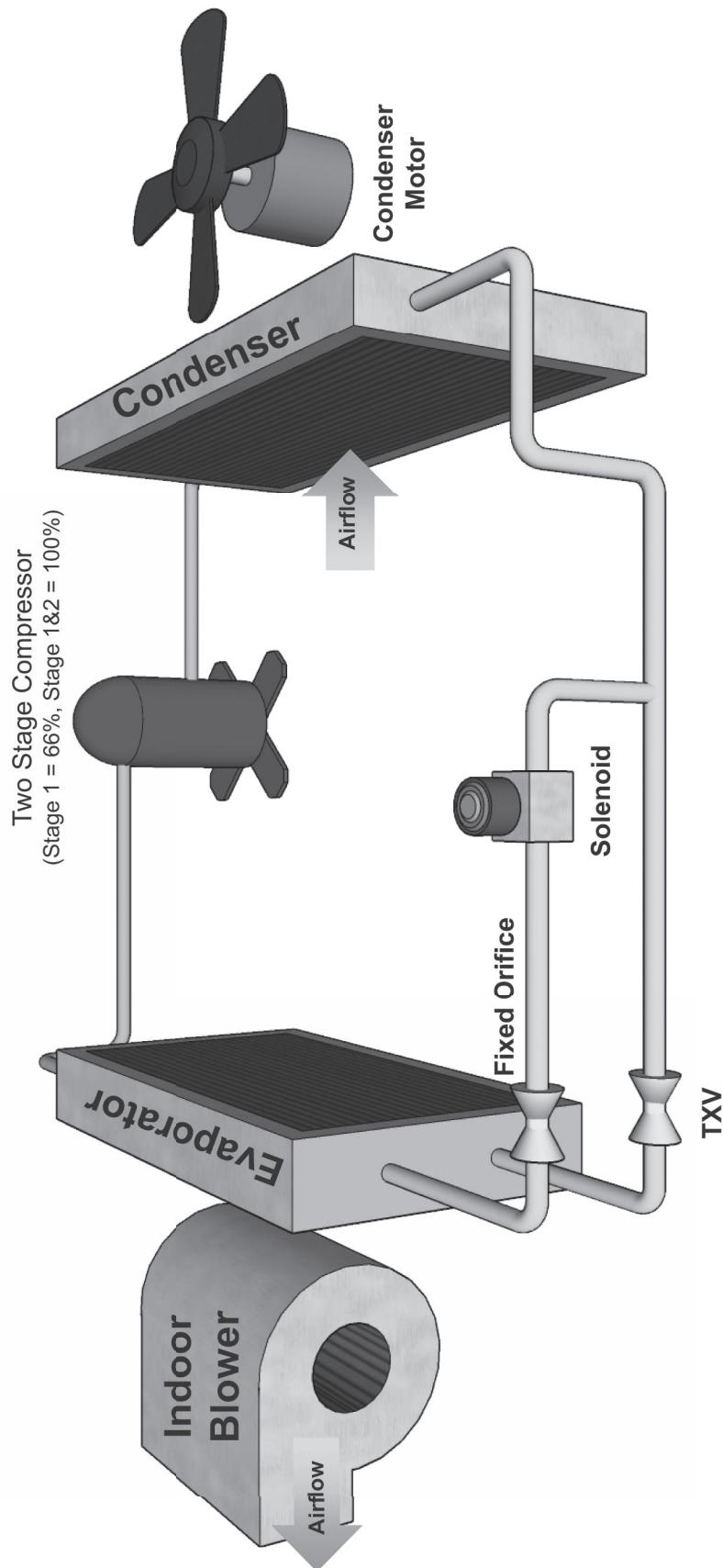


Fig. 83 — Ultra Tech Scroll Compressor Diagram



## START-UP CHECKLIST — 48TC PACKAGED ROOFTOP UNITS WITH GAS HEAT AND ELECTRIC COOLING

**NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instruction document.**

### I. PRELIMINARY INFORMATION

MODEL NO \_\_\_\_\_

JOB NAME \_\_\_\_\_

SERIAL NO \_\_\_\_\_

ADDRESS \_\_\_\_\_

START-UP DATE \_\_\_\_\_

TECHNICIAN NAME \_\_\_\_\_

ADDITIONAL ACCESSORIES \_\_\_\_\_

### II. PRE-START-UP

Verify that all packaging materials have been removed from unit (Y/N) \_\_\_\_\_

Verify installation of outdoor air hood (Y/N) \_\_\_\_\_

Verify installation of flue exhaust and inlet hood (Y/N) \_\_\_\_\_

Verify that condensate connection is installed per instructions verify that all electrical (Y/N) \_\_\_\_\_

Connections and terminals are tight (Y/N) \_\_\_\_\_

Verify gas pressure to unit gas valve is within specified range (Y/N) \_\_\_\_\_

Check gas piping for leaks (Y/N) \_\_\_\_\_

Check that indoor-air filters are clean and in place (Y/N) \_\_\_\_\_

Check that outdoor air inlet screens are in place (Y/N) \_\_\_\_\_

Verify that unit is level (Y/N) \_\_\_\_\_

Check fan wheels and propeller for location in housing/orifice and verify setscrew is tight (Y/N) \_\_\_\_\_

Verify that fan sheaves are aligned and belts are properly tensioned (Y/N) \_\_\_\_\_

Verify that scroll compressors are rotating in the correct direction (Y/N) \_\_\_\_\_

Verify installation of thermostat (Y/N) \_\_\_\_\_

Verify that crankcase heaters have been energized for at least 24 hours (Y/N) \_\_\_\_\_

### III. START-UP

#### ELECTRICAL

Supply Voltage \_\_\_\_\_

L1-L2 \_\_\_\_\_

L2-L3 \_\_\_\_\_

L3-L1 \_\_\_\_\_

Compressor Amps 1 \_\_\_\_\_

L1 \_\_\_\_\_

L2 \_\_\_\_\_

L3 \_\_\_\_\_

Compressor Amps 2 \_\_\_\_\_

L1 \_\_\_\_\_

L2 \_\_\_\_\_

L3 \_\_\_\_\_

Supply Fan Amps \_\_\_\_\_

L1 \_\_\_\_\_

L2 \_\_\_\_\_

L3 \_\_\_\_\_

#### TEMPERATURES

Outdoor-air Temperature \_\_\_\_\_

°F DB (Dry Bulb)

°F WB (Wet Bulb)

Return-air Temperature \_\_\_\_\_

°F DB

°F WB (Wet Bulb)

Cooling Supply Air Temperature \_\_\_\_\_

°F

Gas Heat Supply Air \_\_\_\_\_

°F

## PRESSES

Gas Inlet Pressure IN. WG \_\_\_\_\_ in. wg  
Gas Manifold Pressure \_\_\_\_\_ in. wg  
Refrigerant Suction STAGE 1 \_\_\_\_\_ in. wg  
STAGE 2 \_\_\_\_\_ in. wg  
CIRCUIT A \_\_\_\_\_ PSIG  
CIRCUIT B \_\_\_\_\_ PSIG  
Refrigerant Discharge CIRCUIT A \_\_\_\_\_ PSIG  
CIRCUIT B \_\_\_\_\_ PSIG  
Verify Refrigerant Charge using Charging Charts (Y/N) \_\_\_\_\_

## GENERAL

Economizer minimum vent and changeover settings to job requirements (if equipped) (Y/N) \_\_\_\_\_  
Verify smoke detector unit shutdown by utilizing magnet test (Y/N) \_\_\_\_\_

## IV. HUMIDI-MIZER® START-UP

### STEPS

1. Check CTB for jumper 5, 6, 7 (Jumper 5, 6, 7 must be cut and open) (Y/N) \_\_\_\_\_
2. Open humidistat contacts (Y/N) \_\_\_\_\_
3. Start unit In cooling (Close Y1) (Y/N) \_\_\_\_\_

### OBSERVE AND RECORD

- A. Suction pressure \_\_\_\_\_ PSIG
- B. Discharge pressure \_\_\_\_\_ PSIG
- C. Entering air temperature \_\_\_\_\_ ° F
- D. Liquid line temperature at outlet or reheat coil \_\_\_\_\_ ° F
- E. Confirm correct rotation for compressor (Y/N) \_\_\_\_\_
- F. Check for correct ramp-up of outdoor fan motor as condenser coil warms (Y/N) \_\_\_\_\_
4. Check unit charge per charging chart (Y/N) \_\_\_\_\_  
(Jumper 32L Motormaster® temperature sensor during this check. Remove jumper when complete.)
5. Switch unit to high-latent mode (sub-cooler) by closing humidistat with Y1 closed (Y/N) \_\_\_\_\_

### OBSERVE

- A. Reduction in suction pressure (5 to 7 psi expected) (Y/N) \_\_\_\_\_
- B. Discharge pressure unchanged (Y/N) \_\_\_\_\_
- C. Liquid temperature drops to 50°F to 55°F range (Y/N) \_\_\_\_\_
- D. LSV solenoid energized (valve closes) (Y/N) \_\_\_\_\_
6. Switch unit to dehumid (reheat) by opening Y1 (Y/N) \_\_\_\_\_

### OBSERVE

- A. Suction pressure increases to normal cooling level
- B. Discharge pressure decreases (35 to 50 psi) (Limited by Motormaster control)
- C. Liquid temperature returns to normal cooling level
- D. LSV solenoid energized (valve closes)
- E. DSV solenoid energized, valve opens
7. With unit in dehumid mode close W1 compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) \_\_\_\_\_
8. Open W1 restore unit to dehumid mode (Y/N) \_\_\_\_\_
9. Open humidistat input compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) \_\_\_\_\_
10. Restore set-points for thermostat and humidistat (Y/N) \_\_\_\_\_

## REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE