48LC
WeatherExpert® Series
Single Package Rooftop
Gas Heat/Electric Cooling Unit
with Puron® (R−410A) Refrigerant
Sizes: 08, 09, 12

Carrier
United Technologies
turn to the experts

Installation Instructions

NOTE: Read the entire instruction manual before starting the installation.

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in USA, ANSI/NFPA 70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

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 personal injury or death.

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

⚠ 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.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury 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.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

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

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

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

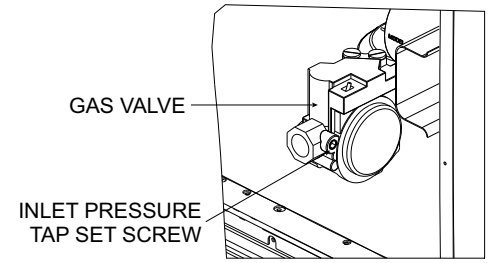
Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing air conditioning equipment.

⚠ WARNING

FIRE HAZARD

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

Inlet pressure tab set screw must be tightened and $^1/_8$ in. NPT pipe plug must be installed to prevent gas leaks.

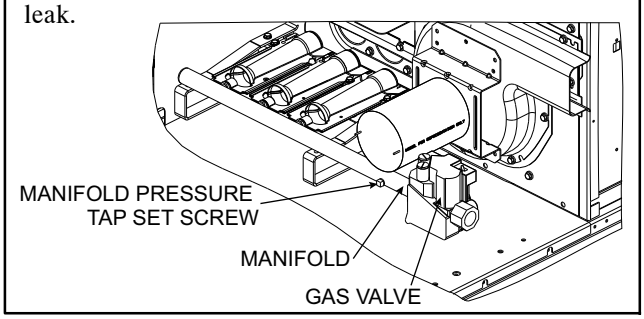


⚠ WARNING

FIRE HAZARD

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



Rated Indoor Airflow (cfm)

The table to the right lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

Model Number	Full Load Airflow (cfm)
48LC**08	2625
48LC**09	2970
48LC**12	3500

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Example:	4	8	L	C	D	0	1	2	A	1	A	5	-	0	A	0	A	0

Unit Heat Type
48 - Gas Heat Packaged Rooftop

Model Series - WeatherExpert®
LC - Ultra High Efficiency

Heat Options
D = Low Gas Heat
E = Medium Gas Heat
F = High Gas Heat
S = Low Heat w/ Stainless Steel Exchanger
R = Medium Heat w/ Stainless Steel Exchanger
T = High Heat w/ Stainless Steel Exchanger

Refrig. Systems Options
0 = Three stage cooling capacity control with TXV
A = Three stage cooling capacity control with TXV and Humidi-MiZer® System

Cooling Tons
08 - 7.5 ton
09 - 8.5 ton
12 - 10 ton

Sensor Options
A = None
B = RA Smoke Detector
C = SA Smoke Detector
D = RA + SA Smoke Detector
E = CO_2
F = RA Smoke Detector and CO_2
G = SA Smoke Detector and CO_2
H = RA + SA Smoke Detector and CO_2

Indoor Fan Options
1 = Standard Static Belt Drive with VFD controller
2 = Medium Static Belt Drive with VFD controller
3 = High Static Belt Drive with VFD controller
4 = Ultra High Static Belt Drive with VFD controller (08, 09 only)

Coil Options: Fin/Tube (Condenser- Evaporator - Hail Guard)
A = Al/Cu - Al/Cu
B = Precoat Al/Cu - Al/Cu
C = E-coat Al/Cu - Al/Cu
D = E-coat Al/Cu - E-coat Al/Cu
E = Cu/Cu - Al/Cu
F = Cu/Cu - Cu/Cu
M = Al/Cu -Al/Cu — Louvered Hail Guard
N = Precoat Al/Cu - Al/Cu — Louvered Hail Guard
P = E-coat Al/Cu - Al/Cu — Louvered Hail Guard
Q = E-coat Al/Cu - E-coat Al/Cu — Louvered Hail Guard
R = Cu/Cu - Al/Cu — Louvered Hail Guard
S = Cu/Cu - Cu/Cu — Louvered Hail Guard

Voltage
1 = 575/3/60
5 = 208-230/3/60
6 = 460/3/60

Design Revision
- = Factory Design Revision

Base Unit Controls
0 = Electro-mechanical Controls
1 = RTU Open Multi-Protocol Controller
4 = SystemVu™ Controller

Intake / Exhaust Options
A = None
B = Standard Leak Temperature Economizer with Barometric Relief
E = Standard Leak Enthalpy Economizer with Barometric Relief
N = Ultra Low Leak Temperature Economizer with Barometric Relief
R = Ultra Low Leak Enthalpy Economizer with Barometric Relief

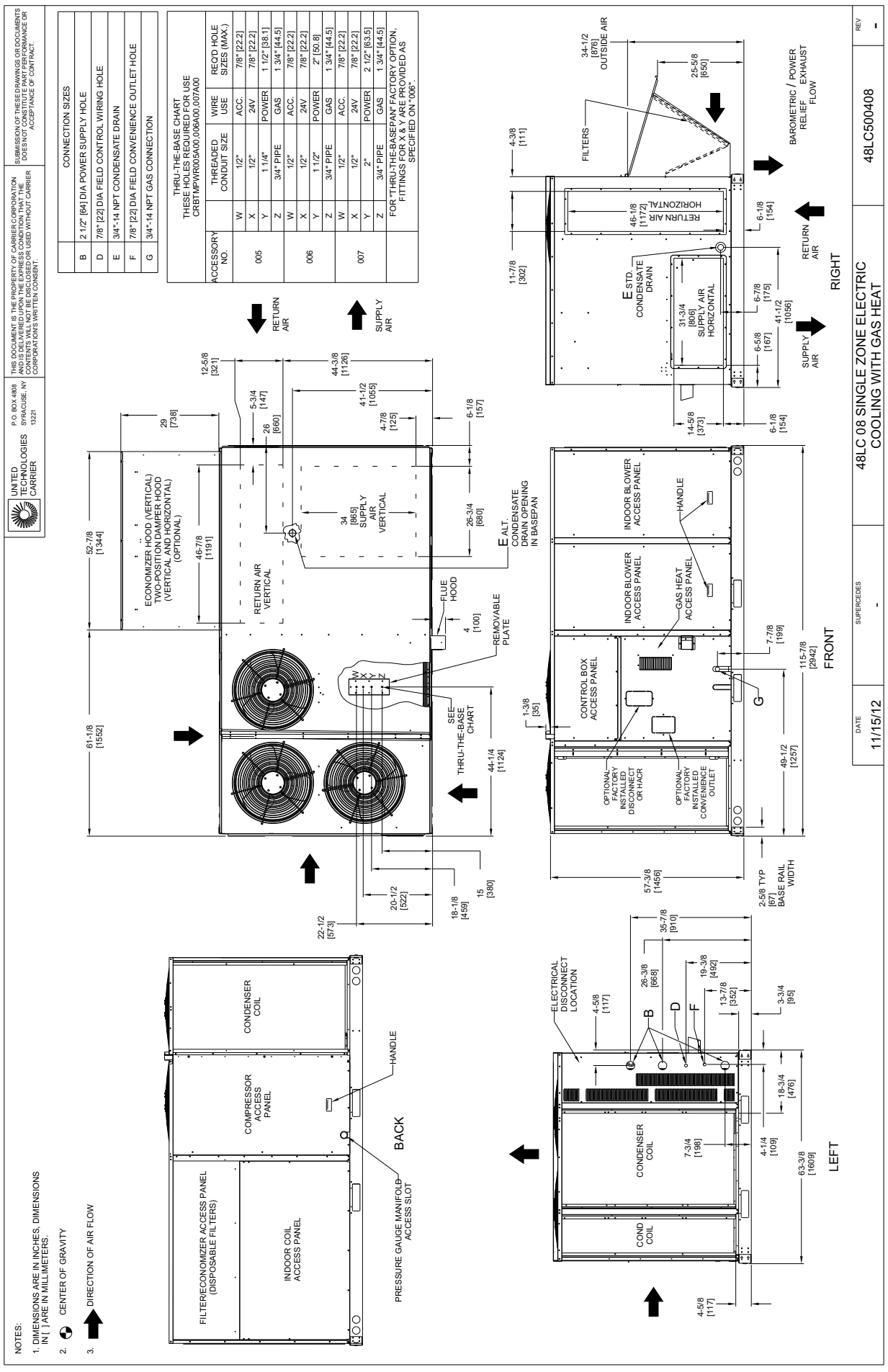
Service Options
0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Panels
4 = Hinged Panels and Unpowered Convenience Outlet
5 = Hinged Panels and Powered Convenience Outlet

Electrical Options
A = None
B = HACR Circuit Breaker
C = Non-Fused Disconnect
D = Thru-The-Base Connections
E = HACR Circuit Breaker and Thru-The Base Connections
F = Non-Fused Disconnect and Thru-The-Base Connections

Packaging
0 = Standard
1 = LTL

a48–9330

Fig. 1 - 48LC 08-12 Model Number Nomenclature (Example)

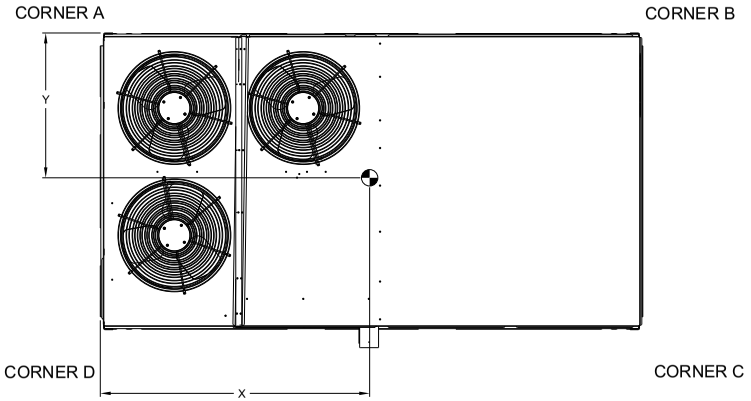


C13010

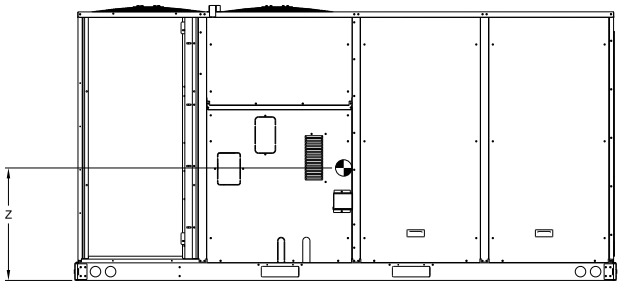
Fig. 2 - Unit Dimensional Drawing – 08 Size Unit

UNIT	STD UNIT WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
48LC 08	1430	650	342	156	377	171	372	169	338	154	60 3/4 [1544]	31 1/2 [801]	20 5/8 [525]

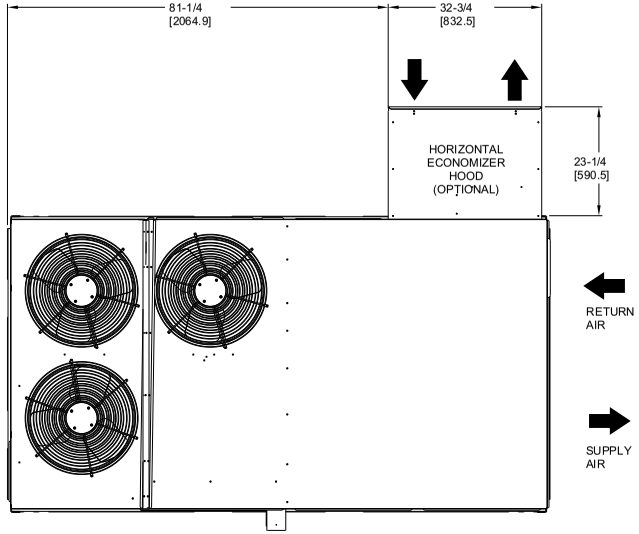
STANDARD UNIT WEIGHT IS WITH LOW GAS HEAT & WITHOUT PACKAGING.
FOR OPTIONS & ACCESSORIES, REFER TO THE PRODUCT DATA CATALOG.

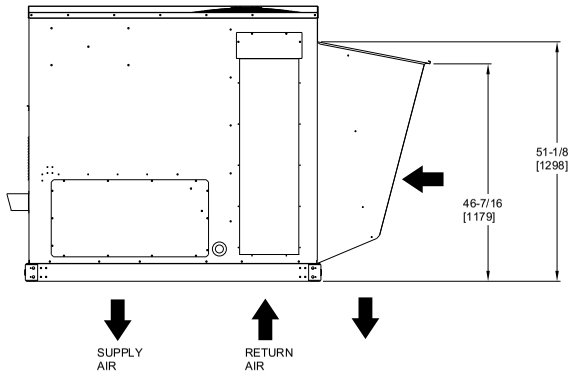


TOP



FRONT

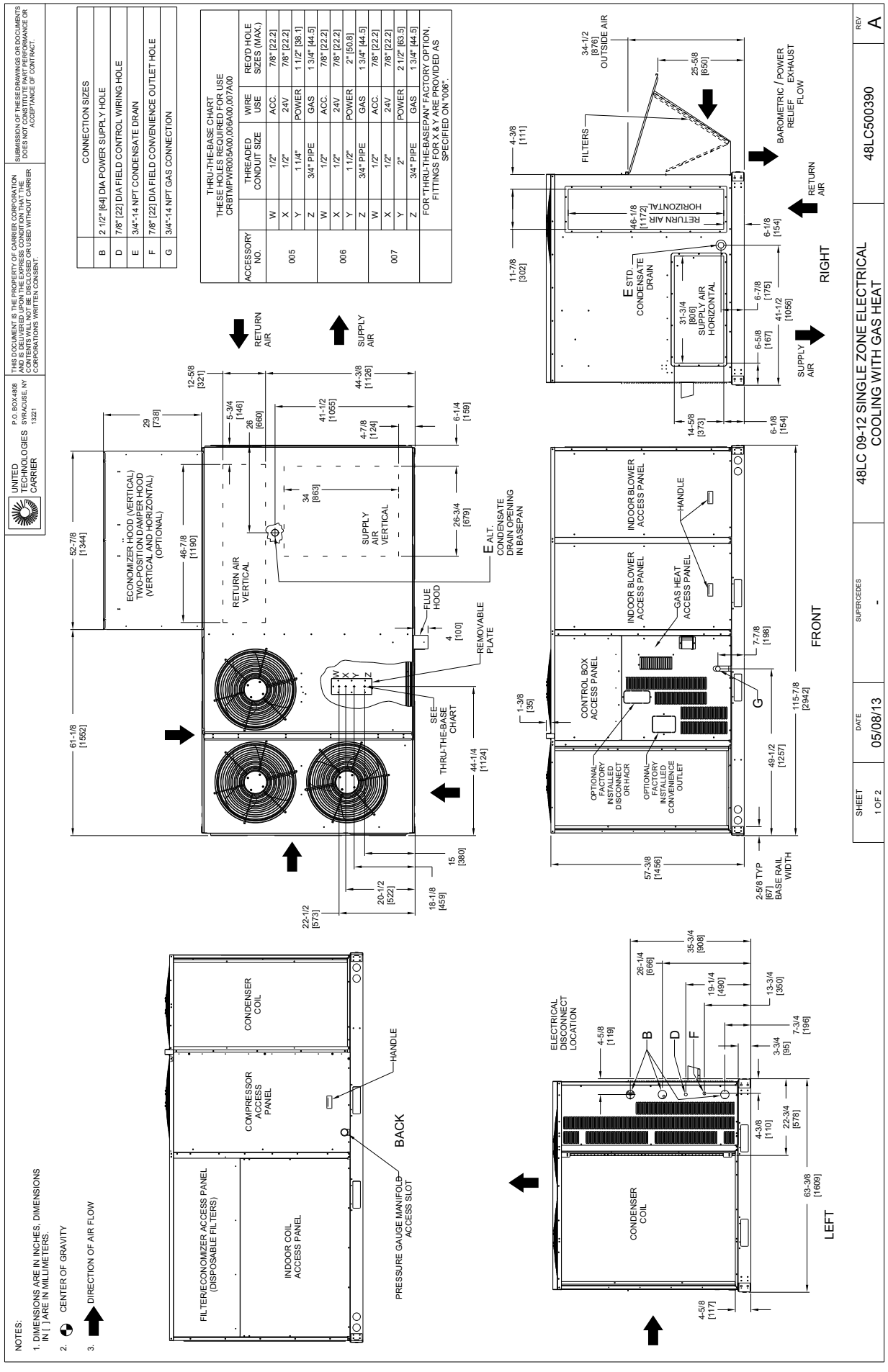




HORIZONTAL ECONOMIZER

DATE	SUPERCEDES			REV
11/15/12	-	48LC 08 SINGLE ZONE ELECTRIC COOLING WITH GAS HEAT	48LC500408	-

Fig. 2 - Unit Dimensional Drawing – 08 Size Unit (cont)

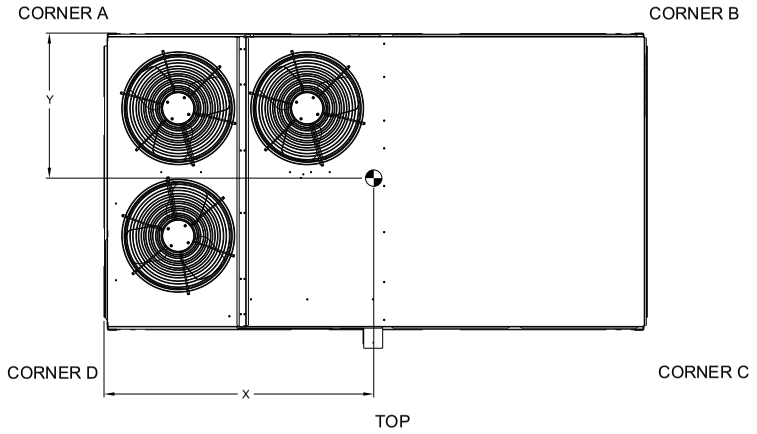


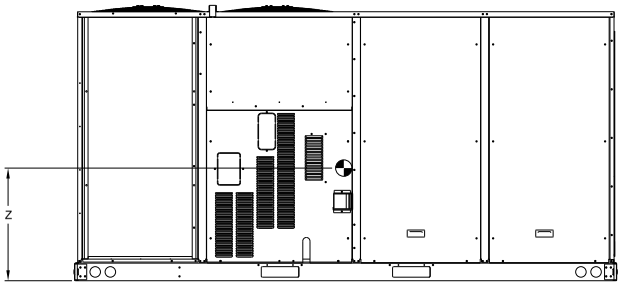
C13316

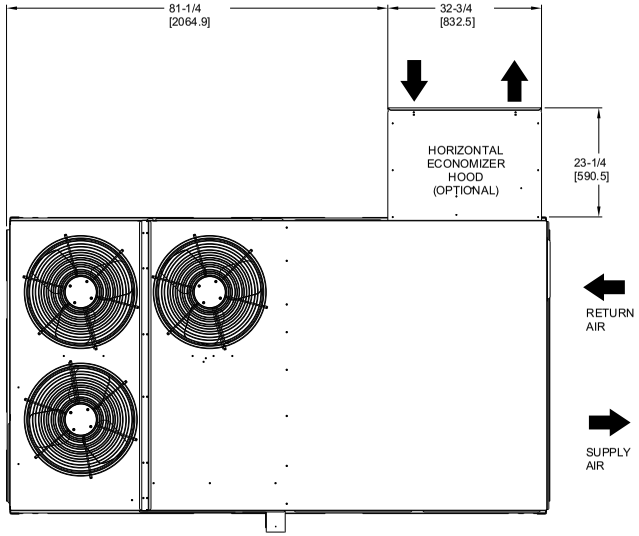
Fig. 3 - Unit Dimensional Drawing – 09 and 12 Size Units

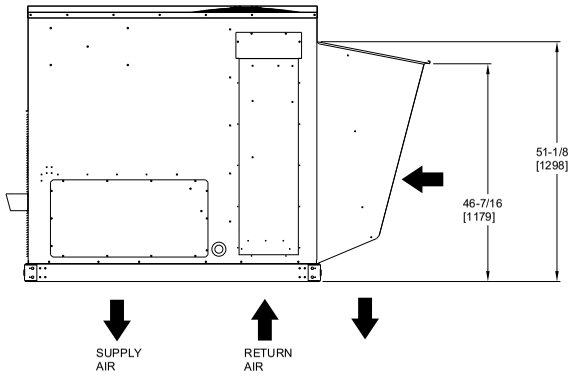
UNIT	STD UNIT WEIGHT		CORNER WEIGHT (A)		CORNER WEIGHT (B)		CORNER WEIGHT (C)		CORNER WEIGHT (D)		C.G.		
	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z
48LC 09	1606	728	406	184	410	186	397	180	393	178	58 [1473]	32 [812]	20 5/8 [524]
48LC 12	1606	728	406	184	410	186	397	180	393	178	58 [1473]	32 [812]	20 5/8 [524]

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







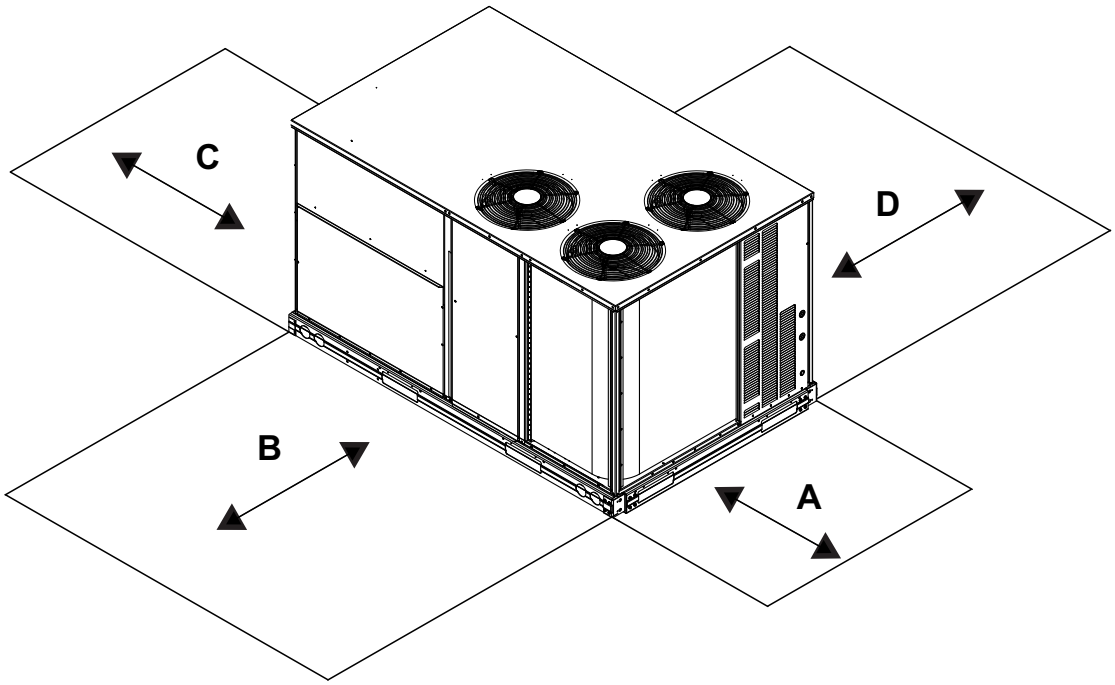


HORIZONTAL ECONOMIZER

UNITED TECHNOLOGIES CARRIER P.O. BOX 4808 SYRACUSE, NY 13221

SHEET	DATE	SUPERCEDES			REV
2 OF 2	05/08/13	-	48LC 09-12 SINGLE ZONE ELECTRICAL COOLING WITH GAS HEAT	48LC500390	A

Fig. 3 - Unit Dimensional Drawing – 09 and 12 Size Units (cont)



C12322

LOCATION	DIMENSION	CONDITION
A	48 – in (1219 mm) 18 – in (457 mm) 18 – in (457) mm 12 – in (305 mm)	Unit disconnect is mounted on panel No disconnect, convenience outlet option Recommended service clearance Minimum clearance
B	42 – in (1067 mm) 36 – in (914 mm) Special	Surface behind servicer is grounded (e.g., metal, masonry wall) Surface behind servicer is electrically non – conductive (e.g., wood, fiberglass) Check sources of flue products within 10 – ft of unit fresh air intake hood
C	36 – in (914 mm) 18 – in (457 mm)	Side condensate drain is used Minimum clearance
D	48 – in (1219 mm) 42 – in (1067 mm) 36 – in (914 mm) 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

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

Fig. 4 - Service Clearance Dimensional Drawing

INSTALLATION

Jobsite Survey

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.

Step 1 — Plan for Unit Location

Select a location for the unit and its support system (curb or other) that provides for at least 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. 4.

NOTE: Consider also the effect of adjacent units.

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, relief valves, or other sources of contaminated air.

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

Select a unit mounting system that provides adequate height to allow installation of condensate trap per requirements. Refer to Step 11 — Install External Condensate Trap and Line for required trap dimensions.

Roof Mount —

Check building codes for weight distribution requirements. Unit operating weight is shown in Table 1.

Table 1 – Operating Weights

48LC**	UNITS LB (KG)		
	08	09	12
Base Unit	1430 (650)	1534 (696)	1554 (705)
Economizer			
Vertical	103 (47)	103 (47)	103 (47)
Horizontal	242 (110)	242 (110)	242 (110)
Powered Outlet	35 (16)	35 (16)	35 (16)
Curb	Curb	Curb	Curb
14–in/356 mm	180 (82)	180 (82)	180 (82)
24–in/610 mm	255 (116)	255 (116)	255 (116)

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 —

Install curb

Install field-fabricated ductwork inside curb

Install accessory thru-base service connection package (affects curb and unit) (refer to accessory installation instructions for details)

Prepare bottom condensate drain connection to suit planned condensate line routing (refer to Step 11 for details)

Rig and place unit

Install outdoor air hood

Install condensate line trap and piping

Make electrical connections

Install other accessories

Pad-mounted installation —

Prepare pad and unit supports

Check and tighten the bottom condensate drain connection plug

Rig and place unit

Convert unit to side duct connection arrangement

Install field-fabricated ductwork at unit duct openings

Install outdoor air hood

Install condensate line trap and piping

Make electrical connections

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.

On units with hinged panel option, check to be sure all latches are snug and in closed position.

Locate the carton containing the outside air hood parts; see Fig. 12. Do not remove carton until unit has been rigged and located in final position.

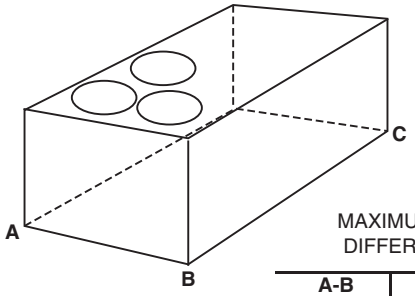
Step 4 — Provide Unit Support

Roof Curb Mount —

Accessory roof curb details and dimensions are shown in Fig. 6. Assemble and install accessory roof curb in accordance with instructions shipped with the curb.

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. 6. Improperly applied gasket can also result in air leaks and poor unit performance.

Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are shown in Fig. 5. Refer to Accessory Roof Curb Installation Instructions for additional information as required.



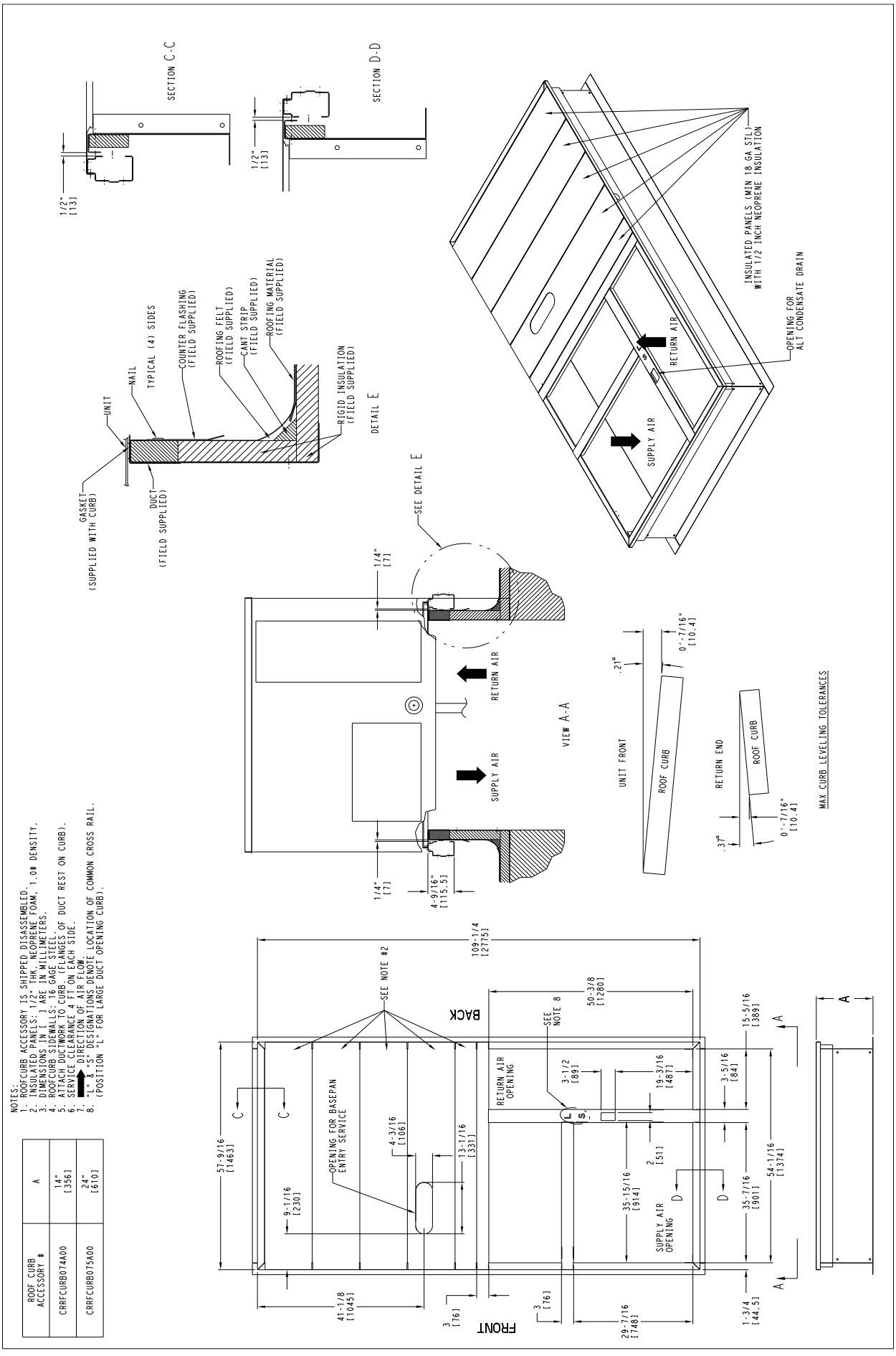
MAXIMUM ALLOWABLE DIFFERENCE IN. (MM)

A-B	B-C	A-C
0.5” (13)	1.0” (25)	1.0” (25)

C10001

Fig. 5 - Unit Leveling Tolerances

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



C10772B

Fig. 6 - Roof Curb Details - Size 08-12 Units

IMPORTANT:

If the unit's gas connection and/or electric and control wiring is to be routed through the basepan and the unit is equipped with the factory-installed Thru-the-Base service option see the following sections:

- **Factory-Option Thru-Base Connections (Gas Connection)** on page 16
- **Factory-Option Thru-Base Connections (Electrical Connections)** on page 29

If using the field-installed Thru-the-Base accessory follow the instructions provided with the accessory kit.

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.

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.

⚠ 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

When the unit is ready to be rigged and no longer will be lifted by a fork truck, the wood protector under the basepan must be removed. Remove 4 screws from each base rail. Wood protector will drop to the ground. See instructions on the unit base rails.

Keep unit upright and do not drop. Spreader bars are not required. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 1 and Fig. 7 for additional information.

Lifting holes are provided in base rails as shown in Fig. 7. Refer to rigging instructions on unit.

Rigging materials under unit (cardboard or wood) 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 plug can be tightened with a $^1/_2$-in. square socket drive extension. For further details see Step 11 — Install External Condensate Trap and Line on page 18.

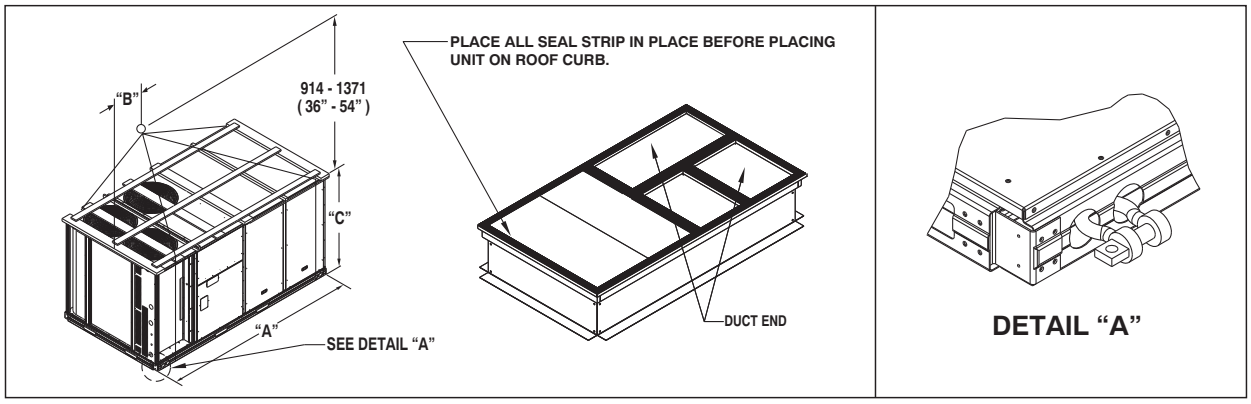
Before setting the unit onto the curb, recheck gasketing on curb.

⚠ 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 panels or packaging are removed.



C10774

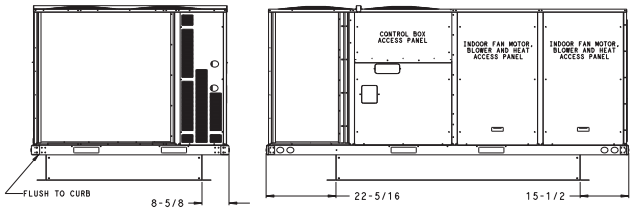
UNIT	MAX WEIGHT		DIMENSIONS					
			A		B		C	
	LB	KG	IN	MM	IN	MM	IN	MM
48LC*008	2460	1116	116	2945	57	1448	59.5	1510
48LC*009	2465	1118	116	2945	58	1473	59.5	1510
48LC*012	2465	1118	116	2945	58	1473	59.5	1510

NOTES:
1. Dimensions in ( ) are in millimeters.
2. 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.
3. Use wooden top to prevent rigging straps from damaging unit.

Fig. 7 - Rigging Details

Positioning on Curb —

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 position as shown in Fig. 8. Maintain the 15.5 in. (394 mm) and 8 $^5/_8$ in. (220 mm) clearances and allow the 22 $^5/_{16}$ in. (567 mm) dimension to float if necessary.



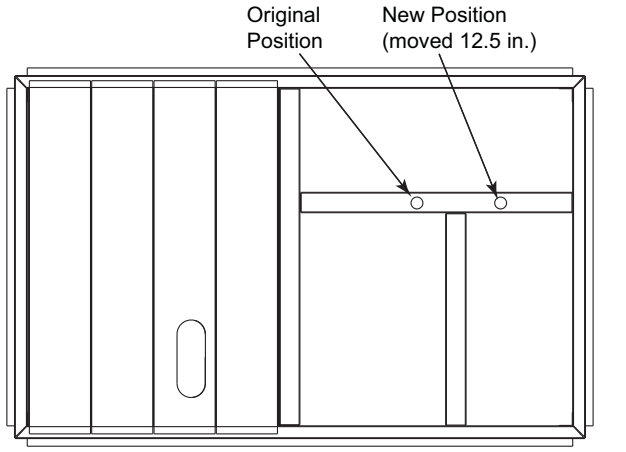
C10003

Fig. 8 - Retrofit Installation Dimensions

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 end of the unit. (See Fig. 9.)

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. 27 and 28. Recycle or dispose of all shipping materials.



C10904

Fig. 9 - 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 16
- **Factory-Option Thru-Base Connections (Electrical Connections)** on page 29

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 & Connect Ductwork (when required)

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. See Fig. 10.

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.

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.

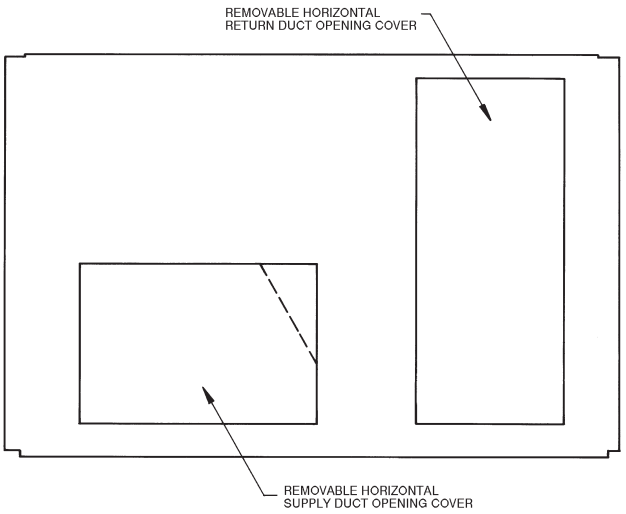


Fig. 10 - Horizontal Conversion Panels

Step 8 — Install Outside Air Hood

Economizer Hood Removal and Setup - Factory Option —

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. 11.)
3. Locate and cut the (2) plastic tie-wraps, being careful to not damage any wiring. (See Fig. 12.)
4. Carefully lift the hood assembly through the filter access opening and assemble per the steps outlined in the following procedure *Economizer Hood Assembly.*

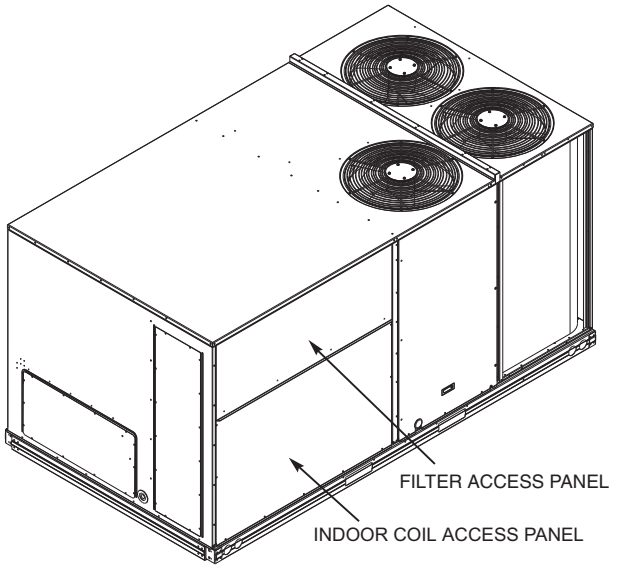


Fig. 11 - Typical Access Panel Locations

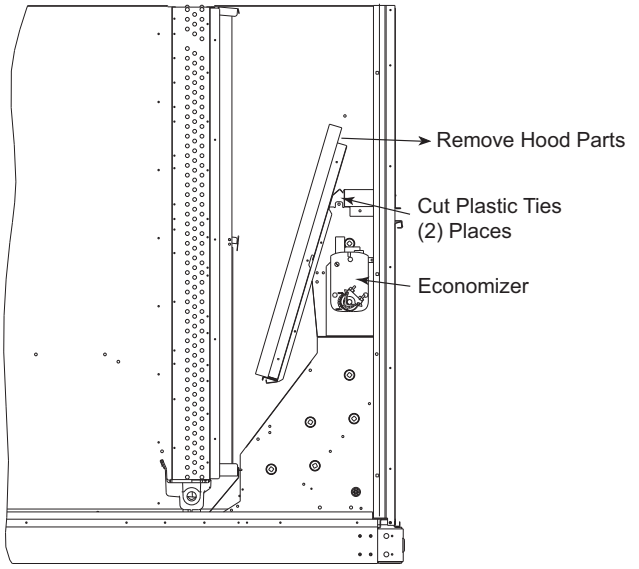
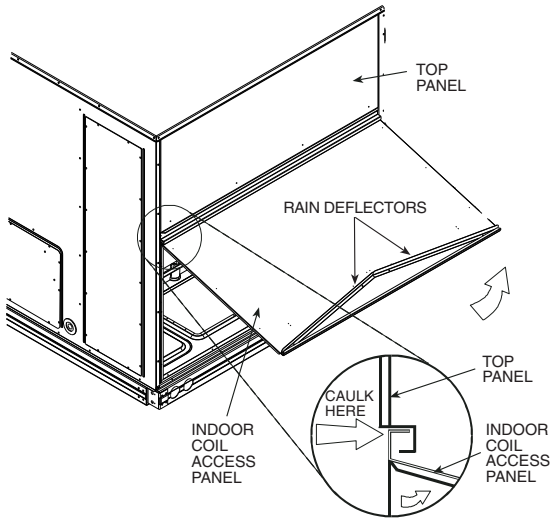


Fig. 12 - Economizer Hood Package Location

Economizer Hood Assembly —

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.

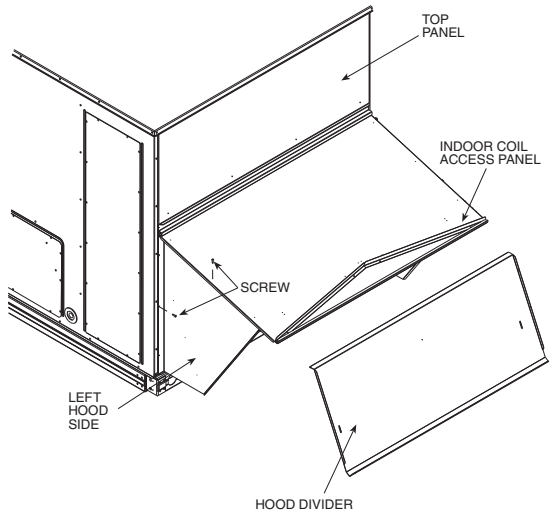
1. The indoor coil access panel will be used as the top of the hood. If the panel is still attached to the unit, remove the screws along the sides and bottom of the panel. See Fig. 13.



C10007B

Fig. 13 - Indoor Coil Access Panel Relocation

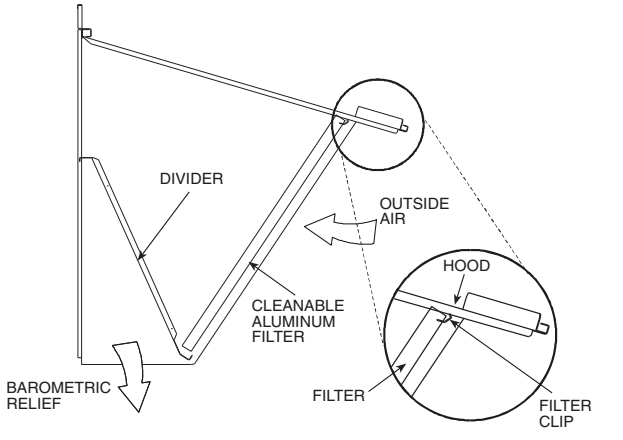
2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). ***Be careful not to lift the panel too far as it might fall out.*** Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 14.



C10008

Fig. 14 - Economizer Hood Construction

3. Remove the shipping tape holding the economizer barometric relief damper in place.
4. Insert the hood divider between the hood sides. See Fig. 14 and 15. Secure hood divider with 3 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.
5. Attach the post that separates the filters with the screws provided.
6. Open the filter clips which are located underneath the hood top. Insert the aluminum filters into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filters into place. See Fig. 15.
7. Install the two rain deflectors on the edge of the hood top as shown in Fig. 13.



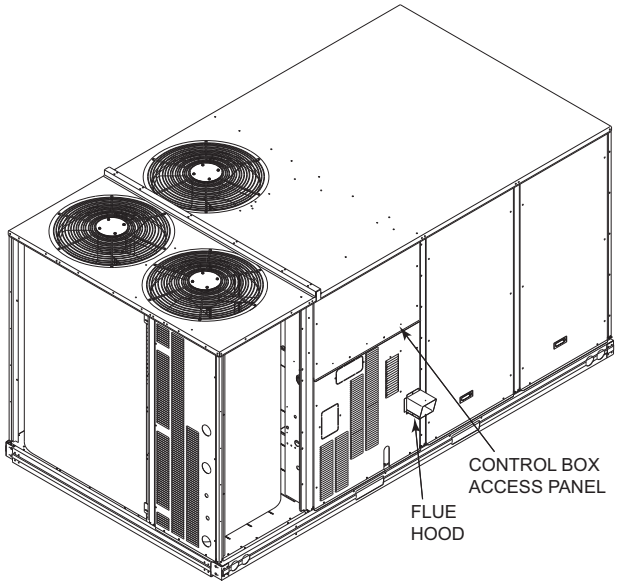
C10009

Fig. 15 - Economizer Filter Installation

8. Caulk the ends of the joint between the unit top panel and the hood top as shown in Fig. 13.
9. Replace the filter access panel.

Step 9 — Install Flue Hood

The flue hood is shipped screwed to the basepan beside the burner compartment access panel. Remove the panel below the control box access panel to access the flue hood shipping location. Using screws provided, install flue hood and screen in location shown in Fig. 16.



C10804

Fig. 16 - Flue Hood Details

Step 10 — Install Gas Piping

Installation of the gas piping must be 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 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 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 fuel. See accessory kit installation instructions regarding these accessories.

NOTE: In U.S.A. the input rating for altitudes above 2000 ft (610 m) must be derated by 4% for each 1000 ft (305 m) above sea level.

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 liquified petroleum applications, the gas pressure must not be less than 11 in. wg (2740 Pa) or greater than 13 in. wg (3240 Pa) at the unit connection.

Table 2 – Natural Gas Supply Line Pressure Ranges

UNIT	MIN	MAX
48LC*008/09/12	4.0 in. wg (996 Pa)	13.0 in. wg (3240 Pa)

Table 3 – Liquid Propane Supply Line Pressure Ranges

UNIT	MIN	MAX
48LC*008/09/12	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 $^3/4$-in. FPT gas inlet port on the unit gas valve.

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

Table 4 – Natural Gas Manifold Pressure Ranges

UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE
48LCD/E/S/R0	08, 09, 12	3.5 in. wg (872 Pa)	2.0 in. wg (498 Pa)
48LCF/T0 (High Heat units only)	12 only	3.4 in. wg (847 Pa)	2.3 in. wg (573 Pa)

Manifold pressure for liquid propane (LP) fuel must be adjusted to specified range. Follow instructions in the accessory kit to make initial readjustment.

Table 5 – Natural Gas Manifold Pressure Ranges

UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE
48LCD/E/S/R0	08, 09, 12	10.0 in. wg (2491 Pa)	5.7 in. wg (1420Pa)
48LCF/T0 (High Heat units only)	12 only	6.2 in. wg (1554 Pa)	3.9 in. wg (971 Pa)

⚠ CAUTION

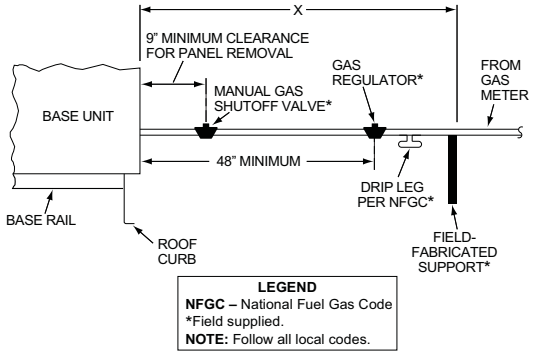
EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in damage to equipment.

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. 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. 17.



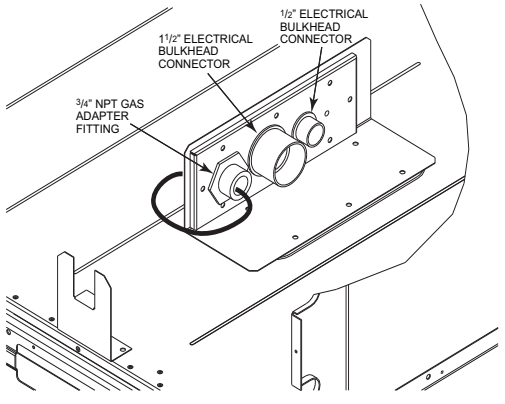
STEEL PIPE NOMINAL DIAMETER (in.)	SPACING OF SUPPORTS X DIMENSION (ft)
$^1/2$	6
$^3/4$ or 1	8
$1^1/4$ or larger	10

C11121

Fig. 17 - Gas Piping Guide

Factory-Option Thru-Base Connections (Gas Connection) —

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. 18.



C10905

Fig. 18 - Thru-the-Base Option, Shipping Position

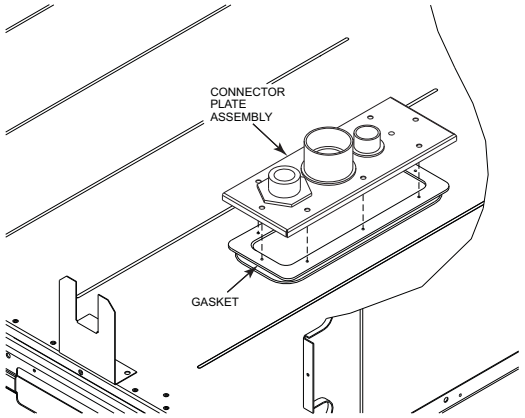
1. Remove the "L" bracket assembly from the unit (see Fig. 18).
2. Cut and discard the wire tie on the gas fitting. Hand tighten the fitting if it has loosened in transit.
3. Remove connector plate assembly from the "L" bracket and discard the "L" bracket, but retain the washer head screws and the gasket (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. 19.
5. Install the connector plate assembly to the basepan using 8 of the washer head screws.

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.

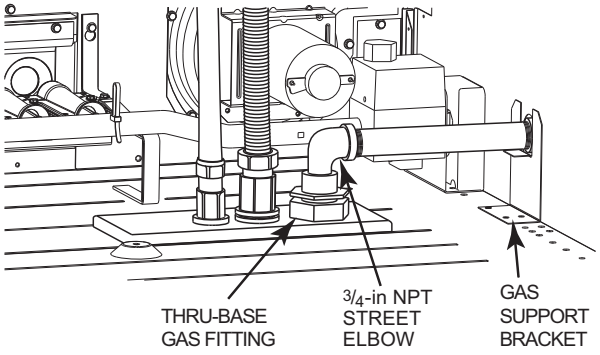


C10906

Fig. 19 - Completing Installation of Thru-the-Base Option

Check tightness of connector lock nuts before connecting gas piping.

Install a $^{3}/_{4}$-in. NPT street elbow 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. 20.)



C10806

Fig. 20 - Gas Line Piping

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. 21 and 22 for typical piping arrangements for gas piping that has been routed through the sidewall of the curb. See Fig. 23 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.

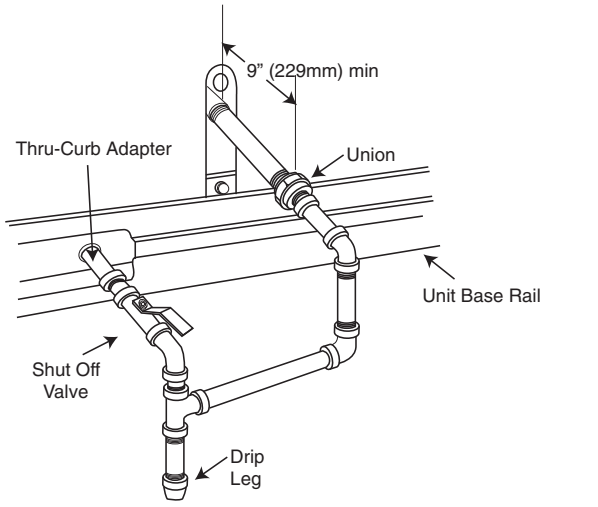


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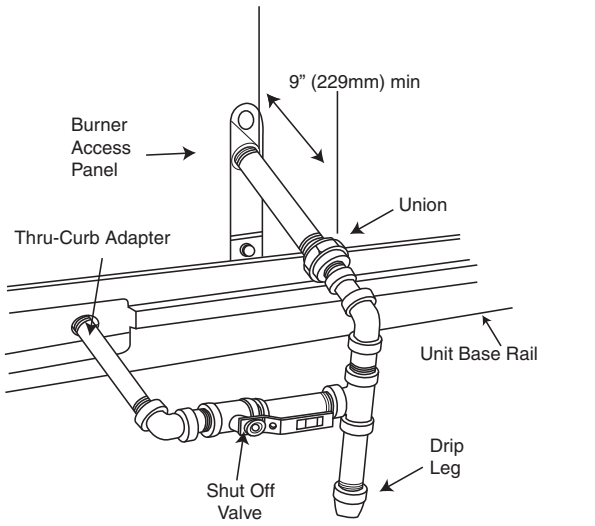
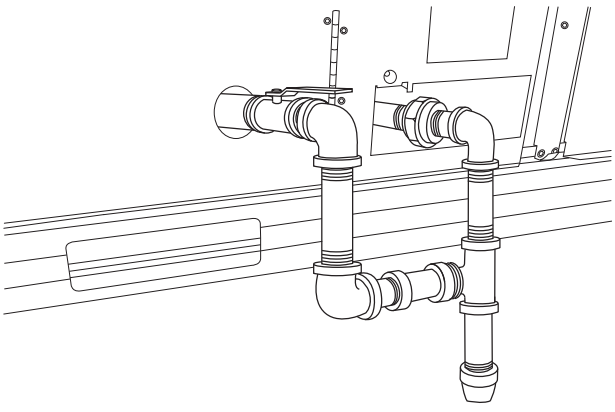
Fig. 21 - Gas Piping with Direct Drip Leg



C07470

Fig. 22 - Gas Piping with Offset Drip Leg



C10826

Fig. 23 - 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 NFGC 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*) tape, ensure the material is Double Density type and is labeled for use on gas lines. Apply tape per manufacturer's instructions.
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

FIRE OR EXPLOSION HAZARD

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. A burr-free and squarely aligned orifice hole is essential for proper flame characteristics. See Fig. 24.

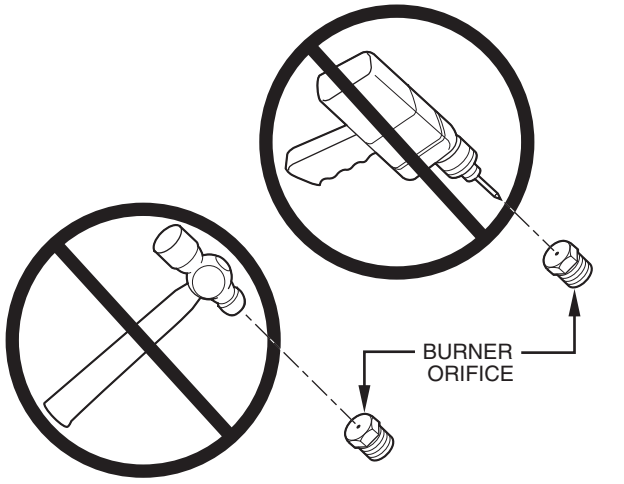


Fig. 24 - Orifice Hole

Step 11 — Install External Condensate Trap & 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. 25. Unit airflow configuration does not determine which drain connection to use. Either drain connection can be used with vertical or horizontal applications.

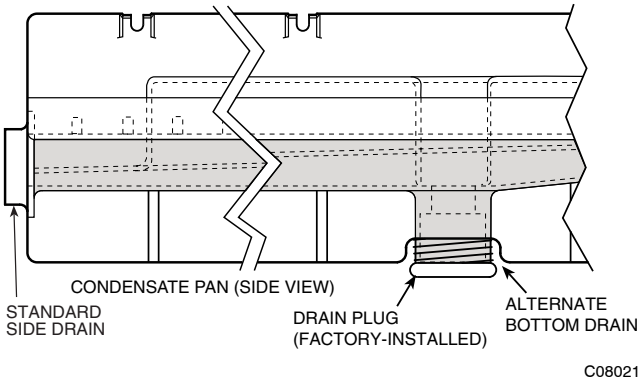


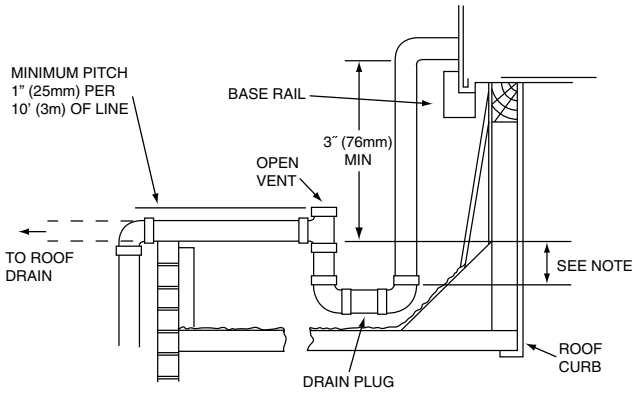
Fig. 25 - Condensate Drain Pan (Side View)

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. 26.

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.).

* Teflon is a registered trademark of DuPont.



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

C11291

Fig. 26 - Condensate Drain Piping Details

Step 12 — Make Electrical Connections

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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 —

For those units without through-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. 27 and 28) to either the factory option disconnect or the bottom of the control box. One-inch 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. 27 and 28 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. 29). 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. 30). 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.

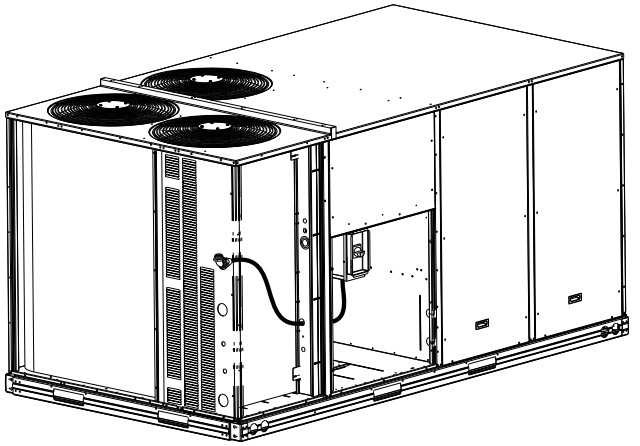


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Fig. 27 - Conduit into Factory Option Non-Fused Disconnect or HACR

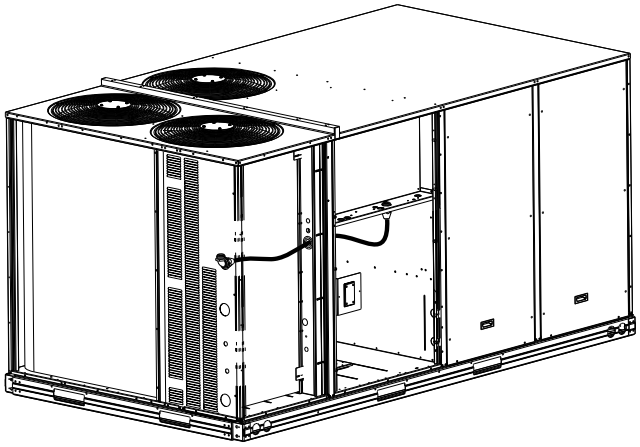

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Fig. 28 - Conduit into Control Box

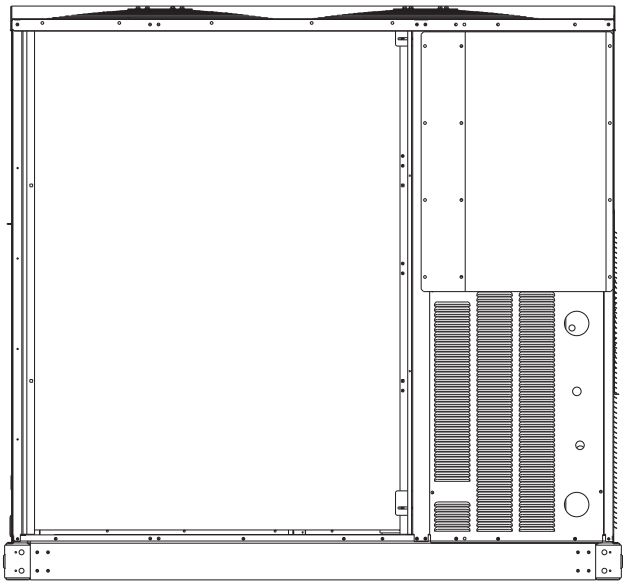

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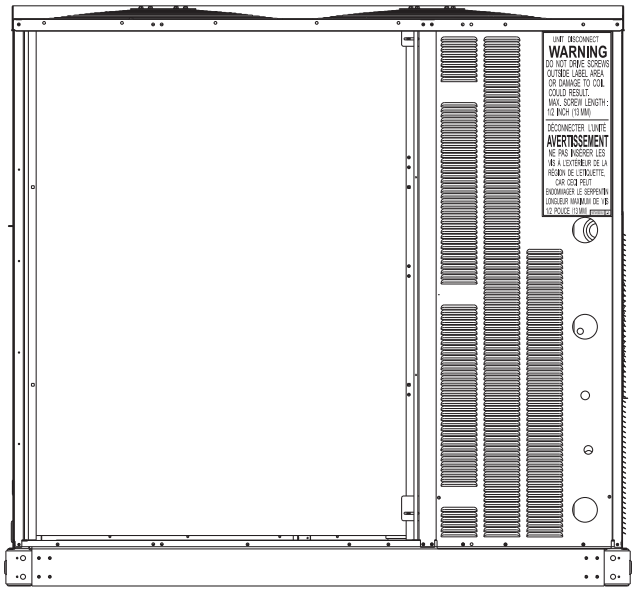
Fig. 29 - Mounting Position for Field Disconnects (over 100A)



C10854

Fig. 30 - Mounting Position for Field Disconnects (up to 100A)

Field power wires are connected to the unit at line-side pressure lugs at the main terminal block (TB1) or at factory-installed option non-fused disconnect switch or HACR. Refer to Table 6 for maximum wire size at connection lugs. Use copper wire only. See Fig. 37.

Table 6 – 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
25A HACR Option	#14	1/0
30A HACR Option	#14	1/0
35A HACR Option	#14	1/0
40A HACR Option	#14	1/0
50A HACR Option	#14	1/0
60A HACR Option	#14	1/0
70A HACR Option	#14	1/0
80A HACR Option	#14	1/0
90A HACR Option	#14	1/0
100A HACR Option	#14	1/0

NOTE: TEST LEADS - Unit may be equipped with short leads (pigtails) on the field line connection points off the optional non-fused disconnect switch or HACR. 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 intermittent operation or performance satisfaction.

Do not connect aluminum wire between disconnect switch and air conditioning unit. Use only copper wire. (See Fig. 31.)

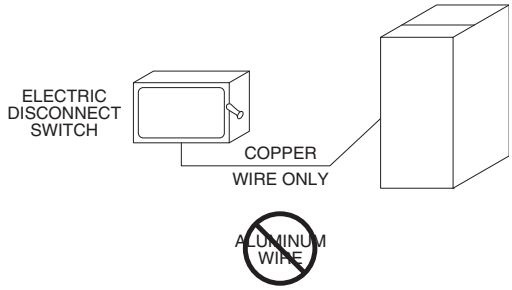


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Fig. 31 - Disconnect Switch and Unit

All Units —

All field wiring must comply with NEC and all local requirements.

Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 37 and the unit label diagram for power wiring connections to the unit power terminal blocks and equipment ground. Refer to Table 6 for maximum wire size at connection lugs.

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.

NOTE: Units ordered with factory-installed HACR do not need an additional ground-fault and short-circuit over-current protection device unless local codes require.

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. See Tables 24 and 25. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown in the legend for Tables 24 and 25 (see Note 3 on page 71) to determine the percent of voltage imbalance.

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.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

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.

NOTE: Check all factory and field electrical connections for tightness.

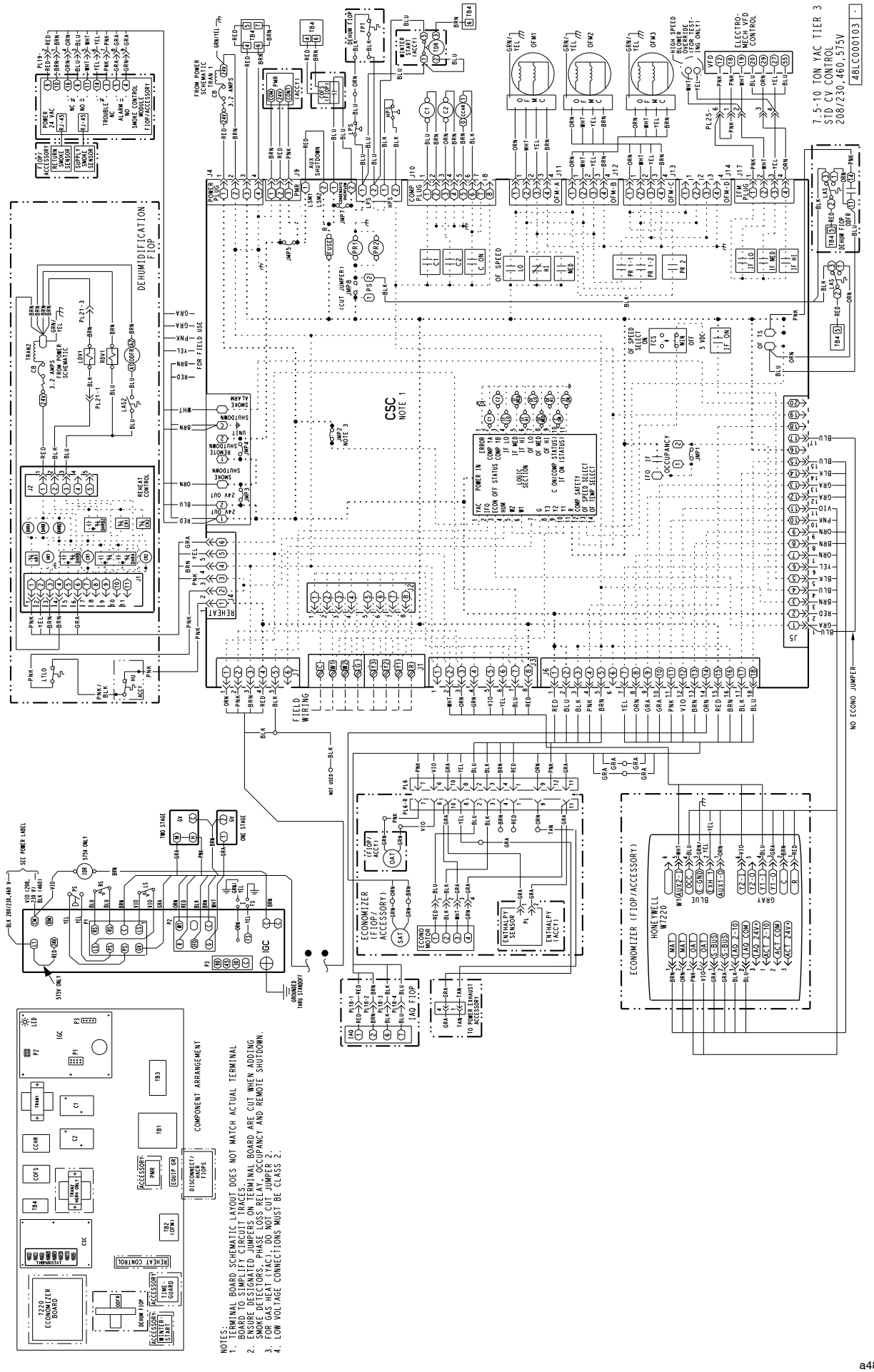


Fig. 32 - 48 LC 08-12 Electro-mechanical Control Wiring Diagram

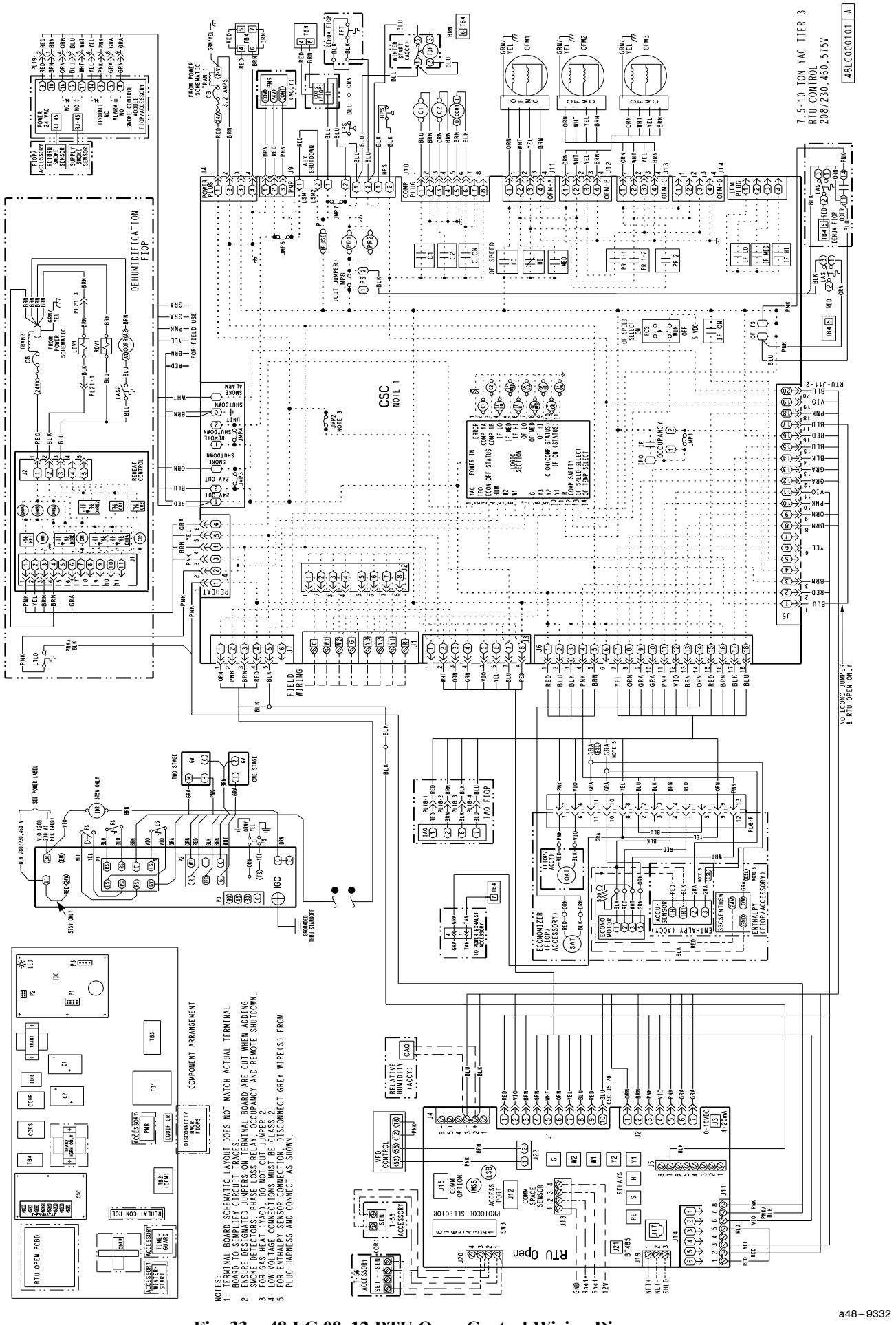


Fig. 33 - 48 LC 08-12 RTU Open Control Wiring Diagram

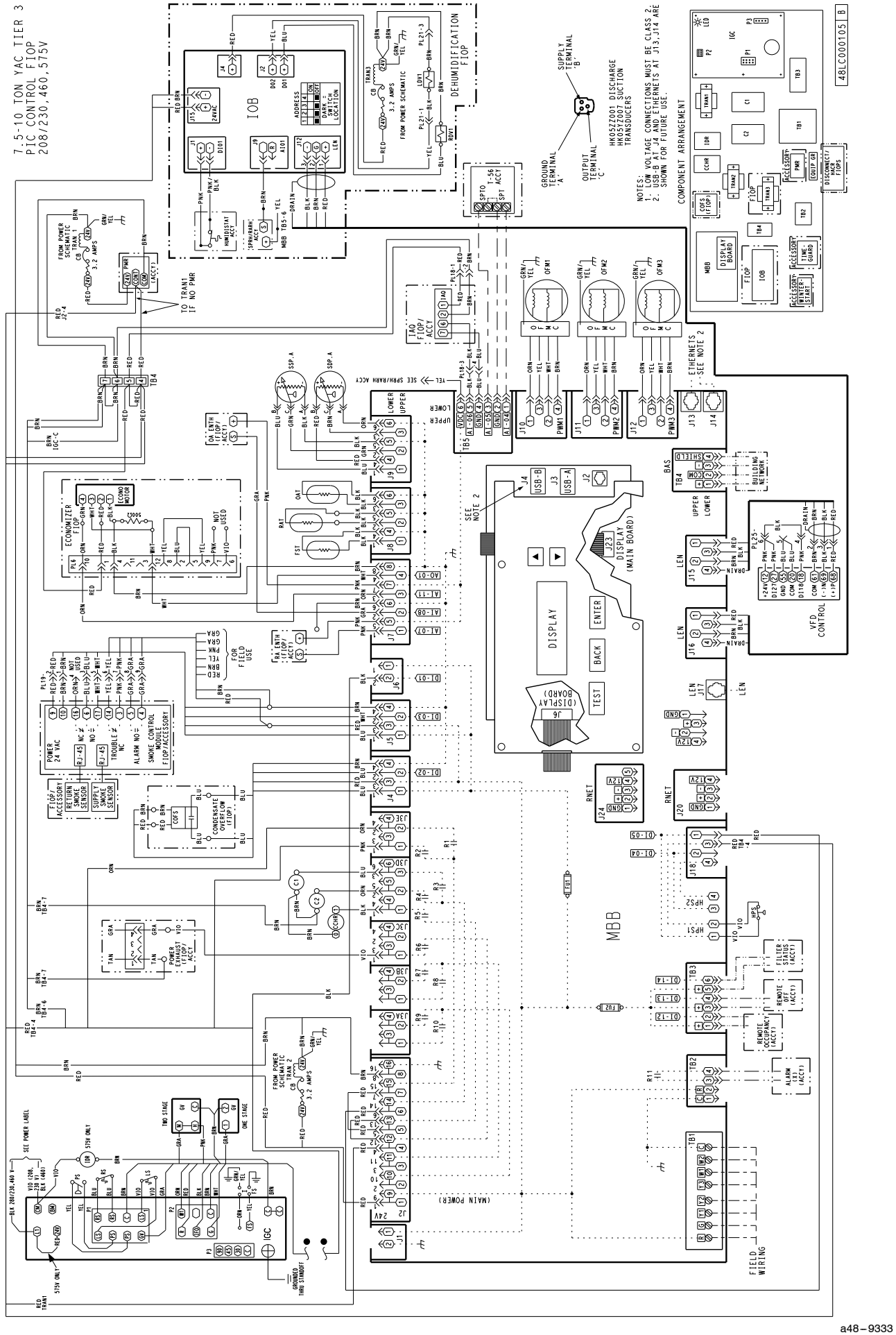


Fig. 34 - 48 LC 08-12 SystemVu™ Control Wiring Diagram

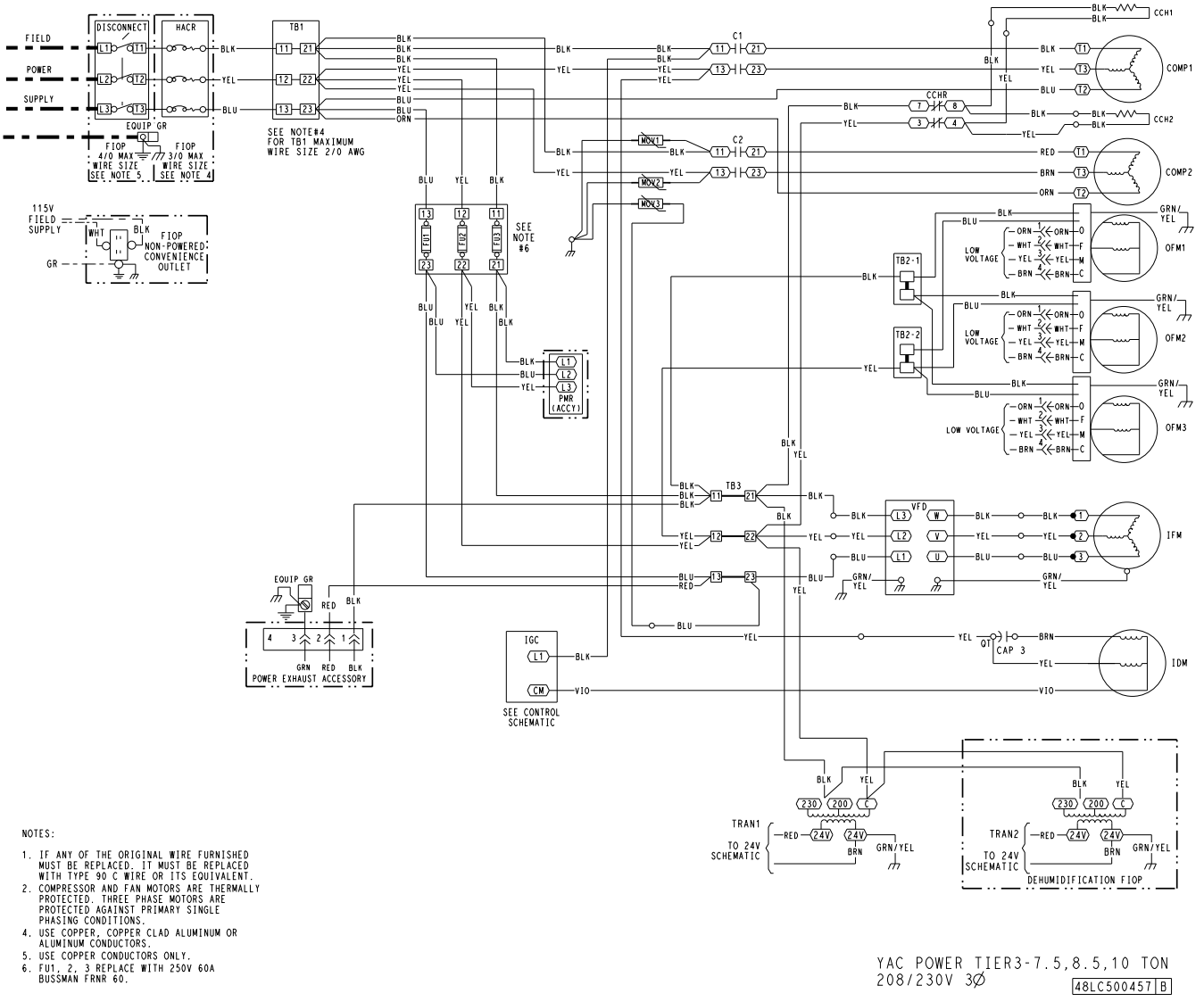
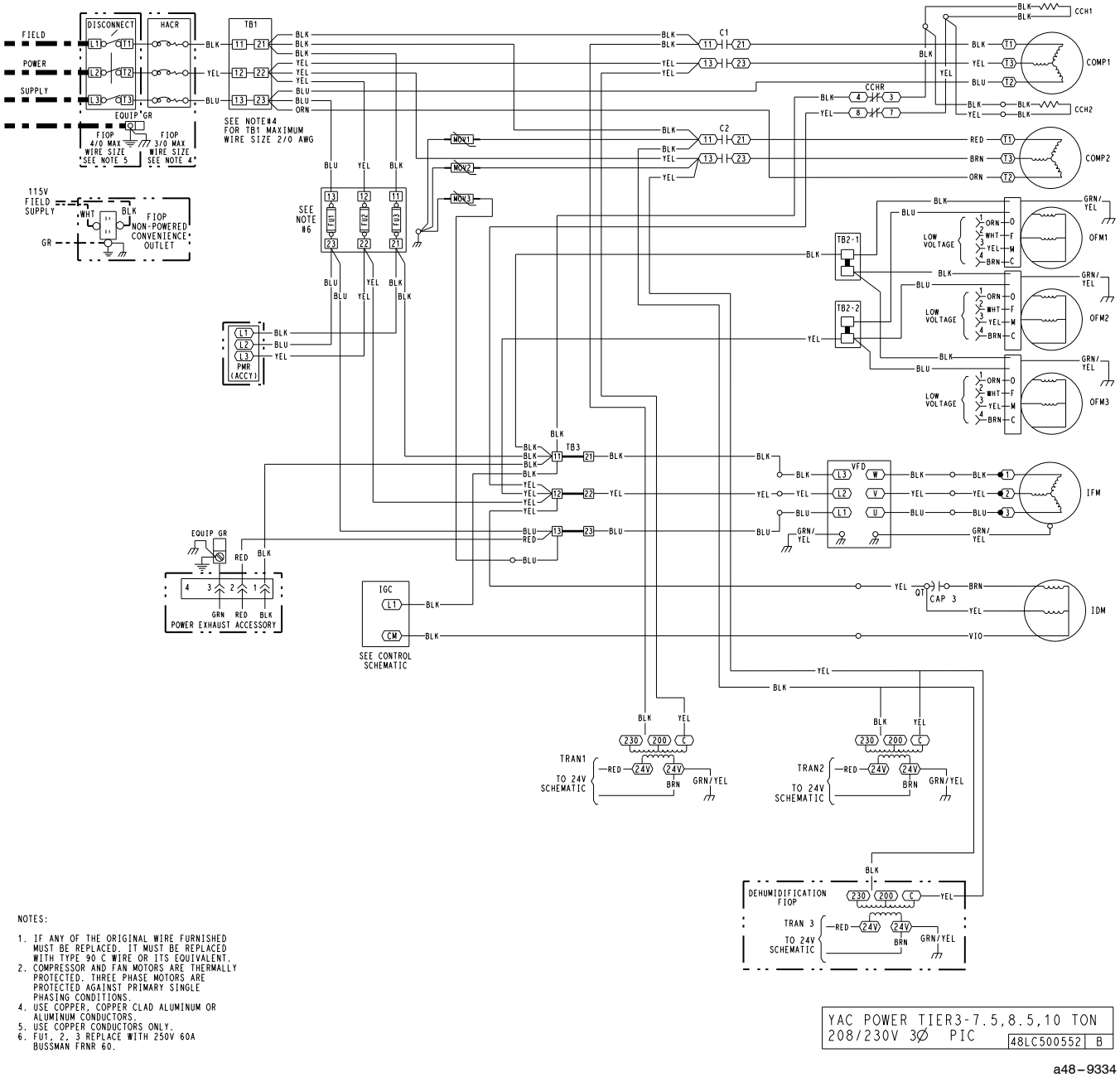


Fig. 35 - 48LC 08-12 Typical Power Wiring Diagram, Electro-mechanical and RTU Open Controls, 208/230V Unit Shown



NOTES:

1. IF ANY OF THE ORIGINAL WIRE FURNISHED MUST BE REPLACED. IT MUST BE REPLACED WITH TYPE 90 C WIRE OR ITS EQUIVALENT.
2. COMPRESSOR AND FAN MOTORS ARE THERMALLY PROTECTED. THREE PHASE MOTORS ARE PROTECTED AGAINST PRIMARY SINGLE PHASING CONDITIONS.
4. USE COPPER, COPPER CLAD ALUMINUM OR ALUMINUM CONDUCTORS.
5. USE COPPER CONDUCTORS ONLY.
6. FU1, 2, 3 REPLACE WITH 250V 60A BUSSMAN FRNR 60.

a48-9334

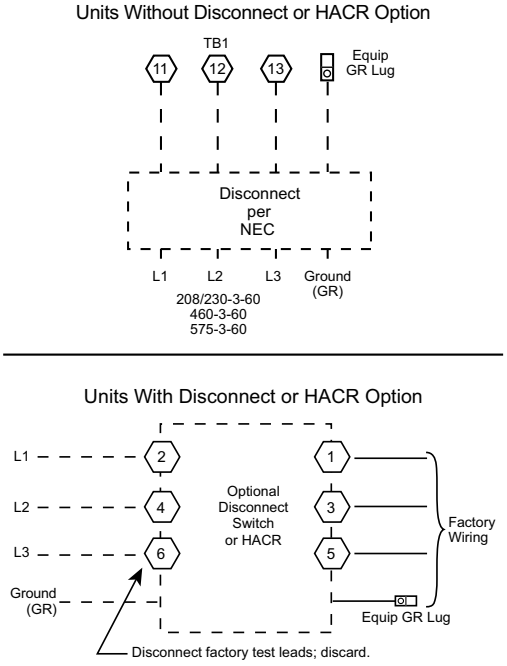
Fig. 36 - 48LC 08-12 Typical Power Wiring Diagram, SystemVu™ Control, 208/230V Unit Shown

Units Without Factory-Installed Non-Fused Disconnect or HACR —

When installing units, provide a disconnect switch of adequate size per NEC (National Electrical Code). 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.

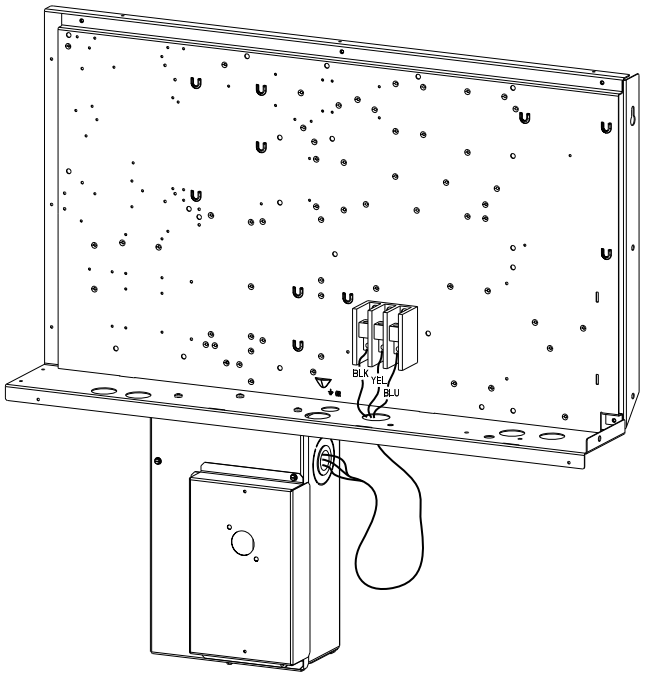
Units With Factory-Installed Non-Fused Disconnect or HACR —

The factory-installed option non-fused disconnect switch (NFD) or HACR is located in a weatherproof enclosure located under the main control box. The manual switch handle is shipped in th disconnect or HACR enclosure. Assemble the shaft and handle to the switch or HACR at this point. Discard the factory test leads (see Fig. 37). The factory disconnect is either an 80A or 100A depending on the unit voltage, indoor motor and options.



C12323

Fig. 37 - Power Wiring Connections

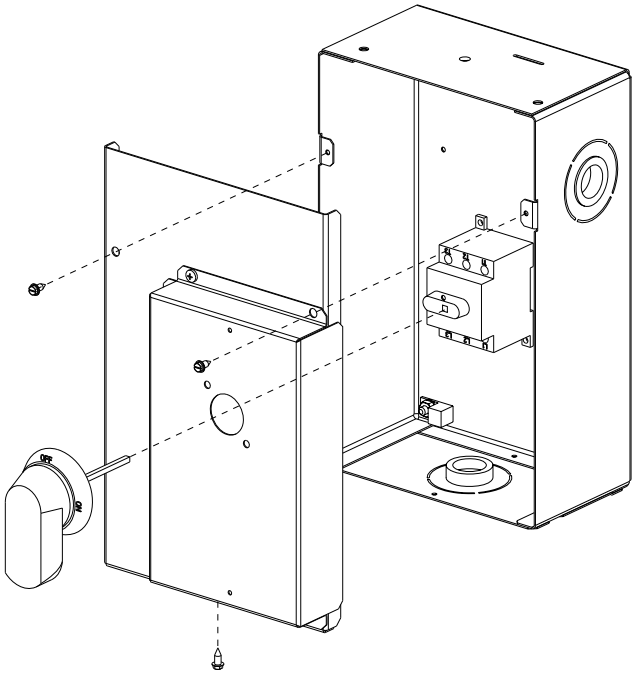


C12324

Fig. 38 - Location of Non-Fused Disconnect Enclosure

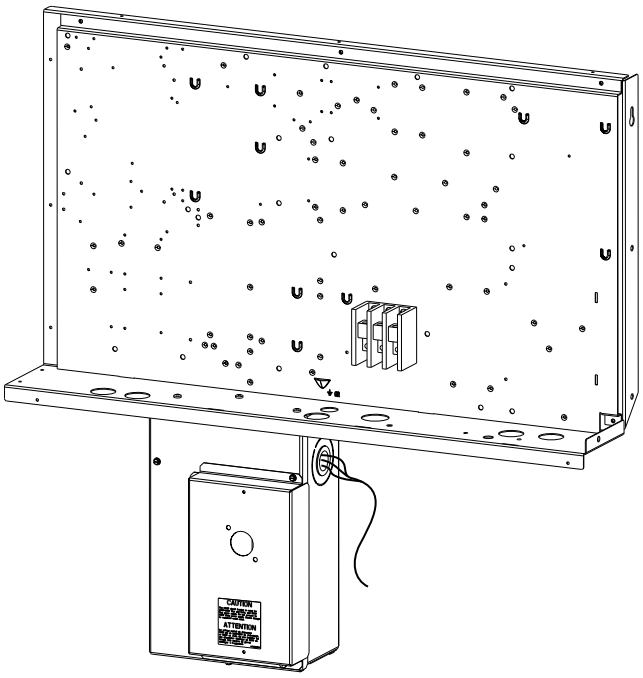
To field install the NFD shaft and handle:

1. Remove the unit front panel (see Fig. 2 and 3).
2. Remove (3) hex screws on the NFD enclosure - (2) on the face of the cover and (1) on the bottom.
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. Measure the tip of the shaft to the top surface of the pointer to be 3.75 to 3.88 in. (95 to 99 mm) for 80A and 100A NFD and 3.43 to 3.56 in. (87 to 90 mm) 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 at 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.



C12325

Fig. 39 - Handle and Shaft Assembly for NFD

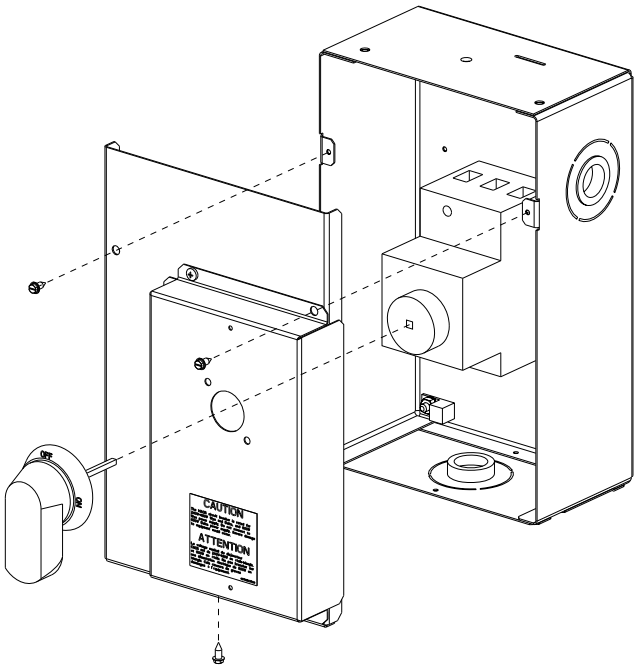


C12326

Fig. 40 - Location of HACR Enclosure

To field install the HACR shaft and handle:

1. Remove the unit front pane (see Fig. 2 and 3).
2. Remove (3) hex screws on the HACR enclosure - (2) on the face of the cover and (1) on the bottom.
3. Remove the front cover of the HACR enclosure.
4. Make sure the HACR shipped from the factory is at OFF position (the white arrow pointing at OFF).
5. Insert the shaft all the way with the cross pin on the top of the shaft in the horizontal position.
6. Tighten the locking screw to secure the shaft to the HACR.
7. Turn the handle to the OFF position with red arrow pointing at OFF.
8. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
9. Secure the handle to the painted cover with (2) screws and lock washers supplied.
10. Engaging the shaft into the handle socket, re-install (3) hex screws on the HACR enclosure.
11. Re-install the unit front panel.



C12327

Fig. 41 - Handle and Shaft Assembly for HACR

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 48LC units: non-powered and unit-powered. Both types provide a 125-volt GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the panel beneath the control box. See Fig. 42.

Non-powered type: This type requires the field installation of a general-purpose 125-volt 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size and conduit requirements, 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.

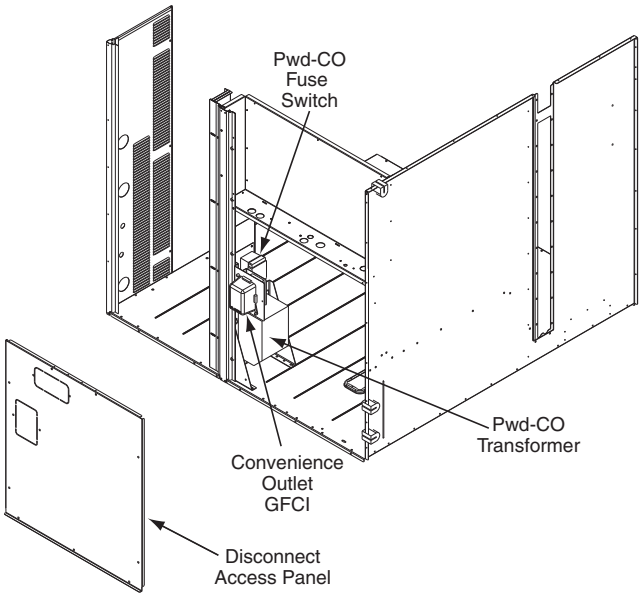
Unit-powered type: A unit-mounted transformer is factory-installed to stepdown the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the panel beneath the control box. See Fig. 42.

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; this will provide service power to the unit when the unit disconnect switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect switch is open. See Fig. 44. On a unit without a unit-mounted disconnect, connect the source leads to the main terminal block (TB1).

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 wire 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.

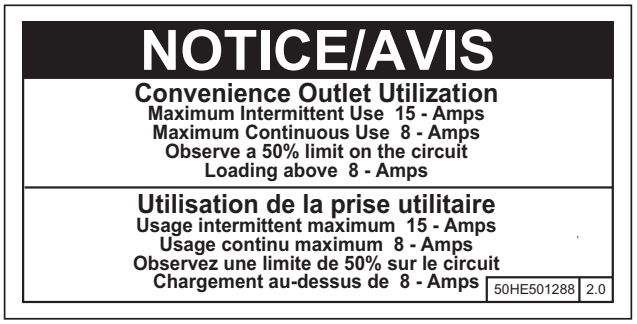
If the convenience outlet transformer is connected to the line side of the factory disconnect option, route the wires through the web bushing located on the bottom of the disconnect box. For the load side wiring to the factory option disconnect, route the wires through the hole on the right side of the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

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.



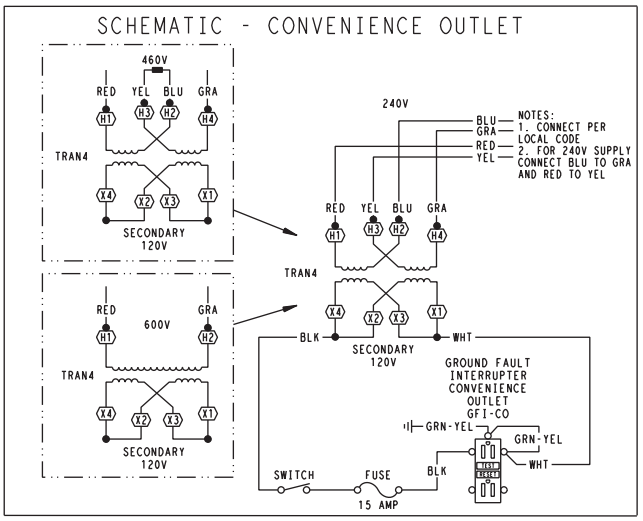
C10361

Fig. 42 - Convenience Outlet Location



C10077

Fig. 43 - Convenience Outlet Utilization Notice



C08283

UNIT VOLTAGE	CONNECT AS	PRIMARY CONNECTIONS	TRANSFORMER TERMINALS
208, 230	240	L1: RED +YEL L2: BLU + GRA	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. 44 - Unit 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.

⚠ WARNING

ELECTRICAL OPERATION HAZARD

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

Using unit-mounted convenience outlets: Units with unit-mounted convenience outlet circuits 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.

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

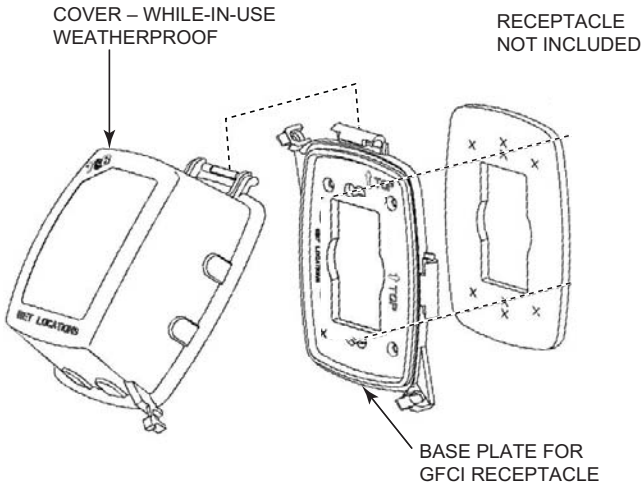
The weatherproof cover kit is shipped in the unit's control box. The kit includes the hinged cover, a backing plate and gasket.

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 are 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. 45. 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.

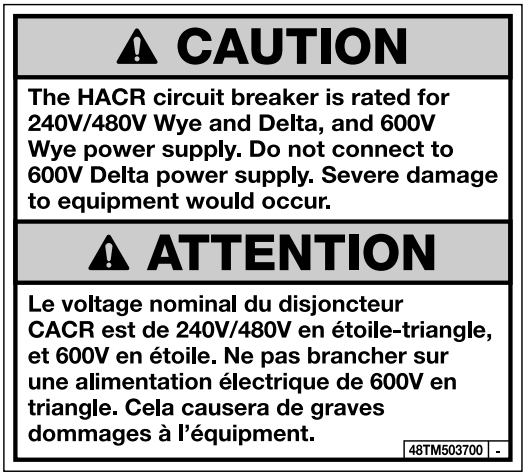


C09022

Fig. 45 - Weatherproof Cover Installation

HACR —

The amp rating of the HACR factory-installed option is based on the size, voltage, indoor motor and other electrical options of the unit as shipped from the factory. If field-installed accessories are added or changed in the field (i.e., power exhaust), the HACR may no longer be of the proper amp rating and therefore will need to be removed from the unit. See unit nameplate and label on factory-installed HACR for the amp rating of the HACR that was shipped with the unit from the factory. See unit nameplates for the proper fuse, HACR or maximum over-current protection device required on the unit with field-installed accessories.

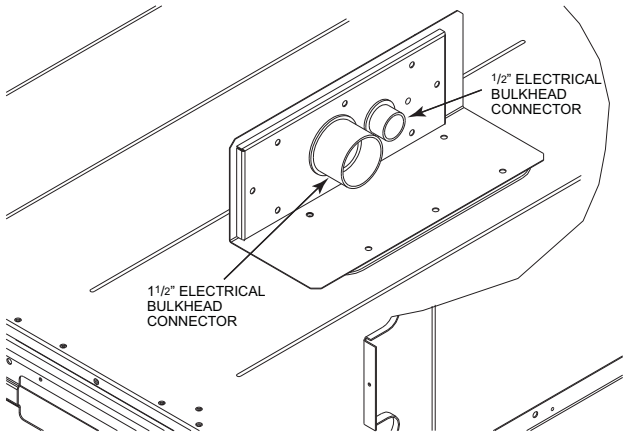


C12105

Fig. 46 - HACR Caution Label

Factory-Option Thru-Base Connections (Electrical Connections) —

This service connection kit consists of 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. 47. The $^1/_2$-in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The $1^1/_2$-in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan.



C10907

Fig. 47 - Thru-the-Base Option, Shipping Position

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. 48.
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.

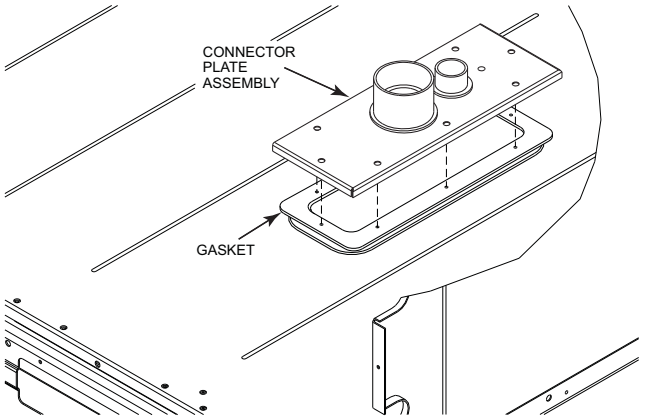


Fig. 48 - Completing Installation of Thru-the-Base Option

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 and low 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. 37.

Field Control Wiring —

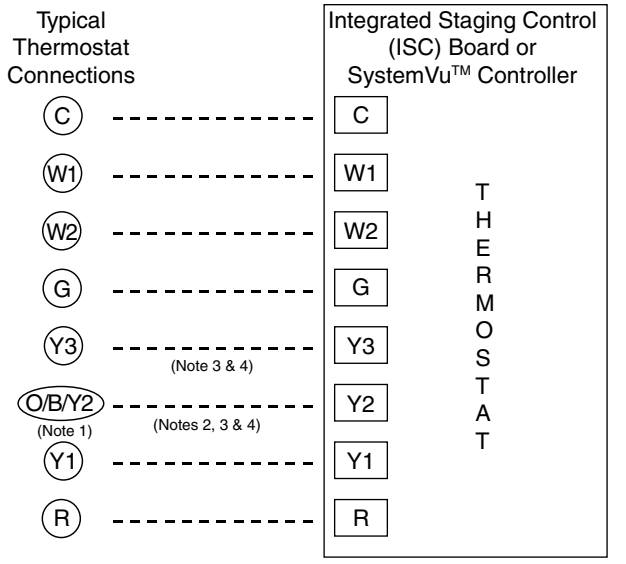
The 48LC unit requires an external temperature control device such as a thermostat (field-supplied).

Thermostat —

Install a Carrier-approved accessory thermostat according to installation instructions included with the accessory. For complete economizer function and 3-stage compressor operation select a three-stage cooling thermostat. If a 3-stage cooling thermostat is not available use a 2-stage cooling thermostat instead, but note that this will limit cooling to just 2 stages. 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 eight leads. If the thermostat does not require a 24-v source (no "C" connection required), use a thermostat cable or equivalent with minimum of seven 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 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.



Note 1: Typical multi-function marking. Follow manufacturer's configuration Instructions to select Y2.

Note 2: Y2 to Y3 connection required for 2-stage cooling operation and when integrated economizer function is desired.

Note 3: To Connect a 2-Stage Thermostat:
Y2 to Y3 connection required for 2-stage cooling operation which provides low and high cooling states.

Note 4: SystemVu controller is default configured for 3-stage cooling and 2-stage heating thermostats; it can be configured for other thermostat types.

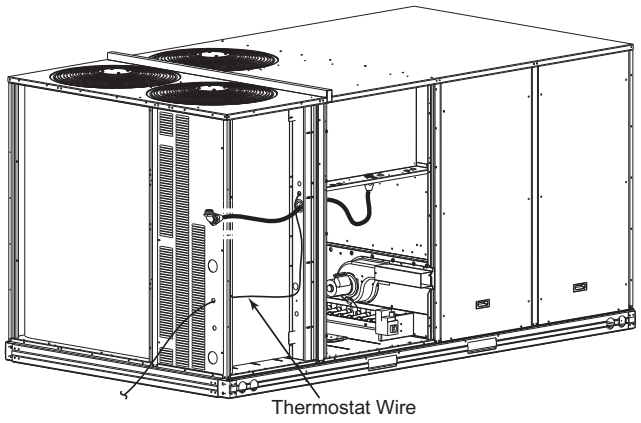
- - - Field Wiring

a48-9346

Fig. 49 - Typical Low-Voltage Control Connections

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. Using 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 lower left corner of the Integrated Staging Control (ISC) Board. 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. 50.



C10886

Fig. 50 - Thermostat Wire Routing

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® System Control Connections

NOTE: It is suggested to ensure the Auto-Changeover function of an installed thermostat is enabled when used in conjunction with the Humidi-MiZer Adaptive Dehumidification system.

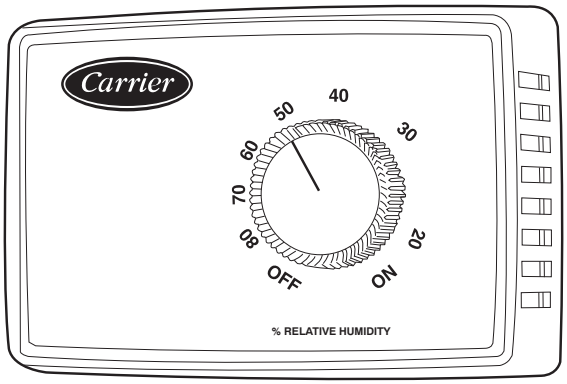
Humidi-MiZer System – Space RH Controller —

The Humidi-MiZer dehumidification system requires a field-supplied and installed space relative humidity control device. This device may be a separate humidistat control (contact closes on rise in space RH above control setpoint) or a combination thermostat-humidistat control device with isolated contact set for dehumidification control.

NOTE: Use of a humidistat device is not permitted on 48LC units equipped with RTU Open control; these units require use of a field-supplied RH sensor (33ZCSENSRH-02 or 33ZHCSENDRH-02), or a ZS series sensor with humidity sensing. SystemVu™ controls requires a Space Humidistat (HL38MG029) or a Wall Mount Space Humidity Sensor (33ZCSENSRH-01) or a Duct Mount Humidity Sensor (33ZCSENDRH-01).

To connect the Carrier humidistat (HL38MG029):

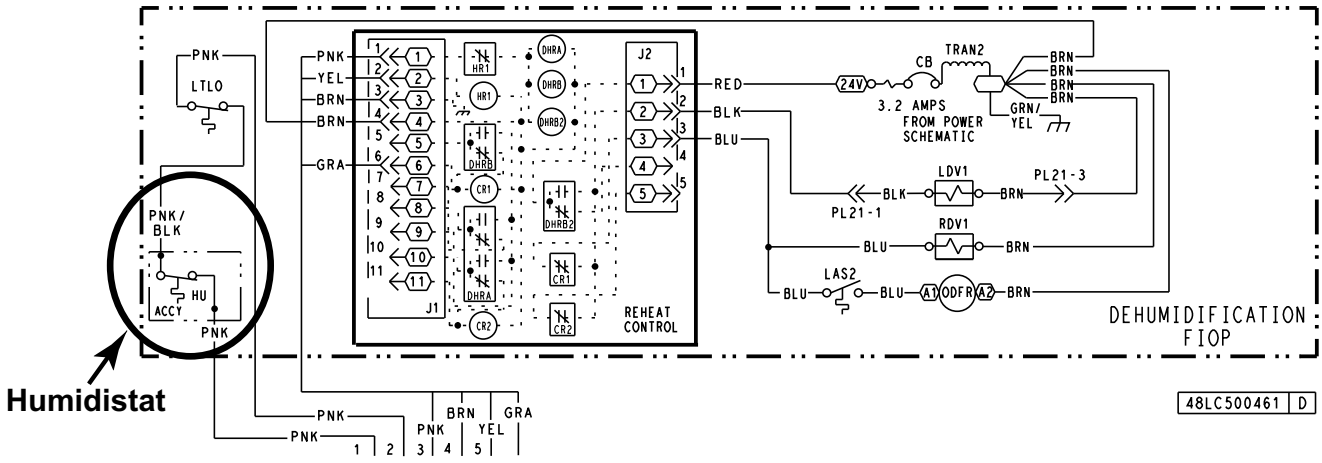
1. Route the humidistat 2-conductor cable (field-supplied) through the bushing in the unit's louvered end panel (see Fig. 50).
2. Route the cable through the snap-in wire tie and up to the web bushing near the control box.
3. Feed the cable through the bushing and into the bottom left side of the control 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 (see Fig. 50).
5. Use wire nuts to connect humidistat cable to the leads in the low–voltage wiring (as shown in Fig. 52), connecting PNK to PNK and PNK/BLK to PNK/BLK.



C09295

Fig. 51 - Accessory Field-Installed Humidistat

NOTE: 48LC**08/09/12 units require a 3-stage cooling thermostat device and are not compatible with Carrier's Edge® Pro thermidistat.



a48–9329

Fig. 52 - Typical Humidi-MiZer Adaptive Dehumidification System Humidistat Wiring

RTU Open Controller (Factory-Installed Option)

For details on operating 48LC**08/09/12 units equipped with the factory-installed RTU Open option refer to *48/50LC 07-26 Factory Installed Option RTU Open Multi-Protocol Controller Controls, Start-up, Operation and Troubleshooting*.

SystemVu™ Controller (Factory-Installed Option)

For details on operating 48LC**08/09/12 units equipped with the factory-installed SystemVu control option refer → to *48/50LC 04-26 Single Package Rooftop Units with SystemVu Controls Version 2.X Controls, Start-up, Operation and Troubleshooting* manual.

Integrated Staging Control (ISC) Board

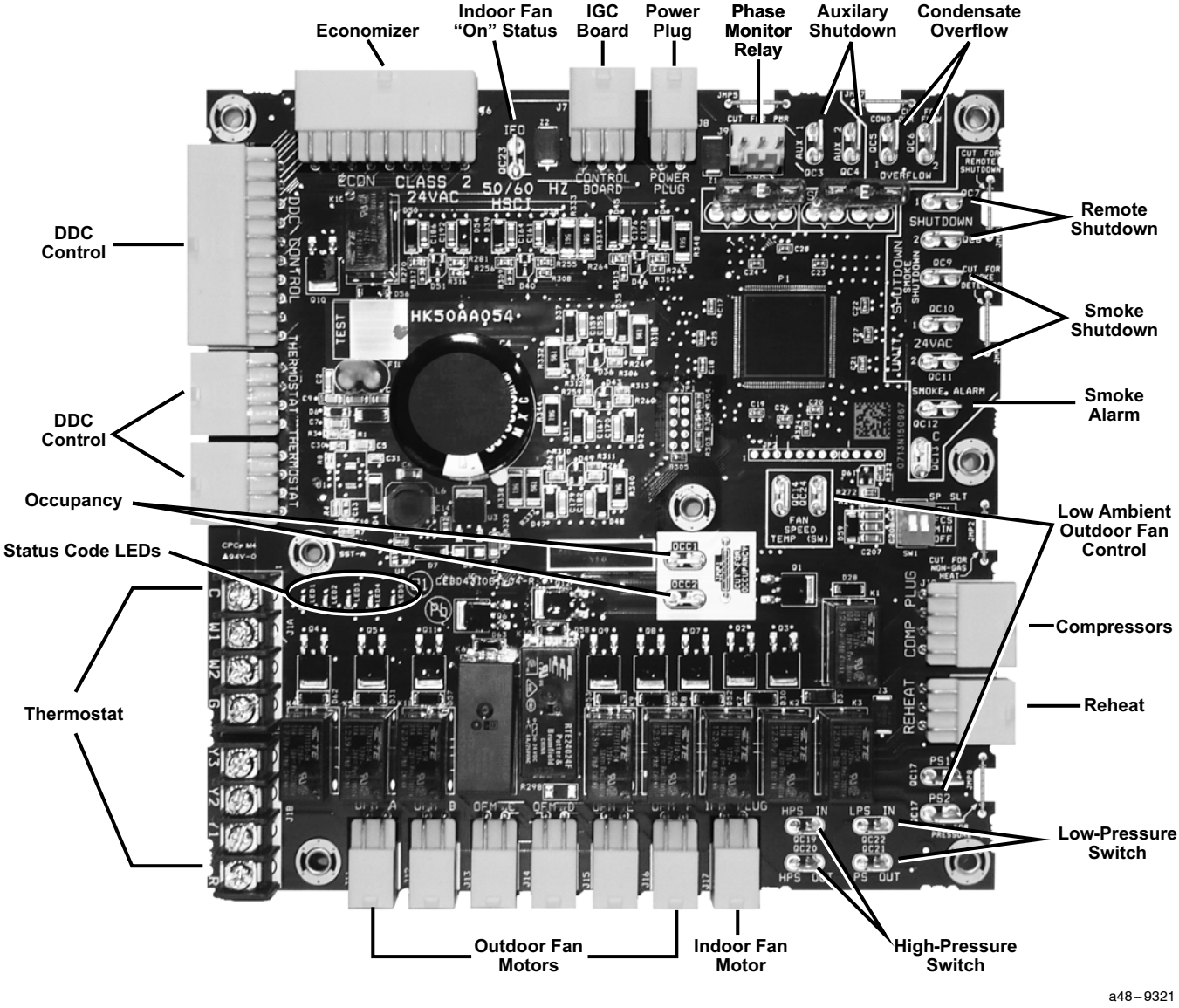


Fig. 53 - Integrated Staging Control (ISC) Board

ISC Board - Sequence of Operation

General —

The Carrier Integrated Staging Control (ISC) is intended for use with a standard thermostat or direct digital controls (DDC) capable of three cooling stages. After initial power to the board, a Green LED will blink with a 1 second duty cycle indicating the unit is running properly. In the event of the ISC board failing, the Green LED will be OFF or continuously ON. When the unit is not running properly, the Green LED will blink along with Red LED lights. The Red LED light configuration will indicate the type of error the board has identified. See Fig. 53 for LED locations and Table 7 for a list of status codes.

The ISC board can be remotely shutdown by removing Jumper 4 and wiring to the Remote Shutdown terminal. The Smoke Control Module can shutdown the unit by removing Jumper 3 and wiring to the Smoke Shutdown terminal. The Smoke Alarm terminal on the ISC Board provides a pass thru connection should a smoke alarm signal be connected. In the case of the RTU Open option, the RTU Open controller provides the signal which is passed thru the ISC board to the Smoke Alarm terminal.

The crankcase heater will run at all times except when the compressors are running. An auxiliary power supply (24Vac) available at TB-4 Terminal is provided to power auxiliary equipment. An optional Phase Monitor Relay can be wired to the PMR terminal by removing Jumper 5. An optional Condensate Flow Switch can be wired to the COFS Terminal by removing Jumper 7.

Ventilation —

In the Ventilation/Fan Mode (G on the thermostat), the indoor-fan will run at low speed and the damper will operate at minimum position.

Table 7 – Status Code Descriptions for ISC Board LEDs

ERROR#	ERROR NAME	LED INDICATION				
		LED01	LED02	LED03	LED04	LED05
1	Check Smoke Detector/PMR/AUX		RED	Blinking Green LED (Note 1)		
2	Check HPS/LPS/COFS	RED	RED			
3	Call for Y3 with no call for Y1. Check Y1 wiring.				RED	
4	Call for Y3 with no call for Y1/Y2. Check Y1 wiring.				RED	RED
5	Call for Y2 with no call for Y1. Check Y1 wiring.		RED		RED	
6	Call for W2 with no call for W1. Check W1 wiring.	RED				RED
7	Call for heat (W1/W2) and cooling (Y1/Y2/Y3). Check thermostat wiring.	RED	RED		RED	RED
8	Call for heat (W1/W2) with no IFM. Check G wiring.		RED		RED	RED
9	Call for cooling (Y1/Y2/Y3) with no G. Check G wiring	RED	RED		RED	
10	Call for heat (W1/W2) and cooling (Y1/Y2/Y3) with no G. Check thermostat and G wiring.	RED	RED			RED
11	Check ISC Board and the thermostat wiring	RED			RED	RED
12	Call for Economizer Y1 Feedback (ECON) from economizer with no call for Y1 from thermostat. Check thermostat and economizer wiring.	RED				
13	Check ISC Board and the thermostat wiring	RED			RED	
14	Check ISC Board and the thermostat wiring					RED
15	Check ISC Board and the thermostat wiring		RED			RED

NOTES: 1. Green LED Blinking at 1HZ indicates normal operation.
2. Solid red LED indicates an error exists, see above LED configuration.

Cooling —

In the Cooling Mode, the small and large compressors will be sequenced to maintain the thermostat temperature setpoint. The chart below shows the cooling operation based on the following conditions.

INPUT	OUTPUT			
Thermostat	Compressor C1	Compressor C2	Indoor Fan Speed	Outdoor Fan Speed
First Stage Cooling (Y1)	On	Off	Low	Low (700 rpm)
Second Stage Cooling (Y2)	Off	On	Medium	Medium (800 rpm)
Third Stage Cooling (Y3)	On	On	High	High (1000 rpm)

The outdoor fan and VFD controlled indoor-fan will operate at low, medium and high speed. The RPM is factory set by the CFM and static pressure requirements for the unit installed.

Humidi-MiZer® System (Optional) —

In the Dehumidification Mode, both compressors will run and Indoor airflow will be rise to High Speed.

At subcooler reheating mode (reheat-1), during part load conditions when the room temperature and humidity are above the set point, the unit initiates the sub-cooling mode of operation; a call for cooling and dehumidification. RDV (Reheat Discharge Valve) and TWV (Three Way Valve) close; Indoor and Outdoor airflow will rise until reaching 100% of Speed.

At hot-gas-bypass reheating mode (reheat-2), when there is a call for dehumidification without a call for cooling, a portion of the hot gas from the compressor bypasses the condenser coil when RDV opens and hot gas is fed into the liquid line, TWV closes in this mode and the system provides mainly latent cooling. Indoor airflow will rise until reaching 100% of Speed, Outdoor airflow will run at High speed as long as outdoor temperature is above 80°F (26.7°C); when operating in this mode below 80°F (26.7°C) OAT, the system outdoor fan will operate as shown in the table below based on Size:

LC Size	RPM	Number of Fans On	Number of Fans Off
08	160	2	1
09	160	2	1
12	160	2	1

Economizer (Optional) —

When the economizer is in Free Cooling Mode and a demand for cooling exists (Y1 on the thermostat), the economizer will modulate the outdoor-air damper to provide a 50°F (10°C) to 55°F (13°C) mixed-air temperature into the zone and run the indoor-fan at high speed. As mixed-air temperature fluctuates above 55°F (13°C) or below 50°F (10°C) dampers will be modulated (open or close) to bring the mixed-air temperature back within control. Upon more call for cooling (Y2 on the thermostat), the outdoor-air damper will maintain its current position, compressor C1 will run and the outdoor-fan will run at low speed. If there is further demand for cooling, the outdoor-air damper will maintain its current position, compressor C2 will run and the outdoor-fan will run at medium speed. The VFD controlled indoor-fan will operate at high speed regardless of the cooling demand.

If the increase in cooling capacity causes the mixed-air temperature to drop below 45°F (7°C), the outdoor-air damper will return to the minimum position. If the mixed-air temperature continues to fall, the outdoor-air damper will close. Control returns to normal once the mixed-air temperature rises above 48°F (9°C). The power exhaust fans will be energized and de-energized, if installed, as the outdoor-air damper opens and closes.

In field-installed accessory CO_2 sensors are connected to the Economizer, a demand controlled ventilation strategy will begin to operate. As the CO_2 level in the zone increases above the CO_2 set-point, the minimum position of the damper will be increased proportionally. As the CO_2 level decreases because of the increase of fresh air, the outdoor-air damper will be proportionally closed. For economizer operation, there must be a thermostat call for the fan (G). If the unit is occupied and the fan is on, the damper will operate at minimum position. Otherwise, the damper will be closed.

Low Ambient Cooling Operation Down to 40°F (4°C) —

In Low Ambient RTU conditions when the temperature is between 55°F (13°C) and 40°F (4°C), the Low Ambient Switch (LAS) will be active and the outdoor fans will run to the pre-set factory outdoor-fan speed. When the temperature is greater than 65°F (18°C), the Low Ambient Switch will deactivate and the outdoor fans will run in the standard cooling mode. If the Outdoor Fan Select Switch (see Fig. 54) is in the ON position, the outdoor fans will run in the Fan Cycle Speed Mode (FCS) set to 250 rpm. If the Outdoor Fan Select Switch is in the OFF position, the outdoor fans will run in the Minimum Fan Speed Mode (MIN) set to 160 rpm regardless of the cooling demand.

LC Size 08 through 12 units have a SPDT Low Ambient Switch wired to the OF terminal and the Outdoor Fan Relay (see Fig. 55). The jumper across the PS terminal will be removed. When the LAS is active, the switch will close making contact to the OF terminal and will drop connection to the ODF Relay. When electrical connection is removed from the ODF Relay, the PS connection will be opened. This will place the third outdoor-fan electrically isolated from receiving any speed command, which will then turn the motor off. This is done for units that only require two outdoor fans to run at the same pre-set factory Low Ambient Speed.

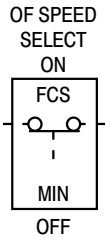


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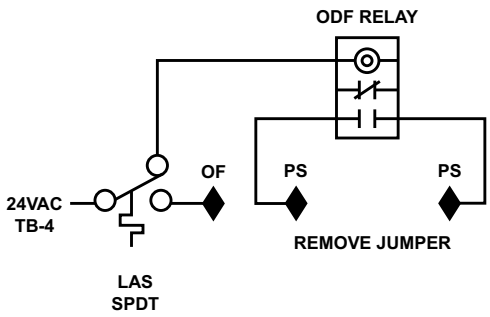
Fig. 54 - Outdoor Fan Speed Select Switch



C13703

Fig. 55 - Schematic of SPDT Low Ambient Switch

The Low Ambient Temperature Outdoor Fan Control Table (below) shows the operation of the outdoor fan for size 08, 09 and 12 units.

Table 8 – Low Ambient Temperature Outdoor Fan Control

LC Size	No. of Fans On	No. of Fans Off	Switch	Outdoor Fan Select Switch	RPM
08	2	1	(1) SPDT	Down	160
09	2	1	(1) SPDT	Down	160
12	2	1	(1) SPDT	Down	160

Heating —

In the Heating Mode (W1 and G on the thermostat), the ISC board sends power to W on the IGC board. Assuming the unit is controlled through a room thermostat set for fan auto, the indoor-fan motor will energize and the outdoor-air dampers will open to their minimum position. The ISC board upon seeing W1 and G ON will turn the indoor fan to high speed.

The IGC board starts its gas ignition process. A check is made to ensure that the rollout switch and limit switch are closed. If the check was successful, the induced draft motor is energized, and when its speed is satisfactory, as proven by the flue gas pressure switch, the ignition activation period begins. The burners will ignite within 5 seconds. If the burners do not light, there is a 22-second delay before another 5-second attempt. This sequence is repeated for 15 minutes or until the burners light. If, after the 15 minutes, the burners still have not lit, heating is locked out. To reset the control, break 24VAC power to the thermostat.

When gas ignition occurs, the IGC board will continue to monitor the condition of the rollout switch, the limit switches, the flue gas pressure switch, as well as the flame sensor.

When W1 is turned OFF, the IGC board turns off the gas valve. The IGC board has a delay time before it turns IFO=OFF. At this time, the ISC board sees W1=OFF and IFO=ON. The ISC will keep the indoor fan ON high speed. Once the IGC board delay times out, the ISC board will see W1=OFF and IFO=OFF, which then turns the indoor fan OFF.

If the call for W1 lasted less than 1 minute, the heating cycle will not terminate until 1 minute after W1 became active. If the unit is controlled through a room thermostat set for fan auto, the indoor fan motor will continue to operate for an additional 45 seconds then stop. If the over temperature limit opens after the indoor motor is stopped, but within 10 minutes of W1 becoming inactive, on the next cycle the time will be extended by 15 seconds. The maximum delay is 3 minutes. Once modified, the fan OFF delay will not change back to 45 seconds unless power is reset to the control. A LED indicator is provided on the IGC to monitor operation.

When additional heat is required, W2 closes and initiates power to the second stage of the main gas valve. When the thermostat is satisfied, the gas valve closes, interrupting the flow of gas to the main burners.

EconoMi$er® X (Factory-Installed Option)

EconoMi$er X is an economizer system which is available for 48LC 08-12 units.

The factory-installed option consists of:

- Either a Low leak or a Standard leak economizer damper assembly
- Direct-drive damper actuator with local equipment bus communications
- W7220 economizer controller with keypad and display
- Supply Air Temperature sensor (20K ohm)
- Outdoor changeover condition sensor (either 20K ohm dry-bulb or enthalpy sensor)

Unit Installation —

All damper hardware and standard economizer control components except the enthalpy sensor are factory-mounted in their operating location. Complete the unit installation by relocating the enthalpy sensor (when provided; see below), then assembling and mounting the unit's outside air hood. Refer to the base unit's installation instruction manual for directions on locating the hood parts package and assembling the hood with filters.

Enthalpy Sensor Relocation —

See Fig. 64 for view of the enthalpy sensor. Locate the enthalpy sensor on the side of the economizer housing; remove mounting screws and save screws. Confirm the DIP switches are set at OFF, OFF, OFF (see Table 16). Move the enthalpy sensor to the front face of the economizer housing and mount per label.

W7220 Economizer Controller

The economizer controller used on electro mechanical units is the Honeywell W7220.

The W7220 provides typical economizer functions, including:

- Management of outside air damper for base unit Occupied (damper open and modulating) and unit OFF or Unoccupied status (damper closed)
- Free-cooling using all outside air when outdoor conditions permit Integrated cooling operation using outside air and mechanical cooling when required
- Demand Controlled Ventilation (DCV) for modulating ventilation airflow according to space CO_2 level (requires factory-option or field-installed CO_2 sensor)

The W7220 control also includes a new capability that will adjust the damper control points during DCV or minimum ventilation operation as the indoor fan speed is changed. This control function ensures that required space ventilation airflow quantities are maintained during reduced fan speed operation.

Additional control capabilities include automatic detection of new sensors and detection of sensor failure or loss of communication.

The W7220 control module includes an integral user interface with keypad and LCD display that permits direct input of setpoint values and configurations and display of status and alarms.

The W7220 controller is located in the RTU base unit's Control Box. See the Installation Instructions for this base unit for the location of the Control Box access panel.

User Interface —

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

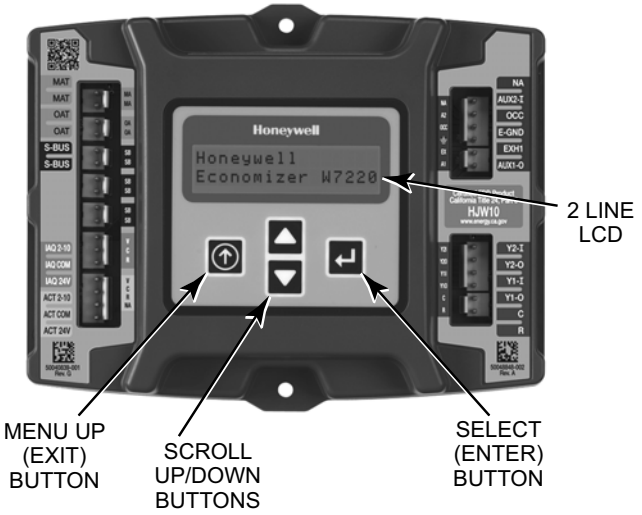


Fig. 56 - W7220 Controller

Keypad

The four navigation buttons (see Fig. 56) are used to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

Using the Keypad with Menus

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.
- Press the ⓘ (Menu Up/Exit) button to exit a menu's item and return to the list of menus.

The Menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

Using the Keypad with Settings and Parameters

To use the keypad when working with Setpoints, 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

IMPORTANT: Table 9 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear.

The menu hierarchy has been modified to reflect controller configuration for 2-speed indoor fan application in the Staged Air Volume option.

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.

Table 9 – Menu Structure*

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
STATUS	ECON AVAIL	NO	YES/NO	ECONOMIZING AVAILABLE YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	ECONOMIZING ACTIVE YES = Outside air being used for Cooling Stage 1. NO = Economizing not active
	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 (Not available on 2–Speed configuration)
	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 ON = 24 Vac on terminal Y1–O; Stage 1 mechanical cooling called on OFF = 0 Vac on terminal Y1–O; no mechanical cooling
	COOL Y2–IN	OFF	ON/OFF	SECOND STAGE COOLING DEMAND (Y2–IN) Y2–I signal from space thermostat or unitary controller for Cooling Stage 2. 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 ON = 24 Vac on terminal Y2–O; Stage 2 mechanical cooling called on OFF = 0 Vac on terminal Y2–O; no Stage 2 mechanical cooling
	MA TEMP	nn°F (or °C)	0 to 140°F (–18 to 60°C)	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed/cooled air from SAT sensor in fan section. Displays ––.– if not connected, short or out–of–range. See Menu Note 2
	DA TEMP	nn°F (or °C)	0 to 140°F (–18 to 60°C)	DISCHARGE AIR TEMPERATURE, after Heating section (Accessory sensor required) Displays when Discharge Air sensor is connected and displays measured discharge temperature. Displays –– –– –– if sensor sends invalid value, if not connected, short or out–of–range.
	OA TEMP	nn°F (or °C)	–40 to 140°F (–40 to 60°C)	OUTSIDE AIR TEMPERATURE Displays measured value of outdoor air temperature. Displays –– –– –– if sensor sends invalid value, if not connected, short or out–of–range.
	OA HUM	nn%	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA enthalpy sensor.

Table 9 - Menu Structure* (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
STATUS (cont)	RA TEMP	nn°F (or °C)	0 to 140°F (−18 to 60°C)	RETURN AIR TEMPERATURE (Accessory sensor required) Displays measured value of return air temperature from RAT sensor.
	RA HUM	nn%	0 to 100%	RETURN AIR RELATIVE HUMIDITY (Accessory enthalpy sensor required) Displays measured value of return air humidity from RA sensor.
	IN CO2	___ppm	0 to 2000 ppm	SPACE/RETURN AIR CO2 (CO_2 sensor required, accessory or factory option) Displays value of measured CO_2 from CO_2 sensor. Invalid if not connected, short or out−of−range
	DCV STATUS	n/a	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS (CO_2 sensor required, accessory or factory option) Displays ON if IN CO^2 value above setpoint DCV SET and OFF if below setpoint DCV SET.
	DAMPER OUT	2.0V	2.0 to 10.0V	Displays voltage output to the damper actuator. 0% = OSA Damper fully closed 100% = OSA Damper full open
	ACT POS	nn%	0 to 100%	Displays actual position of outdoor air damper actuator 2.0V = OSA Damper fully−closed 10.0V = OSA Damper full open
	ACT COUNT	n/a	1 to 65535	Displays number of times actuator has cycled. 1 Cycle equals accrued 180° 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 ON = relay closed OFF = relay open
	MECH COOL ON	0	0, 1, or 2	Displays stage of mechanical cooling 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 9 - Menu Structure* (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
SETPOINTS	MAT SET	53°F (12°C)	38 to 65°F; (3 to 18°C) increment by 1	SUPPLY AIR SETPOINT Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature. See Menu Note 2.
	LOW T LOCK	32°F (0°C)	−45 to 80°F; (−43 to 27°C) increment by 1	COMPRESSOR LOW TEMPERATURE LOCKOUT Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on.
	DRYBLB SET	63°F (17°C)	48 to 80°F (9 to 27°C) increment by 1	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.: at 63°F (17°C), unit will economize at 62°F (16.7°C) and below and not economize at 64°F (17.8°C) and above. There is a 2°F (1.1°C)deadband. See Menu Note 3
	ENTH CURVE	ES3	ES1, ES2, ES3, ES4, or ES5	ENTHALPY CHANGEOVER CURVE (Requires enthalpy sensor option) Enthalpy boundary “curves” for economizing using single enthalpy.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION SETPOINT Displays only if CO_2 sensor is connected. Setpoint for Demand Controlled Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS L	6.0 V	2 to 10 Vdc	VENTILATION MINIMUM POSITION AT LOW SPEED Displays ONLY if a CO_2 sensor is NOT connected.
	MIN POS H	4.4 V	2 to 10 Vdc	VENTILATION MINIMUM POSITION AT HIGH SPEED Displays ONLY if a CO_2 sensor is NOT connected.
	VENTMAX L	6.0 V	2 to 10 Vdc	DCV MAXIMUM DAMPER POSITION AT LOW SPEED (Requires CO_2 sensor connected)
	VENTMAX H	4.4 V	2 to 10 Vdc	DCV MAXIMUM DAMPER POSITION AT HIGH SPEED (Requires CO_2 sensor connected)
	VENTMIN L	3.7 V	2 to 10 Vdc	DCV MINIMUM DAMPER POSITION AT LOW SPEED (Requires CO_2 sensor connected)
	VENTMIN H	2.8 V	2 to 10 Vdc	DCV MINIMUM DAMPER POSITION AT HIGH SPEED (Requires CO_2 sensor connected)
	EXH1 L SET	65%	0 to 100%; Increment by 1	EXHAUST FAN STAGE 1 SETPOINT AT LOW SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer
	EXH1 H SET	50%	0 to 100%; Increment by 1	EXHAUST FAN STAGE 1 SETPOINT AT HIGH SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer
	EXH2 L SET	80%	0 to 100%; Increment by 1	EXHAUST FAN STAGE 2 SETPOINT AT LOW SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer. Only used when AUX1−O is set to EHX2.
	EXH2 H SET	75%	0 to 100%; Increment by 1	EXHAUST FAN STAGE 2 SETPOINT AT HIGH SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer. Only used when AUX1−O is set to EHX2.

Table 9 - Menu Structure* (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
SYSTEM SETUP	INSTALL	01/01/10		Display order = MM/DD/YY Setting order = DD, MM, then YY.
	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. Not available with 2−speed See Menu Note 4
	AUX2 I	W	W required for 2−speed mode	W = Informs controller that system is in heating mode. SD = Enables configuration of shutdown (not available on 2−Speed) See Menu Note 4
	FAN TYPE	2speed	2speed required	Sets the economizer controller for operation of 1 speed or 2 speed indoor fan system. See Menu Note 4.
	FAN CFM	5000cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter ONLY if using DCVCAL ENA = AUTO The value is found in the Project Submittal documents for the specific RTU.
	AUX OUT	NONE	NONE EXH2 SYS	Select OUTPUT for AUX1 O relay NONE = not configured (output is not used) 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 to the OCC terminal. RTU control circuit provides 24−Vac to OCC through OCCUPIED terminals on Integrated Staging Control. Board
	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. **RECHECK AUX2 I and FANTYPE for required 2−speed values.**
ADVANCED SETUP	MA LO SET	45°F (7°C)	35 to 55°F; (2 to 12°C) Incremented by 1°	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 CLO = closed MIN = MIN POS or VENTMAX
	CO2 ZERO	0ppm	0 to 500 ppm: Increment by 10	CO_2 ppm level to match CO_2 Sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 50	CO_2 ppm span to match CO_2 sensor.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 h or OFF	COOLING STAGE 3 DELAY Delay after stage 2 for cool has been active. Turns on 2nd stage of cooling when economizer is 1st stage and mechanical cooling is 2nd
	SD DMPR POS	CLO	CLO or OPN	Function NOT AVAILABLE with 2−speed mode
	DCVCAL ENA	MAN	MAN (manual)	Turns on the DCV automatic control of the dampers. Resets ventilation.
	MATTCAL	0.0°F (or C)	+/−2.5°F (+/−1.4°C)	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration supply air temperature (SAT) sensor
	OA T CAL	1.0°F (or C)	+/−2.5°F (+/−1.4°C)	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration outside air temperature (OAT) sensor
	OA H CAL	0% RH	+/−10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of outside air enthalpy sensor
	RA T CAL	2.0°F (or C)	+/−2.5°F (+/−1.4°C)	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration return air temperature (RA) sensor
	RA H CAL	0% RH	+/−10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of calibration return air enthalpy sensor
	DA T CAL	0.0°F (or C)	+/−2.5°F (+/−1.4°C)	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration discharge air temperature (DAT) sensor
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON 2nd STAGE ECONOMIZING While in the Economizing mode, this is the delay between thermostat Y2 call and Y1−O output to mechanical cooling stage, to allow high speed fan operation to attempt to cool space first.

Table 9 - Menu Structure* (cont)

Menu	Parameter	Parameter Default Value	Parameter Range and Increment †	EXPANDED PARAMETER NAME Notes
CHECKOUT	DAMPER VMIN .HS	n/a	n/a	Positions OA damper to VMIN High Speed position
	DAMPER VMAX .HS	n/a	n/a	Positions OA damper to VMAX High Speed position
	DAMPER OPEN	n/a	n/a	Positions OA damper to the full open position.
	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 AUX1O	n/a	n/a	Energizes the AUX1O output. If Aux setting is: • NONE – not action taken • ERV – 24 Vac out. Turns on or signals an ERV that the conditions are not good for economizing but are good for ERV operation. †† • SYS – 24 Vac out. Issues a system alarm
ALARMS(_)				Alarms display only when they are active. The menu title "ALARMS(_)" includes the number of active alarms in parenthesis ( ).
	MA T SENS ERR	n/a	n/a	SUPPLY AIR TEMPERATURE SENSOR ERROR
	CO2 SENS ERR	n/a	n/a	CO2 SENSOR ERROR
	OA T SENS ERR	n/a	n/a	OUTSIDE AIR TEMPERATURE SENSOR ERROR OAT sensor connected at input terminals OAT
	OA SYLK SENS ERR	n/a	n/a	OUTSIDE AIR TEMPERATURE SENSOR ERROR OAT sensor connected on S– bus
	DA T SENS ERR	n/a	n/a	DISCHARGE AIR TEMPERATURE SENSOR ERROR
	SYS ALARM	n/a	n/a	When AUX is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX terminal has 24 Vac out.
	ACT UNDER V	n/a	n/a	ACTUATOR VOLTAGE LOW Voltage received at actuator is below expected range
	ACT OVER V	n/a	n/a	ACTUATOR VOLTAGE HIGH Voltage received at actuator is above expected range
	ACT STALLED	n/a	n/a	ACTUATOR STALLED Actuator stopped before reaching commanded position

* Table 9 illustrates the complete hierarchy, your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) 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 setpoint in the setpoint menu.

Menu Notes

1. ***STATUS –> OCCUPIED –*** The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at ISC terminal G. This signal passes through the Integrated Staging Control Board's OCCUPIED jumper JMP1 to the ECONO connector and to the W7220's OCC input terminal. An external timeclock 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 TYPE = 2SPEED

Connections and Applications

W7220 Economizer Module Wiring —

Use Fig. 57 and Tables 10 and 11 to locate the wiring terminals for the Economizer module.

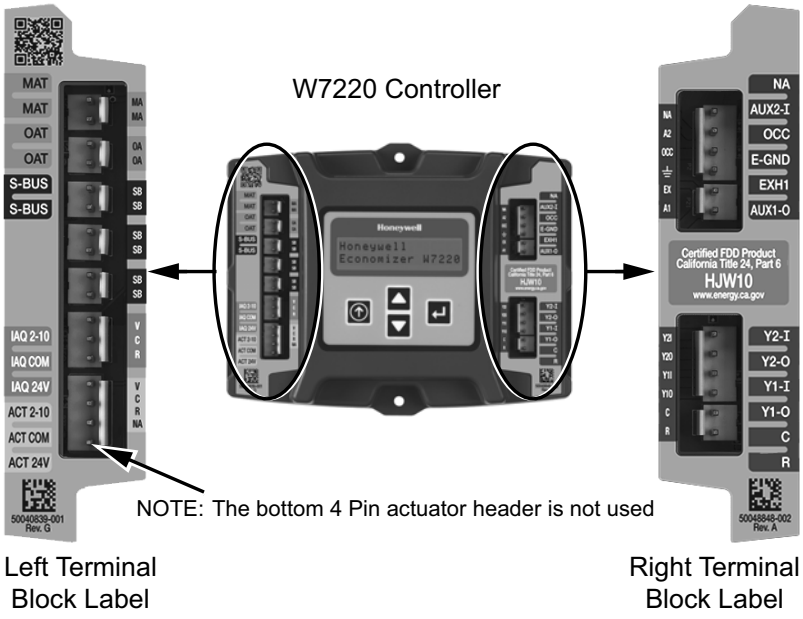


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Fig. 57 - W7220 Economizer Module Terminal Connection Labels

Table 10 – Economizer Module - Left Hand Terminal Blocks

Label	Type	Description
Top Left Terminal Block		
MAT MAT	20k NTC and COM	Supply 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)
Bottom Left Terminal Block		
IAQ 2–10	2–10 Vdc	Air Quality Sensor Input (e.g. CO_2 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 24V	24 Vac	Damper Actuator 24 Vac Source

Table 11 – Economizer Module - Right Hand Terminal Blocks

Label	Type	Description
Top Right Terminal Block		
N/A	n/a	The first terminal is not used
AUX2–I	24 Vac IN	Input from Thermostat W1 indicating base unit is in Heat mode, damper controls to High Fan Speed setpoints
OCC	24 Vac IN	Occupied / Unoccupied Input
E–GND	E–GND	Earth Ground – System Required
EXH1	24 Vac OUT	Exhaust Fan 1 Output
AUX1–O	24 Vac OUT	Programmable: Exhaust fan 2 output or ERV or System Alarm output
Bottom Right Terminal Block		
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)

Refer to Figs 58 and 59 for sensor and controls connections.

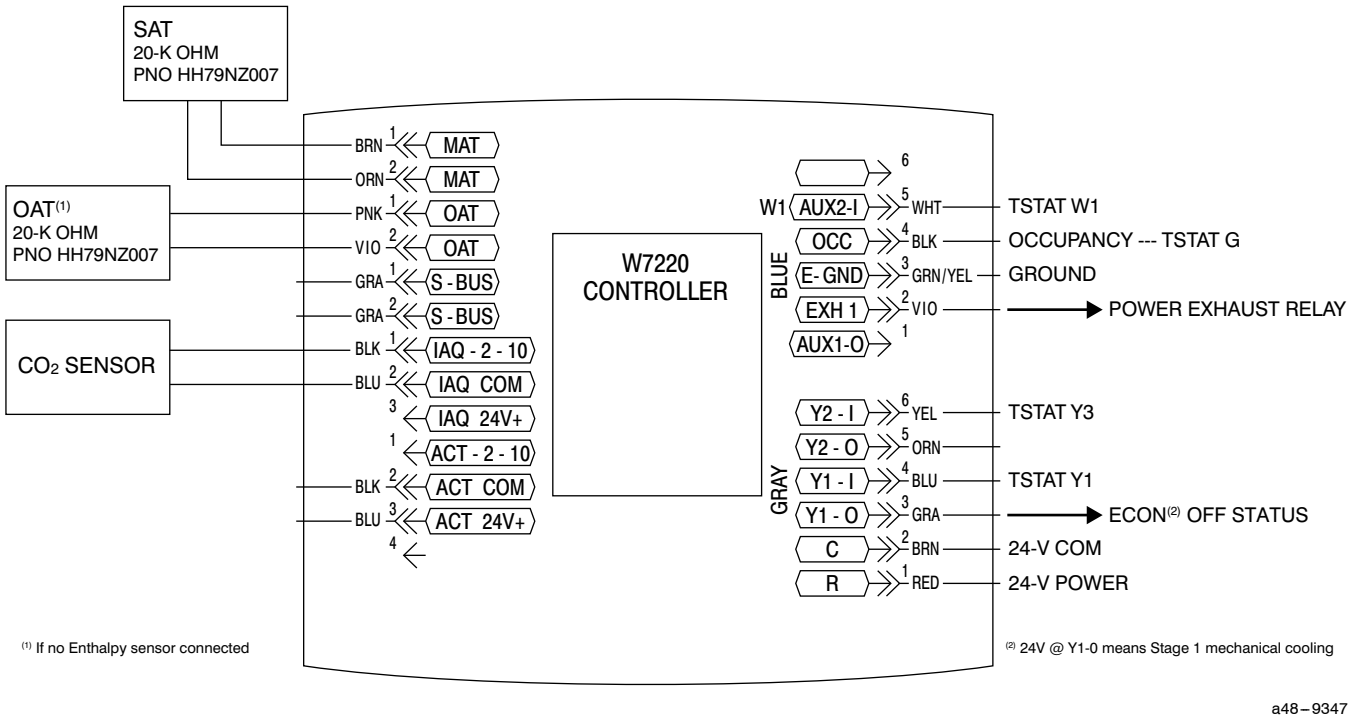


Fig. 58 - W7220 Sensor and Control I/O Connections

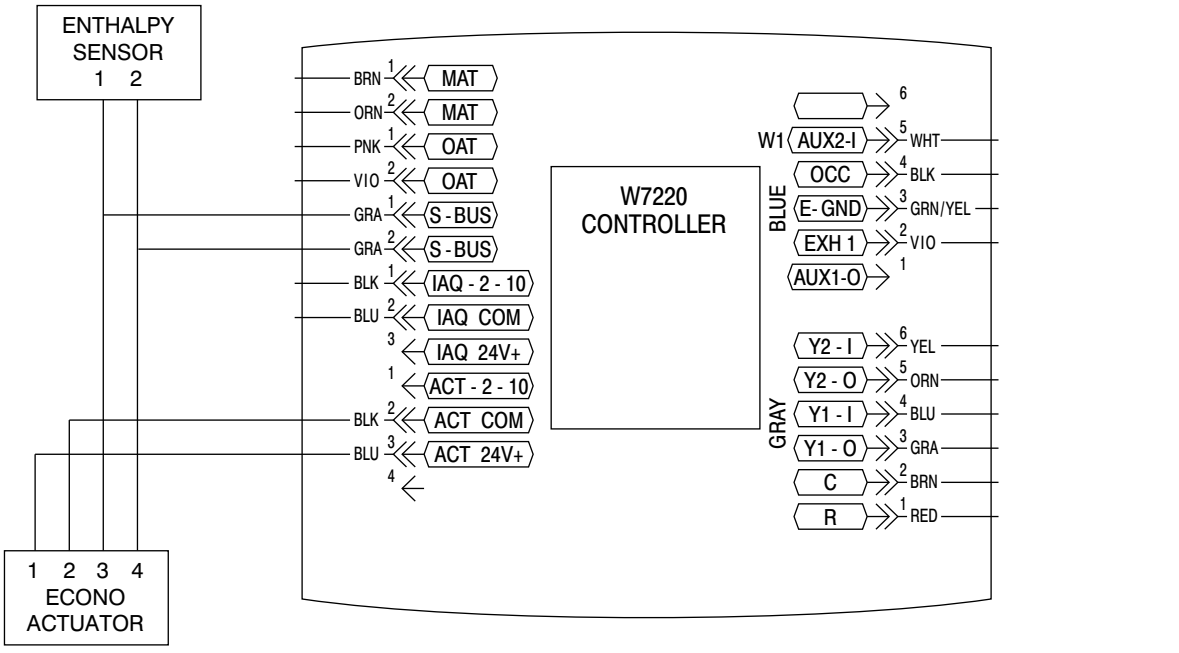


Fig. 59 - Actuator/S-BUS

Economizer Control Configurations

Enthalpy Changeover Control —

Economizer changeover based on outdoor air enthalpy requires an outdoor air enthalpy sensor to replace the OAT sensor. The enthalpy sensor is available as a factory-installed option or as a field-installed accessory (part number HH57AC081). See Fig. 1 for model number nomenclature; check Position #15 for codes N or R indicating a factory-installed enthalpy sensor. Use Fig. 60 and Table 12 to select the enthalpy changeover setting to enter in menu item SETPOINTS -> ENTH CURVE.

Enthalpy Settings —

When the OA temperature, enthalpy and dew point are below the respective setpoints, the Outdoor Air can be used for economizing. Fig. 60 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (setpoints ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 12 for ENTH CURVE setpoint 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.

Fig. 60 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 12 provides the values for each boundary limit.

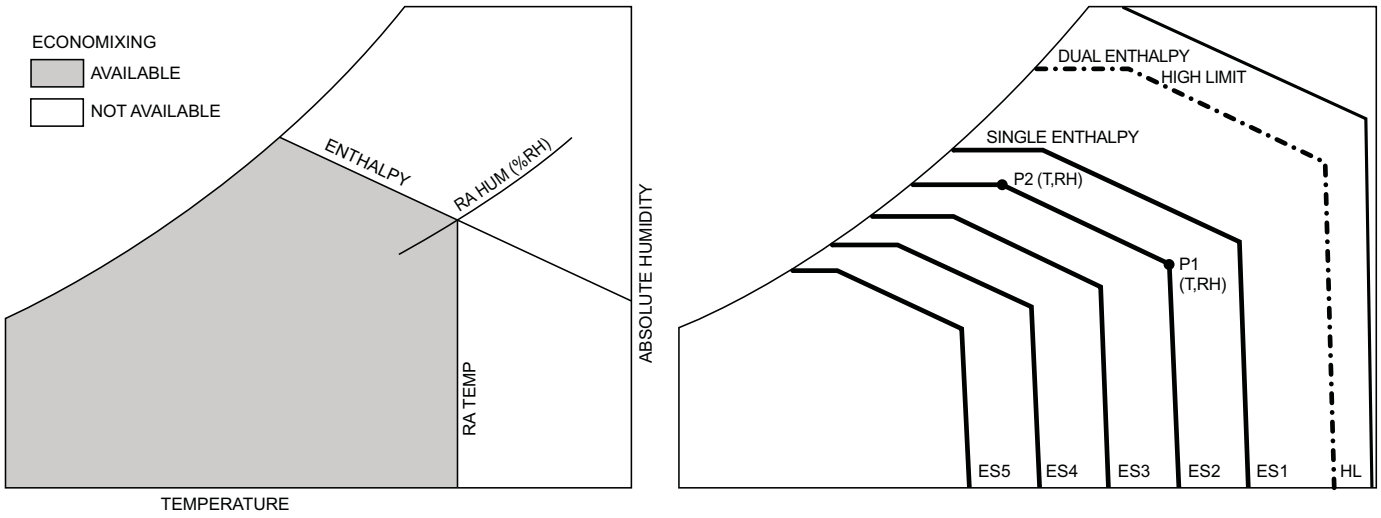


Fig. 60 - Single Enthalpy Curve and Boundaries

Table 12 – Single Enthalpy and Dual Enthalpy High Limit Curves (EN Units)

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	80.0	60.0	28.0	80.0	36.8	66.3	80.1
ES2	75.0	57.0	26.0	75.0	39.6	63.3	80.0
ES3	70.0	54.0	24.0	70.0	42.3	59.7	81.4
ES4	65.0	51.0	22.0	65.0	44.8	55.7	84.2
ES5	60.0	48.0	20.0	60.0	46.9	51.3	88.5
HL	86.0	66.0	32.4	86.0	38.9	72.4	80.3

Demand Controlled Ventilation —

Demand Controlled Ventilation (DCV) function requires a space air CO_2 sensor be connected to the W7220 controller. The CO_2 sensor provides a 2 to 10 vdc signal proportional to the space CO_2 level. This sensor is available as a factory-installed option (located in the unit's return air plenum) or as a field-installed accessory. See Fig. 1 for model number nomenclature; check Position #9 for codes E, F, G or H indicating a factory-installed CO_2 sensor. The W7220 automatically recognizes the connection of this sensor and self-enables the DCV function after the Configuration period.

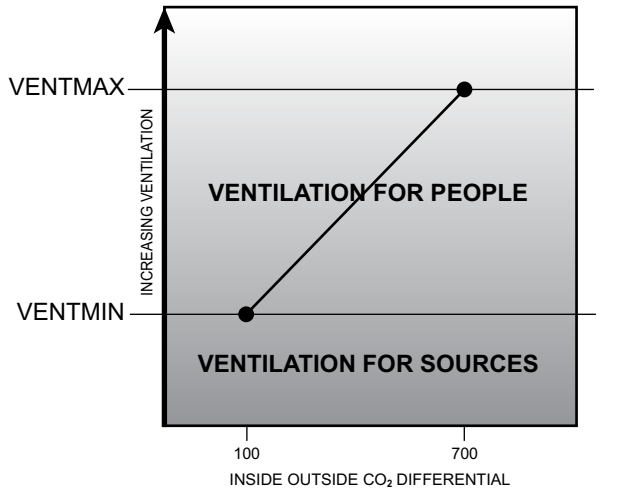


Fig. 61 - DCV Single-Speed System Setpoints

DCV With Single-Speed Fan System: During DCV, the outside air damper modulates between two user configurations depending upon the signal level of the space or return air CO_2 sensor representing the space occupancy level. The lower of these two positions is referred to as the Minimum IAQ Damper Position (designated VENTMIN) while the higher is referred to as Economizer Minimum Position (designated MINIMUM POSITION or VENTMAX). The VENTMIN position should be set to an economizer position that brings in enough fresh air to remove contaminants and CO_2 generated by sources other than people; this airflow rate is designated Va. The VENTMAX should be set to an economizer position that brings in enough fresh air to remove contaminants and CO_2 generated by all sources including people at the design condition for maximum space occupancy; this airflow rate is designated Vbz.

DCV With Two-Speed Fan System: Ventilation codes require that the same ventilation rates (Vbz and Va, expressed as CFM) be provided regardless of supply fan speed. When the supply fan speed is reduced, the internal static pressure in the unit's return plenum also decreases. If the same outside air damper position is retained, the airflow rate through the OA damper decreases below the Va and Vbz levels. To restore ventilation rates to design levels, the damper positions VENTMIN and VENTMAX must be automatically adjusted when the fan speed changes. The W7220 provides this function when it is configured for 2-speed fan operation through a second set of damper position setpoints.

During operation at High fan speed, the damper setpoint limits are designated VENTMIN H and VENTMAX H. Damper operation is same as described under Single-Speed Fan above.

During operation at Low fan speed, the damper setpoint limits change to VENTMIN L and VENTMAX L. These settings are higher than the comparable High speed settings and cause the outside air damper to open more to allow the same Va and Vbz airflow rates to be admitted to the space.

Adjust the DCV setpoints VENTMAX H and VENTMAX L with supply fan speed in High speed and Low speed respectively to provide the design load ventilation airflow rate Vbz by measuring outside air temperature, return air temperature and supply air temperature. Make damper position adjustments with at least 10°F temperature difference between the outdoor and return-air temperatures.

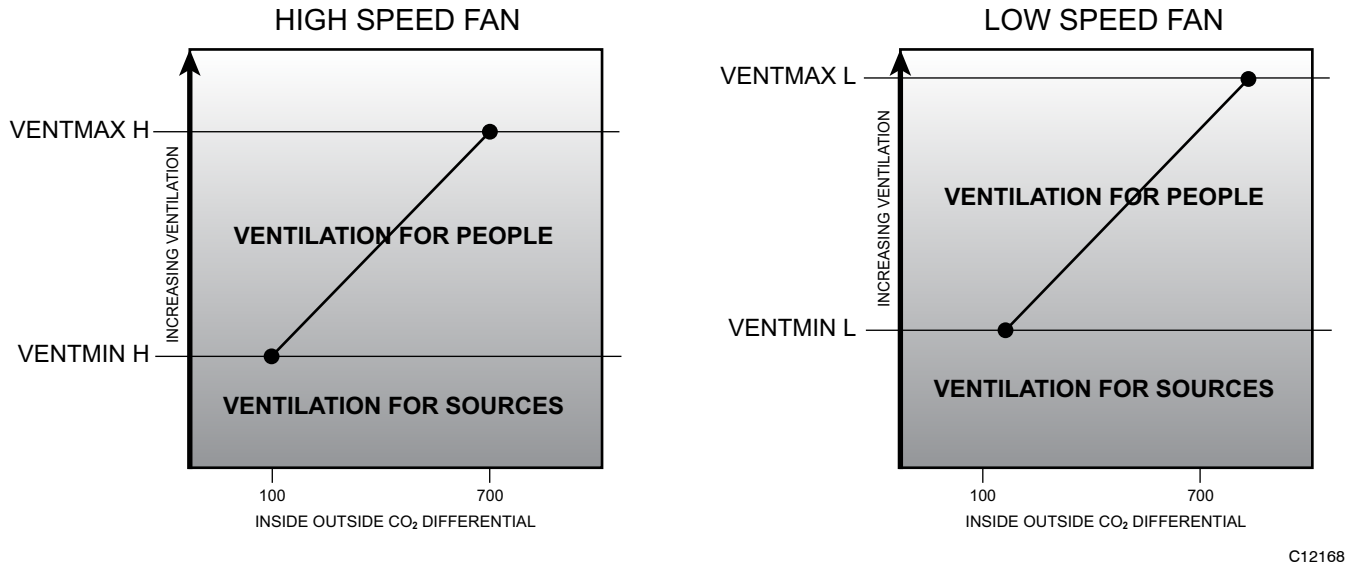


Fig. 62 - DCV 2-Speed System Setpoints — Same Ventilation CFM at Both Speeds

To determine the damper setpoint position, perform the following procedure for each condition setpoint, with mechanical cooling OFF:

Calculate the appropriate supply air temperature using the following formula:

TS = (TO x Vbz/CFM) + TR x (CFM – Vbz)/CFM

TS = Supply Air Temperature
TO = Outdoor Air Temperature
Vbz = Design Maximum Ventilation CFM
CFM= Unit Supply Airflow Rate
TR = Return Air Temperature

As an example:

Unit Airflow Rate at High Speed is 4000 CFM
Ventilation CFM at design occupancy Vbz is 1200 CFM
TO = 60 F
TR = 75 F

Required TS = 60 x (1200/4000) + 75 x (4000 – 1200/4000)
= 60 x 0.30 + 75 x 0.70 = 18.0 + 52.5
= 70.5

At the W7220 keypad, enter the parameter SETUP -> VENTMAX H and adjust the setpoint value until the observed Supply Air Temperature (MA TEMP) reaches 70.5. Press the ↵ "Enter" key to save this setpoint to controller memory.

When determining VENTMIN setpoints, substitute the value for Va in place of Vbz in the formula.

DCV Setpoint: The SETPOINTS parameter DCV SET defines the space CO_2 level above which the DCV mode begins to open the outside air damper beyond its VENTMIN ventilation lower limit. This setpoint should be a minimum of 100 ppm greater than the outdoor ambient CO_2 level to ensure the outside air will be capable of diluting the space CO_2 level. A typical value for outdoor CO_2 is 400 ppm; adjust the setpoint DCV SET to 500 ppm if outdoor CO_2 level is not known. The factory default value for DCV SET is 1100 ppm.

Economizer Occupancy Control —

The 24-v signal that terminates at the W7220's OCC input to place the economizer control in Occupied mode when the supply fan starts is routed through the rooftop unit's Integrated Staging Control Board at its OCCUPANCY jumper. To implement an occupancy control for the economizer operation, connect a contact set at ISC OCCUPANCY quick-connect terminals and cut jumper JMP1. To allow automatic occupancy mode, close the control contacts. To place the economizer in Unoccupied mode, open the control contacts.

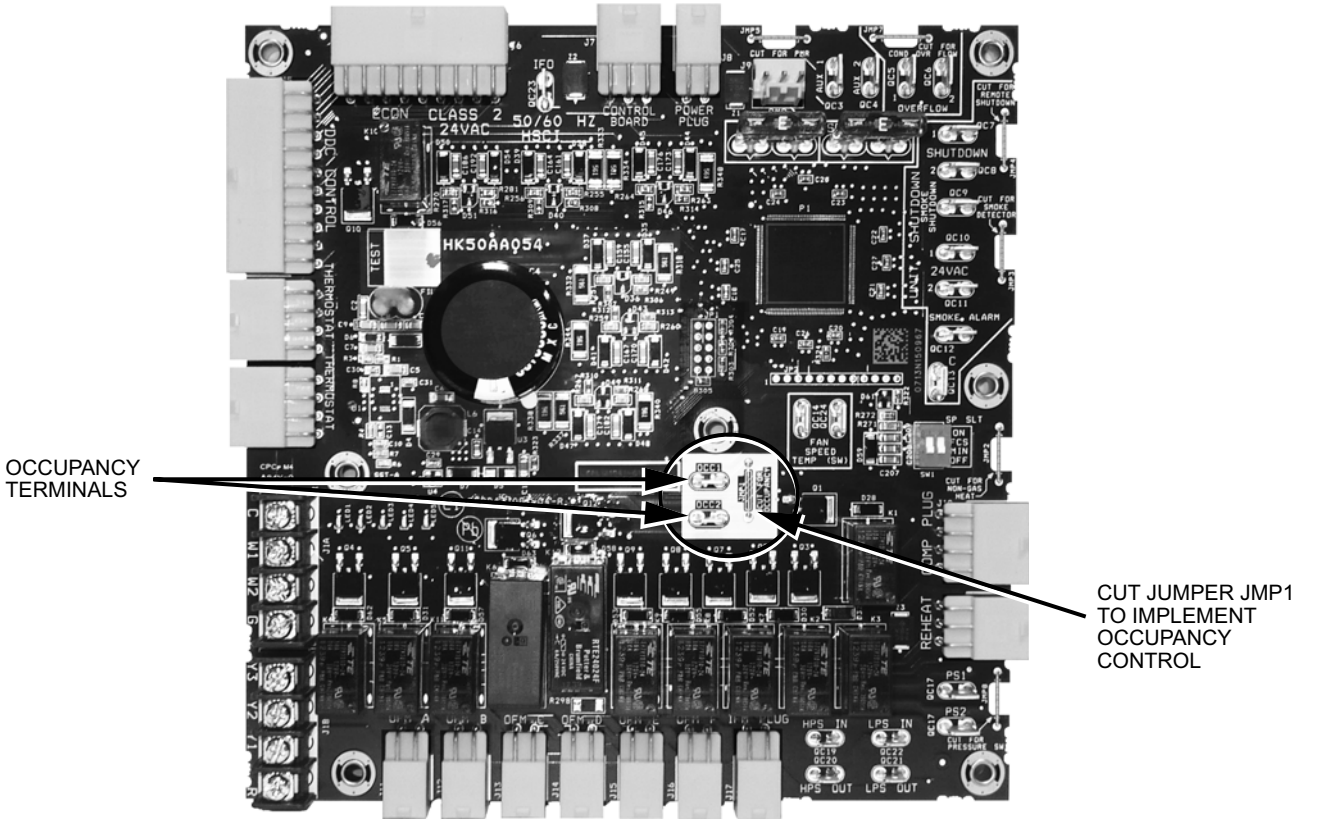


Fig. 63 - Integrated Staging Control (ISC) Board - Occupancy Terminals and Jumper

Hardware

Actuators —

The EconoMi$er® X damper actuators are direct-coupled types with spring-return. Power is 24-v from the W7220 outputs. Range of rotation is 95-degrees; timing for full-range movement is 90 seconds to drive open in normal operation, 30 seconds in Test Mode and 25 seconds for spring return.

These actuators are S-bus enabled. The S-bus is a proprietary local equipment network that connects the W7220 controller, one S-enabled actuator and up to three S-type enthalpy sensors on a two-wire communication network. The S-bus is polarity-insensitive. Devices attached to the S-bus are automatically recognized by the controller.

Actuator command position is defined in a 2-10 vdc value. 2.0-v is outside air damper position fully-closed (0% open); 10.0-v is damper position fully-open (100% open). See Table 13 to correlate control voltage values to outside air damper opening percentage.

Table 13 – Actuator Voltage vs. Damper Position

Vdc	% Open	Vdc	% Open	Vdc	% Open
2.0	0	4.8	35	7.6	70
2.4	5	5.2	40	8.0	75
2.8	10	5.6	45	8.4	80
3.2	15	6.0	50	8.8	85
3.6	20	6.4	55	9.2	90
4.0	25	6.8	60	9.6	95
4.4	30	7.2	65	10.0	100

These units use a 3-Nm (27 lb-in.) torque model, Honeywell Series MS3103K actuator.

Supply Air Temperature Sensor —

The W7220 controller uses a 20-k ohm analog sensor for Supply Air Temperature (SAT). The thermistor is attached to a ring terminal. The ring terminal is attached to the unit's supply fan housing, downstream of the unit's indoor coil. The SAT sensor is connected to the W7220 input terminals marked MAT. See Table 14 for sensor resistance to temperature correlations.

The W7220 controller requires a valid signal from its SAT channel in order to function. If the SAT connection to the W7220 is lost, the W7220 will initiate an alarm condition immediately. No economizing operation will be permitted until this alarm is cleared.

Table 14 – SAT/OAT Sensor Characteristics

Deg C	Ohms
–30	415156
–25	301540
–20	221210
–15	163834
–10	122453
–5	92382
0	70200
5	53806
10	41561
15	32341
20	25346
25	20000
30	15886
35	12698
40	10212
45	8261
50	6720

Deg F	Ohms
–20	386130
0	193070
20	101820
32	70200
40	55420
45	47771
50	41258
55	35725
60	31035
65	27069
70	23719
77	20000
80	18473
100	11544
120	6768

Outside Air Temperature Sensor —

EconoMi$er X systems equipped with outdoor dry bulb temperature changeover control include a 20-k ohm analog sensor to measure Outdoor Air Temperature (OAT). This is the same sensor used for the SAT function; see Table 14 for resistance vs temperature characteristics.

The OAT sensor is attached to the outside air damper frame. It is connected to the W7220's OAT input terminals.

If an accessory enthalpy sensor is added to an EconoMi$er X system with factory dry bulb changeover, disconnect this OAT sensor wiring at the W7220's OAT input terminals.

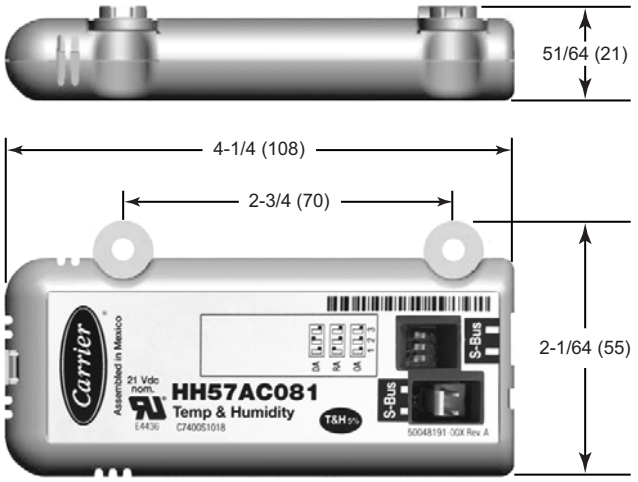
Enthalpy Control Sensor Configuration—

The W7220 economizer control system can accommodate up to three S-bus enthalpy sensors. On EconoMi$er X models with factory-installed Enthalpy Changeover control, one S-bus sensor is provided in the economizer outdoor section. Additional sensors may be added to measure Return Air and Discharge Air conditions.

The Enthalpy Control sensor (Part Number: HH57AC081) communicates with the W7220 Economizer controller on the two-wire local equipment network bus (S-bus) and can either be wired using a two-pin header or using a side connector. This sensor is used for all OAT (Outdoor Air Temperature), RAT (Return Air Temperature) and DAT (Discharge Air Temperature), depending on how its three position DIP switch is set.

Use Fig. 64 and Table 15 to locate the wiring terminals for each Enthalpy Control sensor.

Use Fig. 64 and Table 16 to set the DIP switches for the desired use (location) of the sensor.



NOTE: Dimensions are in inches. Dimensions in ( ) are in mm.

a50–9614

Fig. 64 - Enthalpy Control Sensor, Dimensions and DIP Switch Location

Table 15 – Enthalpy Control Sensor Wiring Terminations*

Terminal		Type	Description
Nbr	Label		
1	S–BUS	S–BUS	S–Bus Communications (Enthalpy Control Sensor Bus)
2	S–BUS	S–BUS	S–Bus Communications (Enthalpy Control Sensor Bus)

* Terminals are polarity insensitive.

Table 16 – Enthalpy Control Sensor DIP Switch Settings

Use	DIP Switch Positions for Switches 1, 2, & 3		
	1	2	3
DA	OFF	ON	OFF
RA	ON	OFF	OFF
OA	OFF	OFF	OFF

Legend
DA = Discharge Air
RA = Return Air
OA = Outside Air

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.

Operating Sequences

Staged Air Volume (3-Speed) Fan Motor —

The Integrated Staging Control (ISC) Board in the main unit determines the operating speed (LOW/MED/HIGH) of the indoor fan based on space thermostat demand conditions. See Table 17 for this logic.

Table 17 – Supply Fan Speed Logic without Economizer

TSTAT OUTPUT				
G/OCC	0–V	**24–V**	0–V	0–V
Y1	0–V	**24–V**	0–V	0–V
Y2	0–V	0–V	**24–V**	0–V
Y3	0–V	0–V	0–V	**24–V**
W1	0–V	0–V	0–V	**24–V**
W2	0–V	0–V	0–V	**24–V**
SUPPLY FAN MOTOR SPEED	OFF	LOW	MED	HIGH

W7220 Economizer Control —

Tables 18 and 19 provide the W7220 Input/Output Logic. Table 18 describes economizer functions for a unit without a CO_2 sensor. Table 19 describes economizer functions for a unit with Demand Controlled Ventilation (CO_2 sensor connected). The supply fan speed is included in these tables for reference; this is neither an input or output of the W7220 controller.

Base Unit Controls —

Base unit includes standard electro-mechanical controls, Staged Air Volume (3-speed supply fan motor with VFD), EconoMi$er® X (with W7220 controller) and thermostat or unitary controller that energizes the G terminal in cooling and heating to control the supply fan operation.

Cooling, Unit With EconoMi$er X Without CO_2 Sensor —

For Occupied mode operation of the EconoMi$er X control, there must be a 24-v signal at terminal G at the unit's Integrated Staging Control Board from the thermostat; supply fan motor will start and run in Low Speed. The signal at G is connected to W7220 input OCC, placing the EconoMi$er X control in Occupied mode; the economizer actuator is commanded open to the MIN POS L ventilation position. Removing the signal at OCC places the EconoMi$er X control in Unoccupied mode; the economizer actuator is driven back to full-closed position.

When free cooling using outside air is not available, the unit cooling sequence will be controlled directly by the space thermostat. Thermostat call for Stage 1 Cooling energizes ISC terminals G and Y1; supply fan motor starts and runs in Low Speed. The Y1 demand is received at W7220 terminal Y1-I. Outside air damper position will be at MIN POS L. W7220 output Y1-O is energized; first stage mechanical cooling starts.

As space temperature falls and space cooling load is satisfied, the thermostat will remove its call for first stage cooling; ISC terminal Y1 call is removed. The W7220 input Y1-I is removed; output Y1-O is de-energized, stopping first stage cooling.

When ISC terminal Y1 is de-energized, terminal G may remain energized, indicating Continuous Fan operation.

The supply fan motor will continue to run in Low Speed. W7220 input OCC remains energized; the outside air damper remains in MIN POS L. If ISC terminal G is also de-energized with Y1, indicating AUTO Fan operation, then the supply fan motor will stop. The W7220 input at OCC is removed; the outside air damper closes.

If the space temperature continues to rise, the thermostat will call for second stage cooling; ISC terminal Y2 is also energized. The supply fan motor shifts to MED Speed. Outside air damper position will remain in MIN POS L, second stage cooling starts.

As space temperature falls, the thermostat will remove its call for second stage cooling; ISC terminal Y2 call is removed. The supply fan motor shifts back to Low Speed. The outside air damper remains at MIN POS L and the ISC board will stop second stage mechanical cooling.

If the space temperature continues to rise, the thermostat will call for third stage cooling; ISC terminal Y-3 is also energized. The supply fan motor shifts to High Speed. The outside air damper position will shift to MIN POS H, third stage cooling starts.

As space temperature falls, the thermostat will remove its call for third stage cooling; ISC terminal Y3 call is removed. The supply fan will shift to Medium Speed. The outside air damper position is repositioned to MIN POS L and stop third stage mechanical cooling.

When free cooling is available as determined by the appropriate changeover command (outdoor dry bulb, outdoor enthalpy, differential dry bulb or differential enthalpy), a space thermostat call for Stage 1 Cooling energizes ISC terminals G and Y1; supply fan motor starts and runs in High Speed. The G demand is received at W7220 input OCC; outside air damper moves to MIN POS L. The Y1 demand is received at W7220 terminal Y1-I. The W7220 economizer control will modulate the outside air damper open and closed to maintain the unit cooling supply air temperature at setpoint MAT SET (default 53°F (12°C)). Compressor will not run.

During free cooling operation, a supply air temperature (SAT) above MAT SET will cause the outside air damper to modulate between MIN POS L setpoint and 100% open. As SAT decreases and approaches setpoint MA LO SET (default 45°F (7°C)), the outside air damper will maintain at the MIN POS L setting. With SAT below MA LO SET, the outside air damper will be closed or at minimum (see FREEZE POS) When SAT rises to MA LO SET plus 3°F, the outside air damper will re-open to MIN POS L setting.

Should 100% outside air not be capable of satisfying the space cooling load, space temperature will rise and the thermostat will call for second stage cooling; ISC terminal Y2 is also energized. The supply fan motor remains at High Speed. Outside air damper position will remain at MIN POS L, starting second stage cooling (Compressor 1 operation). Damper will modulate to maintain SAT at MAT SET concurrent with Compressor 1 operation.

Table 18 – W7220 Input/Output without CO_2 Sensor

INPUTS				Ref: FAN SPD*	OUTPUTS			
					Mechanical Cooling Stage		Occupancy	
DEMAND CONTROLLED VENTILATION	OUTSIDE AIR Good to economize?	Y1 – I	Y2 – I				OCC Yes	OCC No
					Y1 – O/1ST	Y2 – O/2ND	Outside Air Damper Position	
NO CO_2 SENSOR	No	Off	Off	Low	0 – v/Off	0 – v/Off	MIN POS L	Closed
		On	Off	Low	24 – v/On	0 – v/Off	MIN POS L	Closed
		On	On	High	24 – v/On	24 – v/On	MIN POS H	Closed
	Yes	Off	Off	Low	0 – v/Off	0 – v/Off	MIN POS L	Closed
		On	Off	Low	0 – v/Off	0 – v/Off	Modulating: MIN POS L to Full – Open	Modulating: Closed to Full – Open
		On	On	High	2SP DELAY †; 24v/On	0 – v/Off **	Modulating: MIN POS H to Full – Open	Modulating: Closed to Full – Open

* Fan Speed for reference only; this is not an input or output function of the W7220.

† See Menu ADV SETUP –> 2SP FAN DELAY for details.

** See Menu ADV SETUP –> STG# DLY. With Stage 3 delay enabled, control can turn on 2nd stage of cooling Y2 – O after delay if the call for Y2 – I has not been satisfied.

Table 19 – W7220 Input/Output with Demand Controlled Ventilation (DCV)

INPUTS				Ref: FAN SPD*	OUTPUTS			
DEMAND CONTROLLED VENTILATION	OUTSIDE AIR Good to economize?	Y1 – I	Y2 – I		Mechanical Cooling Stage		Occupancy	
							OCC Yes	OCC No
					Y1 – O/1ST	Y2 – O/2ND	Outside Air Damper Position	
Below set	No	Off	Off	Low	0 – v/Off	0 – v/Off	VENTMIN L	Closed
		On	Off	Low	24 – v/On	0 – v/Off	VENTMIN L	Closed
		On	On	High	24 – v/On	24 – v/On	VENTMIN H	Closed
	Yes	Off	Off	Low	0 – v/Off	0 – v/Off	VENTMIN L	Closed
		On	Off	Low	0 – v/Off	0 – v/Off	Modulating: VENTMIN L to Full – Open	Modulating: Closed to Full – Open
		On	On	High	2SP DELAY †; 24v/On	0 – v/Off **	Modulating: VENTMIN H to Full – Open	Modulating: Closed to Full – Open
Above set	No	Off	Off	Low	0 – v/Off	0 – v/Off	Modulating: VENTMIN L to VENTMAX L	Closed
		On	Off	Low	24 – v/On	0 – v/Off	Modulating: VENTMIN L to VENTMAX L	Closed
		On	On	High	24 – v/On	24 – v/On	Modulating: VENTMIN H to VENTMAX H	Closed
	Yes	Off	Off	Low	0 – v/Off	0 – v/Off	Modulating: VENTMIN L to VENTMAX L	Closed
		On	Off	Low	0 – v/Off	0 – v/Off	Modulating: VENTMIN L to Full – Open	Modulating: Closed to Full – Open
		On	On	High	2SP DELAY†; 24v/On	0 – v/Off **	Modulating: VENTMIN H to Full – Open	Modulating: Closed to Full – Open

* Fan Speed for reference only; this is not an input or output function of the W7220.

† See Menu ADV SETUP – > 2SP FAN DELAY for details.

** See Menu ADV SETUP – > STG# DLY. With Stage 3 delay enabled, control can turn on 2nd stage of cooling Y2 – O after delay if the call for Y2 – I has not been satisfied.

As space temperature falls, the thermostat will remove its call for second stage cooling; ISC terminal Y2 call is removed. The supply fan motor remains High Speed. The outside air damper limit is repositioned to between MIN POS L and 100% open. Second stage cooling (Compressor 1 operation) stops. As space temperature continues to fall and space cooling load is satisfied, the thermostat will remove its call for first stage cooling; ISC terminal Y1 call is removed. The W7220 input Y1-I is removed; free cooling mode ends. Outside air damper will remain at MIN POS L if supply fan remains in operation (CONT FAN) or to closed if supply fan stops (AUTO FAN).

Should 100% outside air and second stage cooling (Compressor 1 operation) not be capable of satisfying the space cooling load, space temperature will rise and the thermostat will call for third stage cooling: ISC terminal Y3 is also energized, starting third stage cooling (Compressor 2 operation). The supply fan motor will remain at High Speed. The Y3 demand is received at W7220 input Y2-I. The outdoor air damper position will modulate from MIN POS H to 100% Open to maintain SAT at MAT SET concurrent with Compressor 2 operation.

As space temperature falls, the thermostat will remove its call for third stage cooling; ISC terminal Y3 call is removed. The supply fan will remain at High Speed. The W7220 input Y2-I is also removed; the outside air damper is repositioned to modulate from MIN POS H to 100% Open, third stage cooling (Compressor 2 operation) stops.

Power Exhaust: If accessory power exhaust is installed, the power exhaust fan motors will be energized by the economizer control as the dampers open above the setpoint EXH1 SET L during Low Speed operation or EXH1 SET H during High Speed fan operation. The EXH1 output will be de-energized as the dampers close below the EXH1 setpoint value.

Damper movement from full closed to full open (or vice versa) will take approximately 1-1/2 minutes.

Heating With EconoMi$er® X —

When the space temperature calls for heat (W1 closes), ISC terminal W1 is energized. The supply fan will start and run in High Speed. The W1 signal will connect to W7220 input AUX2I; the outside air damper will move to MIN POS H. Unit heating sequence will follow base unit control sequences.

Demand Controlled Ventilation —

If a space or return air CO_2 sensor is connected to the EconoMi$er® X control, a Demand Controlled Ventilation strategy will operate automatically.

When the space CO_2 level is below setpoint DCV SET (default 1100 ppm), the minimum ventilation position for the outside air damper will be reset to lower settings suited for offsetting CO_2 loads from space sources not including people. The settings will vary according to supply fan speed. When the supply fan speed is Low, the DCV minimum ventilation point is VENTMIN L. When the supply fan speed is High, the DCV minimum ventilation point is VENTMAX H.

As the CO_2 level in the space increases above the setpoint DCV SET (default 1100 ppm), the DCV ventilation position of the outside air damper will be increased proportionally, until the Maximum Ventilation setting is reached. The settings will vary according to supply fan speed. When the supply fan speed is Low, the DCV maximum ventilation point is VENTMAX L. When the supply fan speed is High, the DCV maximum ventilation point is VENTMAX H.

DCV operation will float between its VENTMIN and VENTMAX settings, never exceeding the VENTMAX limit as the space CO_2 level varies according to changes in people occupancy levels.

During concurrent demand for DCV and free cooling, the outdoor-damper will follow the higher demand condition from the DCV mode or from the free-cooling mode.

Setup and Configuration

Before being placed into service, the W7220 Economizer module must be setup and configured for the installed system according to project control specifications.

Inspect all wiring connections at the Economizer module's terminals, and verify compliance with the installation wiring diagrams.

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.

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.

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

Setup and configuration involves stepping through three menus and enabling required functions and re-selecting setpoints to meet project requirements. The menus used are SYSTEM SETUP, ADV SETUP and SETPOINTS.

Obtain a copy of the project control specifications before starting setup and configuration process.

NOTE: W7220 will be in the "set up" mode for the first 60 minutes after powered. If a sensor for OA air or S-bus device (sensor, actuator) is disconnected during the set up mode, the W7220 will not alarm that failure. The SAT sensor is a system "critical" sensor, if the SAT sensor is removed during the set up mode, the W7220 will alarm. After 60 minutes the W7220 controller will change to operation mode and all components removed or failed will alarm in the operation mode.

For this application with the 2-speed supply fan option, note that parameters EQUIPMENT, AUX2I and FAN TYPE have required settings. Check that these parameters are set at these required settings:

EQUIPMENT must be CONV
AUX2I must be W
FAN SPEED must be 2SPEED

Press the ⏎ (EXIT) button to exit the SYSTEM SETUP menu and return to top level menu. Scroll down to ADV SETUP menu and press ↵ (ENTER) button to enter this menu. Scroll down through the list of parameters and adjust settings as required. Be sure that the message CHANGE STORED appears with every change in parameter setting.

Press the ⏎ (EXIT) button to exit the ADV SETUP menu and return to top level menu. Scroll down to SETPOINTS menu and press ↵ (ENTER) button to enter this menu. Scroll down through the list of parameters and adjust settings as required. Be sure that the message CHANGE STORED appears with every change in parameter setting.

SETPOINT Defaults: The default setpoint values represent many years of successful experience with economizing systems. Any changes that represent significant deviations from the default values should be well considered.

DCV SETPOINT: The default value for DCV SET is 1100 ppm. It is recommended that this setpoint be adjusted down to 500 ppm (or CO_2 level of outdoor air plus 100 ppm, whichever is higher) to permit an earlier initiation of the DCV mode as space occupancy increases.

Checkout

For checkout, review the Status of each configured parameter by observing the scrolling display from the Screensaver mode or by entering the STATUS menu.

Use the Checkout menu (see Table 9 on page 41) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the the ▲ and ▼ buttons.
2. Press the ↵ button to select the item.
3. RUN? appears.
4. Press the ↵ 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.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Be sure to allow enough time for compressor startup and shutdown between checkout tests so that you do not short-cycle the compressors.

Status —

Use the STATUS menu (see pages 37 and 38) to check the parameter values for the various devices and sensors configured.

Calibration of Sensors —

There are up to six sensor calibration settings available in the ADV SETUP menu (depending on which sensors are connected to the W7220). See page 40 for this menu.

Resetting All Defaults —

Menu SYSTEM SETUP contains parameter FACTORY DEFAULT. This parameter will reset all setpoints back to factory default values.

To reset all values to defaults, scroll to the SYSTEM SETUP menu, enter the menu and scroll to parameter FACTORY DEFAULT. Enter this parameter and change the display value from NO to YES. Press ENTER ↵.

After resetting all values, scroll up in SYSTEM SETUP to ensure the three parameters requiring special values for use with 2-speed fan system are correct.

Troubleshooting

Power Up Delay—

Upon power up (or after a power outage or brownout) the W7220 controller module begins a 5-minute power up delay before enabling mechanical cooling.

Power Loss (Outage or Brownout) —

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

NOTE: If the power goes below 18 Vac, the W7220 controller module assumes a power loss and the 5-minute power up delay will become functional when power returns above 18 Vac.

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. The list of alarms included in Table 9 (see page 41) is not a complete list of available alarm messages. Each sensor has alarms for temperature, humidity and enthalpy. The list of possible alarms will vary from unit to unit as different sensors are connected.

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.

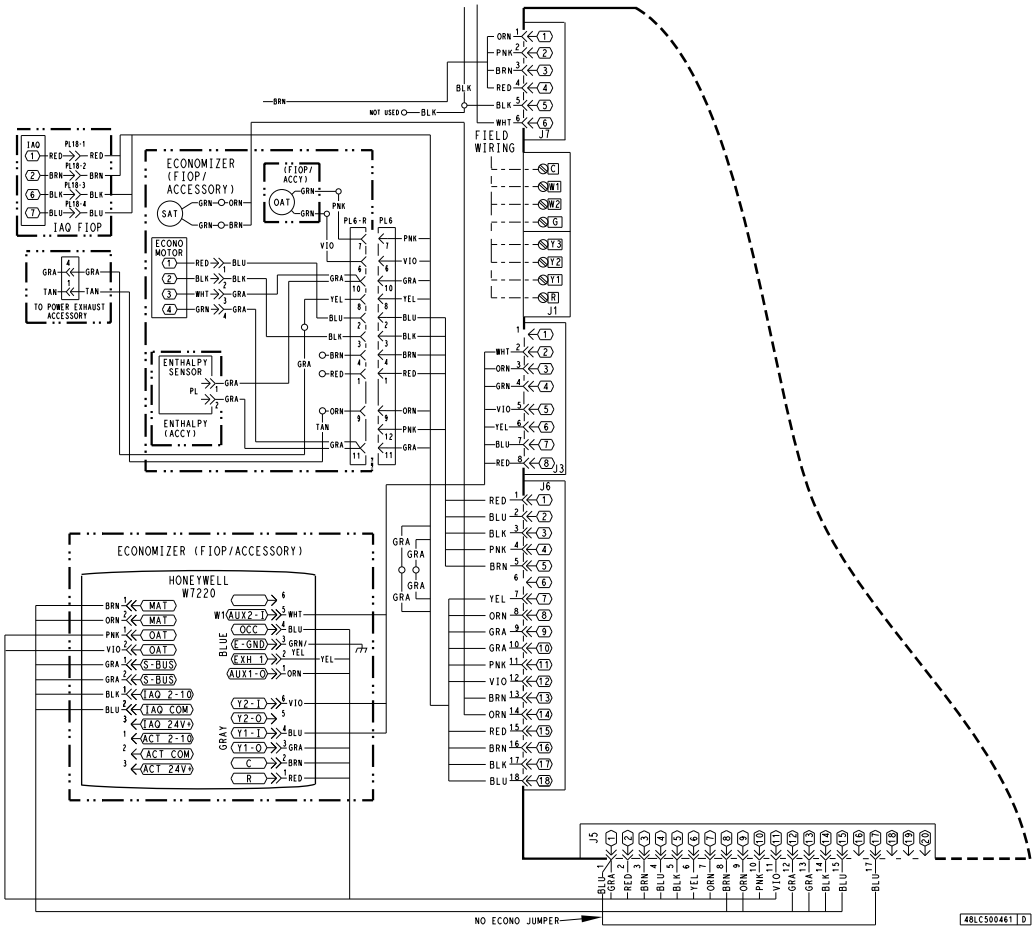
To clear an alarm, perform the following:

1. Navigate to the desired alarm.
2. Press the ↵ button.
3. ERASE? displays.
4. Press the ↵ 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 you clear it, it is redisplayed within 5 seconds.

Table 20 – Operating Issues and Concerns

Issue or Concern	Possible Cause and Remedy
My outdoor temperature reading on the STATUS menu is not accurate.	Check the sensor wiring: • Enthalpy sensors are to be wired to the S–Bus terminals. • Temperature sensors are to be wired to the OAT and MAT terminals.
If my enthalpy sensor drifts in accuracy over time, can I re–calibrate it?	The sensor are not able to be re–calibrated in the field. However there is a menu item under the ADVANCED menu where you are able to input a limited offset in temperature and humidity for each sensor you have connected to the economizer.
Can I go back to factory defaults and start over?	Under the SYSTEM SETUP menu you can change the setpoints to the factory defaults.
Will I be able to see the LCD screen when it is in the unit?	The LCD screen has a backlight that is always illuminated.
What is a good setpoint for the Supply Air Temperature (SAT)?	The supply air temperature is the temperature of air that you want to supply to the space. In a commercial building, this is between 50 to 55°F (10 to 13°C). The supply air is the mixing of the return air and the outdoor air.
I am using enthalpy sensors. Why did the control ask me to input a dry bulb changeover temperature?	In the event the humidity sensor in the enthalpy sensors fails, the backup algorithm in the control is to default to the temperature sensor in the enthalpy sensor.
In checkout, the outdoor damper closes when I command it to open.	Check the actuator linkage or rotation. In the CHECKOUT mode, the outdoor damper should drive open or closed with the return air damper having the opposite effect.
How do I set my minimum position?	The minimum position is set using the VENTMIN and VENTMAX setup in the SETPOINTS menu. VENTMIN is the minimum ventilation required when using an occupancy sensor and VENTMAX is the minimum ventilation when not using an occupancy sensor for Demand Controlled Ventilation. The VENTMAX position is set the same as with the potentiometer on the analog economizers and is the output voltage to the damper actuator. The range is 2 Vdc closed OA damper and 10 Vdc open OA damper.
What if my damper does not go completely closed in the checkout operation?	Check the damper linkage or hub to make sure the damper is able to close completely.
How do I set the OCC?	There are two settings for the OCC setting, INPUT and ALWAYS. INPUT is from the space thermostat, if it has an occupancy output. ALWAYS is the unit in the occupied mode, if the economizer is powered (fan on).
Does the economizer save my program values if the unit loses power?	Yes, once the changes are stored in the controller they will be stored until they are changed by the operator.
If the unit is left in checkout, how long will the unit stay in checkout mode without input?	The unit will remain in checkout for 10 minutes, then return to normal operation.



a48-9322

Fig. 65 - Typical EconoMi$er® X Wiring Diagram

CONTROL SET POINT AND CONFIGURATION LOG

Project Name/Location: _____

Model Number: _____

Serial Number: _____

Date: _____

Technician _____

Menu Tables:

1. SYSTEM SETUP
2. ADVANCED SETUP
3. SETPOINTS

Menu 1: System Setup

Parameter	Project Value	Parameter Default Value	Parameter Range and Increment	Notes
INSTALL		01/01/10		Display order = MM/DD/YY Setting order = DD, MM, then YY
UNITS DEG		_F	_F or _C	Sets economizer controller in degrees Fahrenheit or Celsius.
EQUIPMENT		CONV	CONV required for 2−speed mode	CONV = conventional; HP O/B = Enable Heat Pump mode; not available with 2−speed See Menu Note 4 (on page 41)
AUX2 I		W	W required for 2−speed mode	W = Informs controller that system is in heating mode. SD = Enables configuration of shutdown (not available on 2−speed) See Menu Note 4 (on page 41)
FAN TYPE		2speed	2speed required	Sets the economizer controller for operation of 1 speed or 2 speed indoor fan system.
FAN CFM		5000cfm	100 to 15000 cfm;	UNIT DESIGN AIRFLOW (CFM) Enter ONLY if using DCVCAL ENA = AUTO The value is found in the Project Submittal documents for the specific RTU.
AUX OUT		NONE	NONE ERV EXH2 SYS	Select OUTPUT for AUX1 O relay NONE = not configured (output is not used) ERV = Energy Recovery Ventilator 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 to the OCC terminal. RTU control circuit provides 24−Vac to OCC through OCCUPIED terminals on Integrated Staging Control Board.
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. **RECHECK AUX2 I and FANTYPE for required 2−speed values.**

Menu 2: Advanced Setup

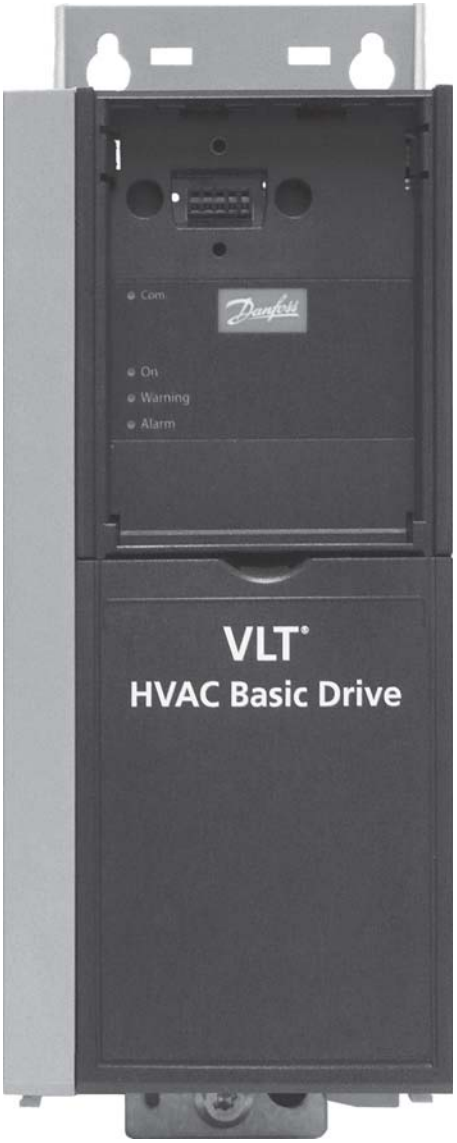
Parameter	Project Value	Parameter Default Value	Parameter Range and Increment	Notes
MA LO SET		45°F (7°C)	35 to 55°F; (2 to 13°C) incremented by 1°	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to achieve Freeze Protection (close damper and alarm if temperature at SAT location falls below setup value)
FREEZE POS		CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active CLO =closed MIN = MIN POS or VENTMAX
CO2 ZERO		0ppm	0 to 500 ppm: Increment by 10	CO_2 ppm level to match CO_2 Sensor start level.
CO2 SPAN		2000ppm	1000 to 3000 ppm; Increment by 50	CO_2 ppm span to match CO_2 sensor.
STG3 DLY		2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 h or OFF	COOLING STAGE 3 DELAY Delay after stage 2 for cool has been active. Turns on 2nd stage of cooling when economizer is 1st stage and mechanical cooling is 2nd
SD DMPR POS		CLO	CLO or OPN	Function NOT AVAILABLE with 2−speed mode
DCVCAL ENA		MAN	MAN (manual)	Turns on the DCV automatic control of the dampers. Resets ventilation
MAT T CAL	0.0	1.0°F (or °C)	+/− 2.5°F (+/−1.4°C)	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration supply air temperature (SAT) sensor
OA T CAL	2.0	3.0°F (or °C)	+/− 2.5°F (+/−1.4°C)	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration outside air temperature (OAT) sensor
OA H CAL		0% RH	+/− 10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of calibration of outside air enthalpy sensor
RA T CAL	4.0	5.0°F (or °C)	+/− 2.5°F (+/−1.4°C)	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration return air temperature (RA) sensor
RA H CAL		0% RH	+/− 10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for the operator to adjust for an out of calibration return air enthalpy sensor
DA T CAL	0.0	1.0°F (or °C)	+/− 2.5°F (+/−1.4°C)	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration discharge air temperature (DAT) sensor
2SP FAN DELAY		5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON 2ND STAGE ECONOMIZING While in the Economizing mode, this is the delay between thermostat Y2 call and Y1−O output to mechanical cooling stage, to allow high speed fan operation to attempt to cool space first.

Menu 3: Setpoints

Parameter	Project Value	Parameter Default Value	Parameter Range and Increment	Notes
MAT SET		53°F (12°C)	38 to 65°F; (3 to 18°C) increment by 1°	SUPPLY AIR SETPOINT Setpoint determines where the economizer will modulate the OA damper to maintain the supply air temperature. See Menu Note 2 (on page 41).
LOW T LOCK		32°F (0°C)	–45 to 80°F (–43 to 27°C) increment by 1°	COMPRESSOR LOW TEMPERATURE LOCKOUT Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on.
DRYBLB SET		63°F (17°C)	48 to 80°F; (9 to 27°C) increment by 1°	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Setpoint determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.: at 63°F (17°C), unit will economize at 62°F (16.7°C) and below and not economize at 64°F (17.8°C) and above. There is a 2°F (1.1°C) deadband. See Menu Note 3 (on page 41).
ENTH CURVE		ES3	ES1, ES2, ES3, ES4, or ES5	ENTHALPY CHANGEOVER CURVE (Requires enthalpy sensor option) Enthalpy boundary “curves” for economizing using single enthalpy.
DCV SET		1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION SETPOINT Displays only if CO_2 sensor is connected. Setpoint for Demand Controlled Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
MIN POS L		6.0 V	2 to 10Vdc	VENTILATION MINIMUM POSITION AT LOW SPEED Displays ONLY if a CO_2 sensor is NOT connected.
MIN POS H		4.4 V	2 to 10Vdc	VENTILATION MINIMUM POSITION AT HIGH SPEED Displays ONLY if a CO_2 sensor is NOT connected.
VENTMAX L		6.0 V	2 to 10Vdc	DCV MAXIMUM DAMPER POSITION AT LOW SPEED (Requires CO_2 sensor connected)
VENTMAX H		4.4 V	2 to 10Vdc	DCV MAXIMUM DAMPER POSITION AT HIGH SPEED (Requires CO_2 sensor connected)
VENTMIN L		3.7 V	2 to 10Vdc	DCV MINIMUM DAMPER POSITION AT LOW SPEED (Requires CO_2 sensor connected)
VENTMIN H		2.8 V	2 to 10Vdc	DCV MINIMUM DAMPER POSITION AT HIGH SPEED (Requires CO_2 sensor connected)
ERV OAT SP		32°F (0°C)	0 to 50°F; (–18 to 10°C) increment by 1°	ENERGY RECOVERY VENTILATION UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV
EXH1 L SET		65%	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SETPOINT AT LOW SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer.
EXH1 H SET		50%	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SETPOINT AT HIGH SPEED Setpoint for OA damper position when exhaust fan1 is powered by the economizer.
EXH2 L SET		80%	0 to 100%; increment by 1	EXHAUST FAN STAGE 2 SETPOINT AT LOW SPEED Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1–O is set to EHX2.
EXH2 H SET		75%	0 to 100%; increment by 1	EXHAUST FAN STAGE 2 SETPOINT AT HIGH SPEED Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1–O is set to EHX2.

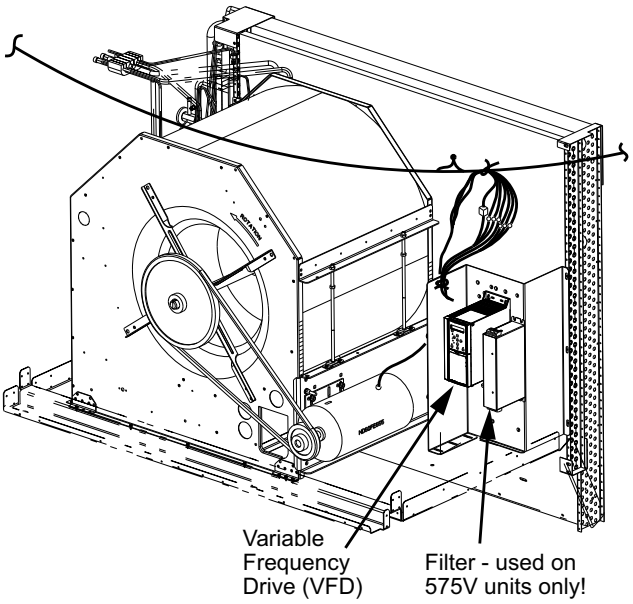
Staged Air Volume (SAV™) with Variable Frequency Drive

The Staged Air Volume (SAV) system utilizes a Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the unit’s ventilation, cooling and heating operation. Per ASHRAE 90.1-2016 during the first stage of cooling operation the SAV system will adjust the fan motor to provide 66% of the design airflow rate for the unit. When the call for the second stage of cooling is required, the SAV system will allow the design airflow rate for the unit established (100%). During the heating mode, the SAV system will allow total design airflow rate (100%) operation. During ventilation mode, the SAV system will operate the fan motor at 66% speed.



C13110

Fig. 66 - Variable Frequency Drive (VFD)



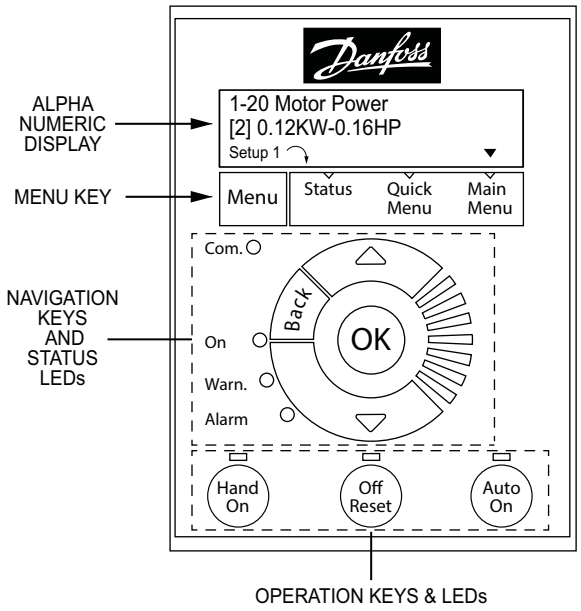
C13229

Fig. 67 - VFD Location

Multi-Speed VFD Display Kit (Field-Installed Accessory)

NOTE: The Remote VFD Keypad is part of the Multi-Speed VFD display kit (PN: CRDISKIT002A00) which is a field-installed accessory. It is not included with the 48LC 08-12 base units.

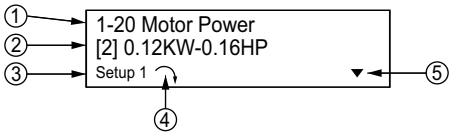
The VFD keypad as shown in Fig. 68 consists of the following sections:



C13112

Fig. 68 - VFD Keypad

Alpha Numeric Display: The LCD display is back lit with 2 alpha-numeric lines. All data is displayed on the LCD.

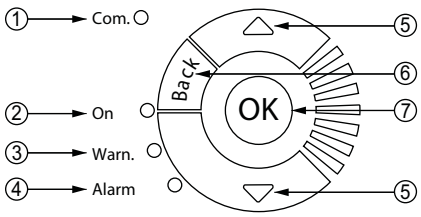


C13113

1	Parameter number and name.
2	Parameter value.
3	Setup number shows the active setup and the edit setup. If the same set-up acts as both the active and edit set-up, only that setup number is shown (factory setting). When the active and edit setup differ, both numbers are shown in the display (SETUP 12). The flashing number indicates the edit setup.
4	The symbol in the number 4 position in the figure above indicates motor direction. The arrow point either clockwise or counter-clockwise to show the motor's current direction.
5	The position of the triangle indicates the currently selected menu: Status, Quick Menu or Main Menu.

Menu Key: Use the Menu key to select between Status, Quick Menu or Main Menu. The triangle icon at the bottom of the LCD display indicates the currently selected mode. (See number 5 in the table above.)

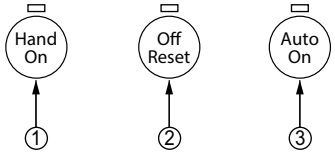
Navigation Keys and Status LEDs: The Navigation keys and Status LEDs are detailed in the following table.



C13114

1	**Com.** LED: Flashes when bus communications is communicating.
2	Green LED/**On**: Control selection is working.
3	Yellow LED/**Warn.**: Indicates a warning.
4	Flashing Red LED/**Alarm**: Indicates an alarm.
5	**Arrows ▲▼**: Use the Up and Down arrow keys to navigate between parameter groups, parameters and within parameters. Also used for setting local reference.
6	**Back** key: Press to move to the previous step or layer in the navigation structure.
7	**OK** key: Press to select the currently displayed parameter and for accepting changes to parameter settings.

Operation Keys and LEDs: The following table details the functions of the Operating keys. An illuminated yellow LED above the key indicates the active key.



C13115

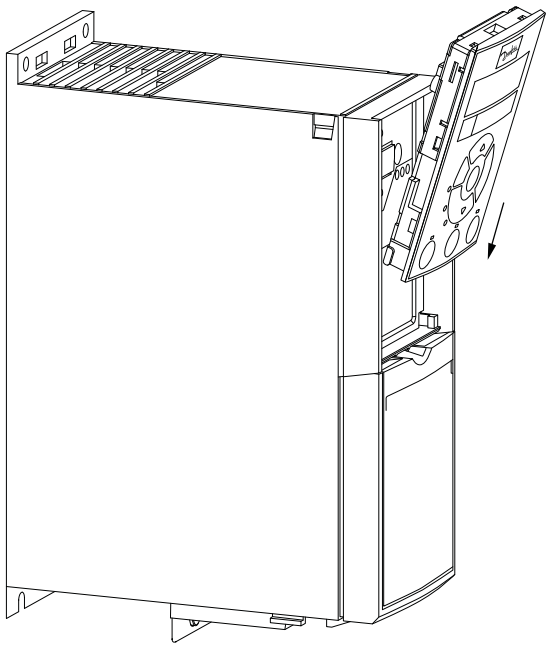
1	**Hand On** key: Starts the motor and enables control of the variable frequency drive (VFD) via the VFD Keypad option. **NOTE**: Please note that terminal 27 Digital Input *(5-12 Terminal 27 Digital Input)* has coast inverse as default setting. This means that the Hand On key will not start the motor if there is no 24V to terminal 27, so be sure to connect terminal 12 to terminal 27.
2	**Off/Reset** key: Stops the motor (off). If in alarm mode the alarm will be reset.
3	**Auto On** key: The variable frequency drive is controlled either via control terminals or serial communication.

Connecting the Keypad to the VFD

The VFD keypad can be mounted directly to the variable frequency drive, provided you can easily access the front panel of the VFD. If you do not have easy access to the VFD front panel, use the cable included with the kit to connect the keypad to the VFD.

Connecting the Keypad Directly to the VFD —

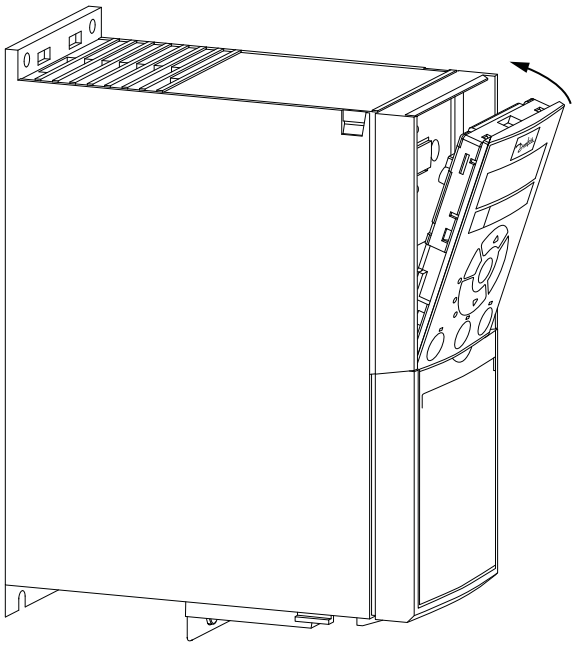
1. Place the bottom of the VFD keypad into the variable frequency drive as shown in Fig. 69.



C13116

Fig. 69 - Align Bottom of VFD Keypad with Opening in VFD Front Panel

2. Push the top of the VFD keypad into the variable frequency drive as shown in Fig. 70.



C13117

Fig. 70 - Secure Keypad in Place

Using the Cable to Connect the Keypad to the VFD —

The VFD keypad can be connected to the variable frequency drive via the cable included with the Multi-Speed VFD display kit (PN: CRDISKIT002A00).

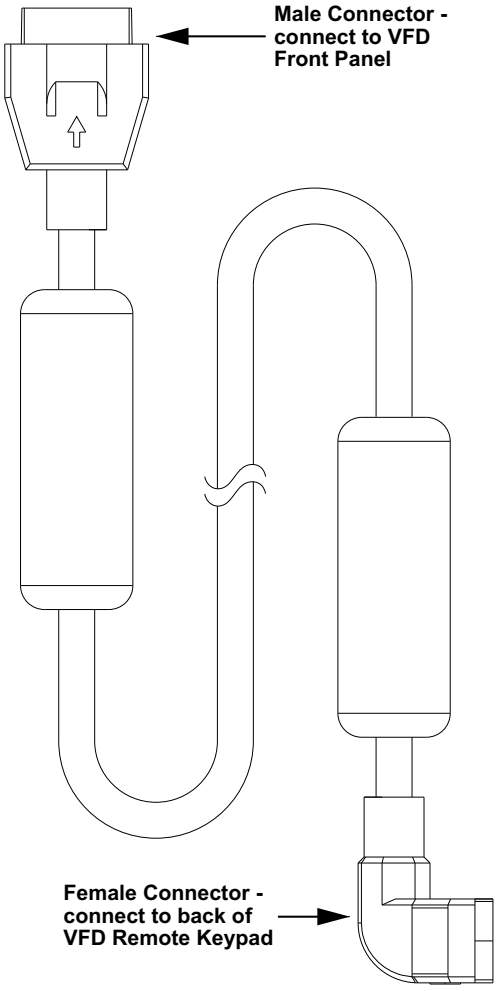


Fig. 71 - VFD Remote Keypad Cable

1. Connect the male end of the cable to the front panel of the variable frequency drive. Use 2 of the screws included with the kit to secure the cable to the VFD.
2. Connect the female end of the cable to the back panel of the VFD Remote keypad. Secure the cable to the remote keypad using the 2 remaining screws from the kit.

Program the VFD for 3 Discrete Indoor Fan Speeds

IMPORTANT: 48LC 08-12 units are programmed at the factory for 3 discrete indoor fan speeds. The following procedure is only to be used to recover this function after an event such as a system crash.

NOTE: This procedure requires use of the VFD Keypad which is included as part of the field-installed Multi-Speed VFD display kit (PN: CRDISKIT002A00). If the VFD keypad is not already installed, install it. See "Connecting the Keypad to the VFD" for details.

To program the VFD for 3 discreet indoor fan motor speeds:

1. At Power-Up:

   At the first power up the LCD displays the Select Language screen. The default setting is English. To change the language, press the **OK** key and use the ▲ and ▼ keys to scroll to the desired language and then press **OK**.

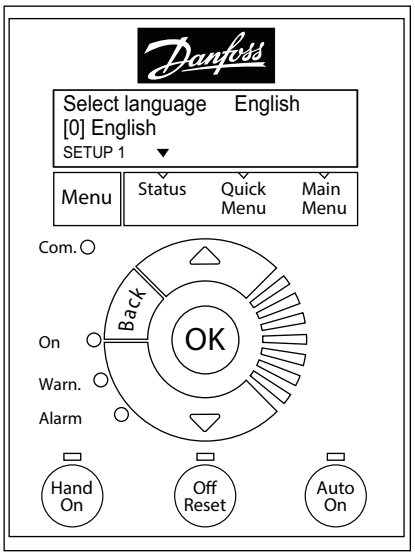


Fig. 72 - Keypad with Power Up Screen Displayed

2. Selecting Regional Settings:
   a. Press the **Off Reset** key.
   b. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0-** Operation / Display
1-** Load and Motor

   c. Press the **OK** key, the display changes to -

0-0* Basic Settings
0-1* Set-up Operations

   d. With the top row highlighted, press **OK**. The display changes to -

0-01 Language
[0] English

NOTE: If English is not the desired language press **OK**, select the desired language and press **OK** again.

   e. Press ▼**(Down Arrow** key) once; the display changes to -

0-03 Regional Settings
[0] International

   f. Press **OK**; the [0] is now highlighted.
   g. Press ▼**(Down Arrow)** key once; the display changes to -

0-03 Regional Settings
[1] North America

   h. Press **OK**

NOTE: If the Alarm 060 appears, follow Step 3 to clear the alarm. Make sure to press **Off Reset** when done. If there is no alarm, continue at Step 4.

3. Clearing Alarm 060: External Interlock:
   a. Press the **Menu** key twice to position the ▼(triangle icon) over Main Menu; the display changes to -

0–** Operation / Display
1–** Load and Motor

   b. Press the ▼**(Down Arrow)** key until the following display appears -

4–** Limits / Warnings
5–** Digital In/Out

   c. Press **OK**. The display changes to -

5–0* Digital I/O mode
5–1* Digital Inputs

   d. Press ▼**(Down Arrow)** once to highlight the bottom row and press **OK**. The display changes to -

5–10 Terminal 18 Digital In...
[8] Start

   e. Press ▼**(Down Arrow)** twice; the following display appears-

5–12 Terminal 27 Digital In...
[7] External Interlock

   f. Press **OK** to highlight the number in the bracket.
   g. Press ▼**(Down Arrow)** until the following display appears -

5–12 Terminal 27 Digital In...
[0] No operation

   h. Press **OK**.
   i. Press **Off Reset.** The Alarm indicator disappears.

4. Entering Grid Type:
   a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0–0* Basic Settings
0–1* Set–up Operations

   b. Press **OK** twice: the display changes to -

0–01 Language
[0] English

   c. Press ▼**(Down Arrow)** three times, to reach the following display -

0–06 Grid Type
[102] 200–240V/60Hz

   d. Press **OK** to highlight the number in the bracket and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the desired voltage and Hertz for the unit.
   e. Press **OK** to accept the selection and continue.

5. Entering Motor Data:
   a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0–** Operation / Display
1–** Load and Motor

   b. Press ▼**(Down Arrow)** once to highlight the bottom row.
   c. Press **OK**, the display changes to -

1–0* General Settings
1–1* Motor Selection

   d. Press ▼**(Down Arrow)** twice to reach the following display -

1–1* Motor Selection
1–2* Motor Data

   e. Press **OK**, the following display appears -

1-20 Motor Power
[9] 1.5kW – 2 hp

NOTE: The number in the bracket may be different from what is shown above.

   f. Press **OK** and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to scroll to the proper motor horsepower. Press **OK** again to set the selected hp.
   g. Press ▼**(Down Arrow)** once, the following display appears -

1-22 Motor Voltage
230V

   h. Press **OK** to highlight the voltage value. Use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the nameplate voltage. Press **OK** again to set the selected voltage.
   i. Press ▼**(Down Arrow)** once to display the following -

1-23 Motor Frequency
60Hz

   j. Press **OK** to highlight the Frequency value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the nameplate Hz. Press **OK** again to set the selected Hz.
   k. Press ▼**(Down Arrow)** once to display the following -

1-24 Motor Current
6.61A

   l. Press **OK** to highlight the Current value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the Max Amps value provided. Press **OK** again to set the selected Max Amps.

NOTE: Max Amps is greater than the nameplate value. Check the VFD Unit Parameters (see Tables 21 - 23 on pages 66 - 68) and use the value listed for the given unit in the column labeled “Motor Current Must-Hold Amps”.

m. Press ▼**(Down Arrow)** once to display the following -

1-25 Motor Nominal Speed
1740rpm

n. Press **OK** to highlight the rpm value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the nameplate rpm. Press **OK** again to set the selected rpm.

6. Entering Parameters for 1-71, 1-73, 1-82, and 1-90:

a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0–** Operation / Display
1–** Load and Motor

b. Press ▼**(Down Arrow)** once to highlight the bottom row.

c. Press **OK**, the display changes to -

1–0* General Settings
1–1* Motor Selection

d. Press ▼**(Down Arrow)** until the following display appears -

1–6* Load Depen. Setting
1–7* Start Adjustments

e. Press **OK**, the following display appears -

1-71 Start Delay
2.0s

f. Press **OK** to highlight the number and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the number provided in Tables 21 - 23. Press **OK** again to set the selected value.

g. Press ▼**(Down Arrow)** twice, the following display appears -

1-73 Flying Start
[1] Enabled

h. Press **OK** to highlight the number in the bracket and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the number provided in Tables 21 - 23. Press **OK** again to set the selected value.

i. Press the **Back** key once, the following display appears -

1–6* Load Depen. Setting
1–7* Start Adjustments

j. Press ▼**(Down Arrow)** once, the following display appears -

1–7* Start Adjustments
1–8* Stop Adjustments

k. Press **OK**, the following display appears -

1-80 Function at Stop
[0] Coast

l. Press ▼**(Down Arrow)** once, the following display appears -

1-82 Min Speed for Functio...
1.0 Hz

m. Press **OK** to highlight the number and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the number provided in Tables 21 - 23. Press **OK** again to set the selected value.

n. Press the **Back** key once, the following display appears -

1–7* Start Adjustments
1–8* Stop Adjustments

o. Press ▼**(Down Arrow)** once, the following display appears -

1–8* Stop Adjustments
1–9* Motor Temperature

p. Press **OK**, the following display appears -

1-90 Motor Thermal Prote...
[4] ETR trip 1

q. Press **OK** to highlight the number in the bracket then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select the number provided in Tables 21 - 23. Press **OK** again to set the selected value.

7. Setting References:

a. Press the **Menu** key to move the ▼(triangle icon) so it is positioned over Main Menu. The display show the following -

0–** Operation / Display
1–** Load and Motor

b. Press ▼**(Down Arrow)** three times, the following display appears -

2–** Brakes
3–** Reference / Ramps

c. Press **OK**, the following display appears -

3–0* Reference Limits
3–1* References

d. Press **OK** again, the following display appears -

3-02 Minimum Reference
0.000

NOTE: If the bottom row displays a number other than 0.000, press **OK** and use the ▲ and ▼ (**Up** and **Down Arrow**) key to select 0.000.

e. Press ▼**(Down Arrow)** once, the following display appears -

3-03 Maximum Reference
60.000

NOTE: If the bottom row displays a number other than 60.000, press **OK** and use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select 60.000.

f. Press the **Back** key until the following display appears -

3–0* Reference Limits
3–1* References

g. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears -

3-10 Preset Reference
[0]0.00%

h. Press **OK** once to highlight the number in the bracket. Press **OK** again; the highlight moves to the current percent value.

Use the ▲ and ▼ (**Up** and **Down Arrow**) keys and the following table to enter the required Preset Reference values.

[0]0.00%	Stop
[1]LL.LL%	Low Speed (see Tables 21 –23, column labeled "Preset References 3–10[1] for the proper % for each unit)
[2]MM.MM%	Medium Speed (see Tables 21 –23, column labeled "Preset References 3–10[2]" for the proper % for each unit)
[3]100%	Override (High Speed)
[4]100%	High Speed (100% or close to 100% to achieve the required CFM at high speed)
[5]0.00%	Stop
[6]0.00%	Stop
[7]0.00%	Stop

8. Setting the Ramp Time:

a. Press the **Back** key until the following display appears -

3–0* Reference Limits
3–1* References

b. Press ▼**(Down Arrow)** twice, the following display appears -

3–1* References
3–4* Ramp 1

c. Press **OK**, the following display appears -

3-41 Ramp 1 Ramp up Time
3.00s

d. Press **OK** again to highlight the bottom row and use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select 10.00s. Press **OK** again to set the selected Ramp up Time.

e. Press ▼**(Down Arrow)** once, the following display appears -

3-42 Ramp 1 Ramp Down Time
3.00s

f. Press **OK** again to highlight the bottom row and use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select 10.00s. Press **OK** again to set the selected Ramp Down Time.

9. Setting Limits:

a. Press the **Back** key until the following display appears -

2–** Brakes
3–** Reference / Ramps

b. Press ▼**(Down Arrow)** once, the following display appears -

3–** Reference / Ramps
4–** Limits / Warnings

c. Press **OK**, the following display appears -

4–1* Motor Limits
4–4* Adj. Warning 2

d. Press **OK** again, the following display appears -

4-10 Motor Speed Direction
[2] Both Directions

e. Press ▼**(Down Arrow)** once, the following display appears -

4-12 Motor Speed Low Limi…
0.0Hz

f. Press ▼**(Down Arrow)** again, the following display appears -

4-14 Motor Speed High Limi…
65.0Hz

NOTE: Press **OK** to highlight the Hz value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to enter the required values.

g. Press ▼**(Down Arrow)** once, the following display appears -

4-18 Current Limit
110%

NOTE: Press **OK** to highlight the % value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to enter the required value. See Tables 21 - 23 for proper selection of the value for this parameter then press **OK** to set the selected value.

h. Press ▼**(Down Arrow)** once, the following display appears -

4-19 Max Output Frequency
65.0Hz

NOTE: Press **OK** to highlight the Hz value and then use the ▲ and ▼ (**Up** and **Down Arrow**) keys to enter the required values.

10. Setting Digital Inputs:
    a. Press the **Back** key until the following display appears –

3–** Reference / Ramps
4–** Limits / Warnings

    b. Press ▼**(Down Arrow)** once, the following display appears –

4–** Limits / Warnings
5–** Digital In/Out

    c. Press **OK**, the following display appears –

5–0* Digital I/O mode
5–1* Digital Inputs

    d. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears –

5-10 Terminal 18 Digital In…
[8] Start

    e. Press ▼**(Down Arrow)** again. The following display appears –

5-11 Terminal 19 Digital In…
[16] Preset ref bit 0

    f. Press ▼**(Down Arrow)** again. The following display appears –

5-12 Terminal 27 Digital In…
[17] Preset ref bit 1

    g. Press ▼**(Down Arrow)** again. The following display appears –

5-13 Terminal 29 Digital In…
[18] Preset ref bit 2

NOTE: By pressing **OK** the number in the bracket can be changed until the desired number appears. Press **OK** again to set the selected value.

11. Setting Analog Inputs:
    a. Press the **Back** key until the following display appears –

4–** Limits / Warnings
5–** Digital In/Out

    b. Press ▼**(Down Arrow)** until the following display appears –

5–** Digital In/Out
6–** Analog In/Out

    c. Press **OK**, the following display appears –

6–** Analog In/Out
6–1* Analog Input 53

    d. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears –

6-10 Terminal 53 Low Voltage
2V

    e. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears –

6-11 Terminal 53 High Voltage
[10V]

    f. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears –

6-14 Set Min Reference
[0 Hz]

    g. Press ▼**(Down Arrow)** once to move the highlight to the bottom row and then press **OK**. The following display appears –

6-15 Set Max Reference
[60 Hz]

12. Setting Reset Mode and RFI Filter:
    a. Press the **Back** key until the following display appears –

0–** Operation / Display
1–** Load and Motor

    b. Press ▼**(Down Arrow)** until the following display appears –

13–** Smart Logic
14–** Special Functions

    c. Press **OK**, the following display appears –

14–0* Inverter Switching
14–1* Mains On/Off

    d. Press ▼**(Down Arrow)** twice. The following display appears –

14–1* Mains On/Off
14–2* Reset Functions

    e. Press **OK**, the following display appears –

14-20 Reset Mode
[0] Manual reset

    f. Press **OK** to highlight the number in the bracket.
    g. Use the ▲ and ▼ (**Up** and **Down Arrow**) keys to change the number to 3 for 3 automatic resets and then press **OK**. The display changes to –

14-20 Reset Mode
[3] Automatic reset x 3

h. Press ▼**(Down Arrow)** once, the following display appears –

14-21 Automatic Restart T…
10s

i. Press **OK** to highlight the number of seconds and use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select 600 seconds. Press **OK** again to set the selected value.

j. Press the **Back** key once, the following display appears –

14–1* Mains On/Off
14–2* Reset Functions

k. Press ▼**(Down Arrow)** twice, the following display appears –

14–4* Energy Optimising
14–5* Environment

l. Press **OK**, the following display appears –

14-50 RFI Filter
[1] On

m. Press **OK** to highlight the number in the bracket and use the ▲ and ▼ (**Up** and **Down Arrow**) keys to select [0]. Press **OK** again to set the selected value.

13. To Complete Reprogramming:

a. Press the **Auto On** key before disconnecting the VFD Remote Keypad from the variable frequency drive.

Table 21 – VFD Unit Parameters - 48LC 08 Units

						Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must–Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference		
Voltage	Unit Size	Motor Option	Motor P/N	VFD Carrier P/N	VFD Mfr P/N	0–03	0–06	1–20	1–22	1–23	1–24	1–25	1–71	1–73	1–82	1–90	3–10 [0]	3–10 [1]	3–10 [2]
208/230V	08	STD	HD56FR233	HK30WA370	131L9795	[1]	[102]	[9]	230	60	5.8	1695	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	08	STD	HD56FR463	HK30WA376	131L9863	[1]	[122]	[9]	460	60	2.9	1690	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	08	STD	HD56FR579	HK30WA382	131N0225	[1]	[132]	[9]	575	60	3.1	1690	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	08	MID	HD56FE653	HK30WA371	131L9796	[1]	[102]	[10]	230	60	7.9	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	08	MID	HD56FE653	HK30WA377	131L9864	[1]	[122]	[10]	460	60	3.6	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	08	MID	HD56FE577	HK30WA382	131N0225	[1]	[132]	[11]	575	60	3.8	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	08	HIGH	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	08	HIGH	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	08	HIGH	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	08	ULTRA	HD60FK658	HK30WA372	131L9797	[1]	[102]	[13]	230	60	13.6	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	08	ULTRA	HD60FK658	HK30WA379	131L9866	[1]	[122]	[13]	460	60	6.8	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	08	ULTRA	HD60FE576	HK30WA387	134F0217	[1]	[132]	[13]	575	60	6.0	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%

			Preset Reference (cont)					Ramp Up Time (Sec)	Ramp Down Time (Sec)	Current Limit	Terminal 18 Digital Input	Terminal 19 Digital Input	Terminal 27 Digital Input	Terminal 29 Digital Input	Terminal 53 Low Voltage	Terminal 53 High Voltage	Terminal 53 Low Reference	Terminal 53 High Reference	Reset Mode	Auto. Restart Time (S)	RFI Filter
Voltage	Unit Size	Motor Option	3–10 [3]	3–10 [4]	3–10 [5]	3–10 [6]	3–10 [7]	3–41	3–42	4–18	5–10	5–11	5–12	5–13	6–10	6–11	6–14	6–15	14–20	14–21	14–50
208/230V	08	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	08	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	08	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	08	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	08	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	08	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	08	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	08	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	08	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	08	ULTRA	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	08	ULTRA	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	08	ULTRA	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]

Table 22 – VFD Unit Parameters - 48LC 09 Units

						Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must–Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference		
Voltage	Unit Size	Motor Option	Motor P/N	VFD Carrier P/N	VFD Mfr P/N	0–03	0–06	1–20	1–22	1–23	1–24	1–25	1–71	1–73	1–82	1–90	3–10 [0]	3–10 [1]	3–10 [2]
208/230V	09	STD	HD56FR233	HK30WA370	131L9795	[1]	[102]	[9]	230	60	5.8	1695	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	09	STD	HD56FR463	HK30WA376	131L9863	[1]	[122]	[9]	460	60	2.9	1690	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	09	STD	HD56FR579	HK30WA382	131N0225	[1]	[132]	[9]	575	60	3.1	1690	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	09	MID	HD56FE653	HK30WA371	131L9796	[1]	[102]	[10]	230	60	7.9	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	09	MID	HD56FE653	HK30WA377	131L9864	[1]	[122]	[10]	460	60	3.6	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	09	MID	HD56FE577	HK30WA382	131N0225	[1]	[132]	[11]	575	60	3.8	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	09	HIGH	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	09	HIGH	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	09	HIGH	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	09	ULTRA	HD60FK658	HK30WA372	131L9797	[1]	[102]	[13]	230	60	13.6	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	09	ULTRA	HD60FK658	HK30WA379	131L9866	[1]	[122]	[13]	460	60	6.8	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	09	ULTRA	HD60FE576	HK30WA387	134F0217	[1]	[132]	[13]	575	60	6.0	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%

			Preset Reference (cont)					Ramp Up Time (Sec)	Ramp Down Time (Sec)	Current Limit	Terminal 18 Digital Input	Terminal 19 Digital Input	Terminal 27 Digital Input	Terminal 29 Digital Input	Terminal 53 Low Voltage	Terminal 53 High Voltage	Terminal 53 Low Reference	Terminal 53 High Reference	Reset Mode	Auto. Restart Time (S)	RFI Filter
Voltage	Unit Size	Motor Option	3–10 [3]	3–10 [4]	3–10 [5]	3–10 [6]	3–10 [7]	3–41	3–42	4–18	5–10	5–11	5–12	5–13	6–10	6–11	6–14	6–15	14–20	14–21	14–50
208/230V	09	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	09	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	09	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	09	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	09	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	09	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	09	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	09	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	09	HIGH	100%	100%	0%	0%	0%5	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	09	ULTRA	100%	100%	0%	0%	0%5	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	09	ULTRA	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	09	ULTRA	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]

Table 23 – VFD Unit Parameters - 48LC 12 Units

						Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must–Hold Amps)	Motor Nominal Speed (rpm)	Star Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference		
Voltage	Unit Size	Motor Option	Motor P/N	VFD Carrier P/N	VFD Mfr P/N	0–03	0–06	1–20	1–22	1–23	1–24	1–25	1–71	1–73	1–82	1–90	3–10 [0]	3–10 [1]	3–10 [2]
208/230V	12	STD	HD56FE653	HK30WA371	131L9796	[1]	[102]	[10]	230	60	7.9	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	12	STD	HD56FE653	HK30WA377	131L9864	[1]	[122]	[10]	460	60	3.6	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	12	STD	HD56FE577	HK30WA382	131N0225	[1]	[132]	[11]	575	60	3.8	1680	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	12	MID	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	12	MID	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	12	MID	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
208/230V	12	HIGH	HD60FK658	HK30WA372	131L9797	[1]	[102]	[13]	230	60	13.6	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
460V	12	HIGH	HD60FK658	HK30WA379	131L9866	[1]	[122]	[13]	460	60	6.8	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%
575V	12	HIGH	HD60FE576	HK30WA387	134F0217	[1]	[132]	[13]	575	60	6.0	1745	2.0	[1]	1.0	[4]	0%	66.50%	66.50%

			Preset Reference (cont)					Ramp Up Time (Sec)	Ramp Down Time (Sec)	Current Limit	Terminal 18 Digital Input	Terminal 19 Digital Input	Terminal 27 Digital Input	Terminal 29 Digital Input	Terminal 53 Low Voltage	Terminal 53 High Voltage	Terminal 53 Low Reference	Terminal 53 High Reference	Reset Mode	Auto. Restart Time (S)	RFI Filter
Voltage	Unit Size	Motor Option	3–10 [3]	3–10 [4]	3–10 [5]	3–10 [6]	3–10 [7]	3–41	3–42	4–18	5–10	5–11	5–12	5–13	6–10	6–11	6–14	6–15	14–20	14–21	14–50
208/230V	12	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	12	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	12	STD	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	12	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	12	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	12	MID	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
208/230V	12	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
460V	12	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]
575V	12	HIGH	100%	100%	0%	0%	0%	10.00	10.00	100%	[8]	[16]	[17]	[18]	2	[10]	0	[60]	[3]	600	[0]

Table 24 – Unit Wire/Fuse or HACR Breaker Sizing Data

48LC UNIT	NOM. V–Ph–Hz	IFM TYPE	NO C.O. or UNPWR C.O.								w/ PWRD C.O.							
			NO P.E.				w/ P.E. (pwrd fr/ unit)				NO P.E.				w/ P.E. (pwrd fr/ unit)			
			MCA	MAX FUSE or HACR BRKR	DISC. SIZE		MCA	MAX FUSE or HACR BRKR	DISC. SIZE		MCA	MAX FUSE or HACR BRKR	DISC. SIZE		MCA	MAX FUSE or HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA			FLA	LRA			FLA	LRA
08	208/230–3–60	STD	42/42	50/50	44/44	200	46/46	50/50	48/48	204	47/47	60/50	49/49	205	51/50	60/60	54/53	209
		MED	43/43	50/50	45/45	204	47/47	60/60	50/49	208	48/48	60/60	51/50	209	52/52	60/60	55/55	213
		HIGH	47/46	60/50	50/48	254	51/50	60/60	54/53	258	52/51	60/60	55/54	259	56/55	60/60	59/58	263
		ULTRA	50/49	60/60	53/52	265	54/53	60/60	57/56	269	55/54	60/60	58/57	270	58/57	70/70	63/62	274
	460–3–60	STD	23	25	24	102	24	30	26	104	25	30	26	104	27	30	28	106
		MED	23	25	24	104	25	30	26	106	25	30	27	106	27	30	29	108
		HIGH	25	30	26	130	26	30	28	132	27	30	28	132	29	30	30	134
		ULTRA	26	30	28	135	28	30	30	137	28	30	30	137	30	35	32	139
	575–3–60	STD	19	20	20	78	23	25	24	82	21	25	22	80	24	30	26	84
		MED	20	25	21	82	23	25	25	86	21	25	23	84	25	30	27	88
		HIGH	21	25	22	91	24	30	26	95	22	25	24	93	26	30	28	97
		ULTRA	23	25	24	105	26	30	28	109	24	30	26	107	28	30	30	111
09	208/230–3–60	STD	45/45	60/50	46/46	227	49/48	60/60	51/50	231	50/49	60/60	52/52	232	53/53	60/60	56/56	236
		MED	46/46	60/60	48/47	231	50/50	60/60	52/52	235	51/51	60/60	53/53	236	55/54	60/60	58/57	240
		HIGH	50/49	60/60	52/51	281	54/53	60/60	56/55	285	55/54	60/60	58/56	286	58/57	70/70	62/61	290
		ULTRA	53/52	60/60	55/54	292	56/55	60/60	60/59	296	57/56	70/60	61/60	297	61/60	70/70	65/64	301
	460–3–60	STD	24	30	25	113	26	30	27	115	27	30	28	115	28	30	30	117
		MED	25	30	26	115	27	30	28	117	27	30	28	117	29	35	30	119
		HIGH	26	30	28	141	28	30	30	143	29	35	30	143	30	35	32	145
		ULTRA	28	30	29	146	30	35	31	148	30	35	32	148	32	35	34	150
	575–3–60	STD	20	25	21	84	24	25	25	88	22	25	23	86	25	30	27	90
		MED	21	25	22	88	24	30	26	92	22	25	24	90	26	30	28	94
		HIGH	22	25	23	97	25	30	27	101	23	25	25	99	27	30	29	103
		ULTRA	24	25	25	111	27	30	29	115	25	30	27	113	29	35	31	117
012	208/230–3–60	STD	51/50	60/60	52/52	252	54/54	60/60	56/56	256	55/55	60/60	58/57	257	59/59	70/70	62/62	261
		MED	54/53	60/60	56/55	302	58/57	70/70	61/59	306	59/58	70/70	62/61	307	63/62	80/80	66/65	311
		HIGH	57/56	70/70	59/58	313	61/60	80/70	64/63	317	62/61	80/80	65/64	318	66/65	80/80	69/68	322
	460–3–60	STD	26	30	27	126	28	30	29	128	28	30	29	128	30	35	31	130
		MED	27	30	28	152	29	35	30	154	29	35	31	154	31	35	33	156
		HIGH	29	35	30	157	30	35	32	159	31	35	33	159	33	40	35	161
	575–3–60	STD	22	25	23	107	26	30	27	111	24	25	25	109	28	30	29	113
		MED	23	25	24	116	27	30	28	120	25	30	26	118	29	30	30	122
		HIGH	25	30	26	130	29	30	30	134	26	30	28	132	30	35	32	136

See “Legend and Notes for Tables 24 and 25” on page 71.

Table 25 – Unit Wire Sizing Data with Factory-Installed HACR Breaker

48LC UNIT	NOM. V–Ph–Hz	IFM TYPE	NO C.O. or UNPWR C.O.								w/ PWRD C.O.							
			NO P.E.				w/ P.E. (pwrd fr/ unit)				NO P.E.				w/ P.E. (pwrd fr/ unit)			
			MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE		MCA	HACR BRKR	DISC. SIZE	
					FLA	LRA			FLA	LRA			FLA	LRA			FLA	LRA
08	208/230–3–60	STD	42/42	50/50	44/44	200	46/46	50/50	48/48	204	47/47	60/60	49/49	205	51/51	60/60	54/53	209
		MED	43/43	50/50	45/45	204	47/47	60/60	50/49	208	48/48	60/60	51/50	209	52/52	60/60	55/55	213
		HIGH	47/47	60/60	50/48	254	51/51	60/60	54/53	258	52/52	60/60	55/54	259	56/56	60/60	59/58	263
		ULTRA	50/50	60/60	53/52	265	54/54	60/60	57/56	269	55/55	60/60	58/57	270	58/58	70/70	63/62	274
	460–3–60	STD	23	25	24	102	24	30	26	104	25	30	26	104	27	30	28	106
		MED	23	25	24	104	25	30	26	106	26	30	27	106	27	30	29	108
		HIGH	25	30	26	130	26	30	28	132	27	30	28	132	29	30	30	134
		ULTRA	26	30	28	135	28	30	30	137	28	30	30	137	30	35	32	139
	575–3–60	STD	19	20	20	78	23	25	24	82	21	25	22	80	24	30	26	84
		MED	20	25	21	82	23	25	25	86	21	25	23	84	25	30	27	88
		HIGH	21	25	22	91	24	30	26	95	22	25	24	93	26	30	28	97
		ULTRA	23	25	24	105	26	30	28	109	24	30	26	107	28	30	30	111
09	208/230–3–60	STD	45/45	60/60	46/46	227	49/49	60/60	51/50	231	50/50	60/60	52/52	232	53/53	60/60	56/56	236
		MED	46/46	60/60	48/47	231	50/50	60/60	52/52	235	51/51	60/60	53/53	236	55/55	60/60	58/57	240
		HIGH	50/50	60/60	52/51	281	54/54	60/60	56/55	285	55/55	60/60	58/56	286	58/58	70/70	62/61	290
		ULTRA	53/53	60/60	55/54	292	56/56	60/60	60/59	296	57/57	70/70	61/60	297	61/61	70/70	65/64	301
	460–3–60	STD	24	30	25	113	26	30	27	115	27	30	28	115	28	30	30	117
		MED	25	30	26	115	27	30	28	117	27	30	28	117	29	35	30	119
		HIGH	26	30	28	141	28	30	30	143	29	35	30	143	30	35	32	145
		ULTRA	28	30	29	146	30	35	31	148	30	35	32	148	32	35	34	150
	575–3–60	STD	20	25	21	84	24	25	25	88	22	25	23	86	25	30	27	90
		MED	21	25	22	88	24	30	26	92	22	25	24	90	26	30	28	94
		HIGH	22	25	23	97	25	30	27	101	23	25	25	99	27	30	29	103
		ULTRA	24	25	25	111	27	30	29	115	25	30	27	113	29	35	31	117
12	208/230–3–60	STD	51/51	60/60	52/52	252	54/54	60/60	56/56	256	55/55	60/60	58/57	257	59/59	70/70	62/62	261
		MED	54/54	60/60	56/55	302	58/58	70/70	61/59	306	59/59	70/70	62/61	307	63/63	80/80	66/65	311
		HIGH	57/57	70/70	59/58	313	61/61	80/80	64/63	317	62/62	80/80	65/64	318	66/66	80/80	69/68	322
	460–3–60	STD	26	30	27	126	27	30	29	128	28	30	29	128	30	35	31	130
		MED	27	30	28	152	29	35	30	154	29	35	31	154	31	35	33	156
		HIGH	29	35	30	157	30	35	32	159	31	35	33	159	33	40	35	161
	575–3–60	STD	22	25	23	107	26	30	27	111	24	25	25	109	28	30	29	113
		MED	23	25	24	116	27	30	28	120	25	30	26	118	29	30	30	122
		HIGH	25	30	26	130	29	30	30	134	26	30	28	132	30	35	32	136

See “Legend and Notes for Tables 24 and 25” on page 71.

Legend and Notes for Tables 24 and 25

LEGEND:

BRKR	–	Circuit breaker
C.O.	–	Convenience outlet
DISC.	–	Disconnect
FLA	–	Full load amps
LRA	–	Locked rotor amps
MCA	–	Minimum circuit amps
P.E.	–	Power exhaust
Pwrd fr/ unit	–	Powered from unit
PWRD C.O.	–	Powered convenience outlet
UNPWR C.O.	–	Unpowered convenience outlet

NOTES:

1. In compliance with NEC requirements for multimotor and combination load equipment (refer to NEC Articles 430 and 440), the overcurrent protective device for the unit shall be fuse or HACR breaker. Canadian units may be fuse or circuit breaker.
2. For 208/230 v units, where one value is shown it is the same for either 208 or 230 volts.
3. **Unbalanced 3-Phase Supply Voltage**
   Never operate a motor where a phase imbalance in supply voltage is greater than 2%. Use the following formula to determine the percentage of voltage imbalance.

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

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.
(AB) 227 – 224 = 3 v
(BC) 231 – 227 = 4 v
(AC) 227 – 226 = 1 v
Maximum deviation is 4 v.
Determine percent of voltage imbalance.

$$\% \text{ Voltage Imbalance} = 100 \times \frac{4}{227} = 1.76\%$$

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.

Smoke Detectors

Smoke detectors are available as factory-installed options on 48LC 08-12 units. Smoke detectors may be specified for Supply Air only or for Return Air without or with economizer or in combination of Supply Air and Return Air. Return Air smoke detectors are arranged for vertical return configurations only. 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 the Integrated Staging Control (ISC) 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. 73 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. 74, Step 1. Save the screws.
2. Turn the assembly 90 degrees and then rotate end to end. Make sure that the elbow fitting is pointing down. See Fig. 74, Step 2.
3. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 74, Step 3.
4. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

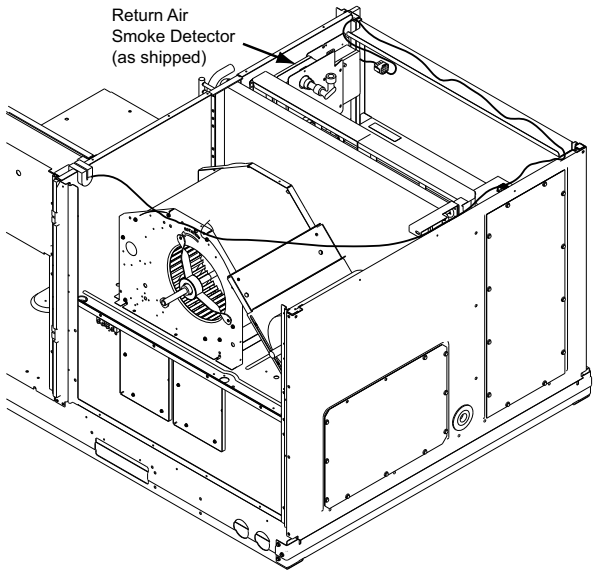


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Fig. 73 - Return Air Smoke Detector, Shipping Position

Additional Application Data —

Refer to *Factory Installed Smoke Detectors for Small and Medium Rooftop Units 2 to 25 Tons* for discussions on additional control features of these smoke detectors including multiple unit coordination.

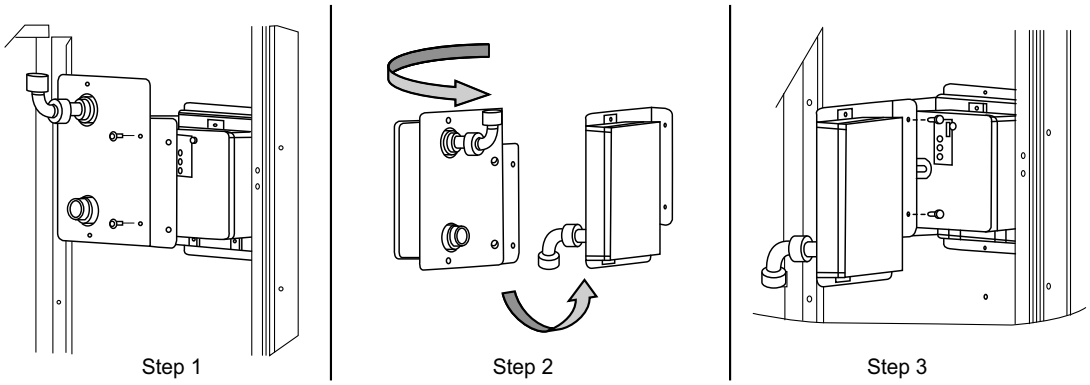

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Fig. 74 - Completing Installation of Return Air Smoke Sensor

Step 13 — Adjust Factory-Installed Options

Smoke Detectors —

Smoke detector(s) will be connected at the Integrated Staging Control (ISC) board, at terminals marked “Smoke Shutdown”. Remove jumper JMP 3 when ready to energize unit.

Step 14 — Install Accessories

Available accessories include:

Roof Curb (must be installed before unit)

Thru-base connection kit (must be installed before unit is set on curb)

EconoMi$er® X (with control)

Power Exhaust

Outdoor enthalpy sensor

Differential enthalpy sensor

CO_2 sensor

Temperature and Humidity sensors

Louvered hail guard

Phase monitor control

Refer to separate installation instructions for information on installing these accessories. See Price Pages for a complete list of field-installed accessories.

Step 15 — Check Belt Tension

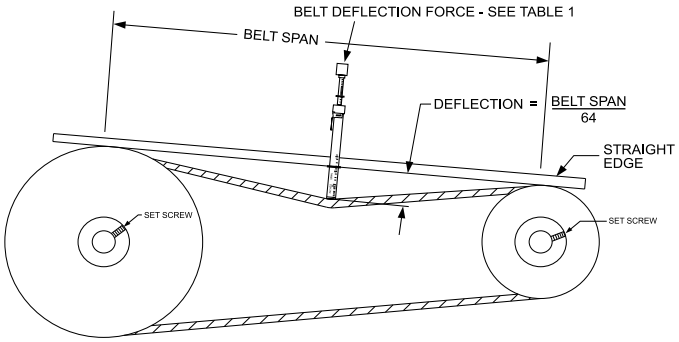
Measure the belt span length as shown in Fig. 75. Calculate the required deflection by multiplying the belt span length by 1/64. For example, if the belt span length is 32 inches: 32 x 1/64 = 1/2 inch deflection.

Belt Force - Deflection Method -

Check the belt tension with a spring-force belt force deflection gauge.

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 gauge to the desired tension (see Table 1 in Fig. 75). 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.

BELT FORCE DEFLECTION METHOD - REQUIRES BELT FORCE - DEFLECTION GAUGE (AVAILABLE FROM DRIVE BELT MANUFACTURER)



TORQUE ALL SHEAVE SET SCREWS TO 110-130 IN LBS.

BELT CROSS SECTION	SMALLEST SHEAVE DIAMETER (IN)	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 TENSION METHOD - REQUIRES BELT TENSION GAUGE THAT MEASURES TENSION IN BELT IN UNITS OF LBS FORCE.

	TENSION FORCE IN BELT (LBS)
NEW	100
USED	80

TABLE 2

48TM002309 REV -

C160146

Fig. 75 - V-Belt Force Label

Adjust belt tension by loosing the motor mounting plate front bolts and rear bolt (see Fig. 76) and sliding 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.

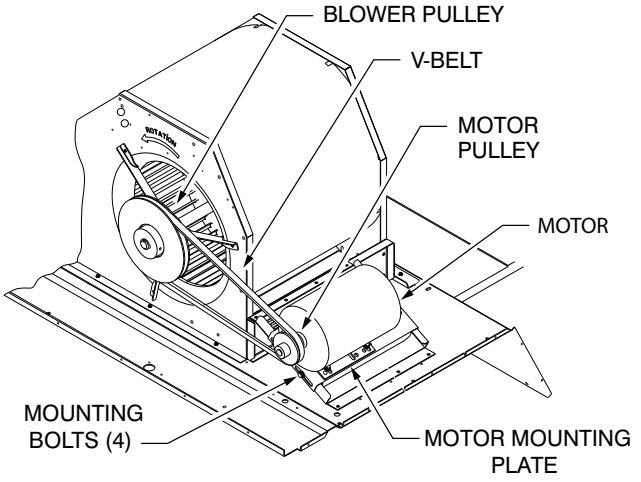


Fig. 76 - Belt Drive Motor Mounting

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).

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UNIT START-UP CHECKLIST

(Remove and Store in Job File)

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

MODEL NO.: _____ SERIAL NO.: _____

I. PRE-START-UP

- ☐ VERIFY THAT ALL PACKAGING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ☐ VERIFY INSTALLATION OF OUTDOOR AIR HOOD
- ☐ VERIFY INSTALLATION OF FLUE EXHAUST AND INLET HOOD
- ☐ VERIFY THAT CONDENSATE CONNECTION IS INSTALLED PER INSTRUCTIONS
- ☐ VERIFY THAT ALL ELECTRICAL CONNECTIONS AND TERMINALS ARE TIGHT
- ☐ VERIFY GAS PRESSURE TO UNIT GAS VALVE IS WITHIN SPECIFIED RANGE
- ☐ CHECK GAS PIPING FOR LEAKS
- ☐ CHECK THAT INDOOR-AIR FILTERS ARE CLEAN AND IN PLACE
- ☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
- ☐ VERIFY THAT UNIT IS LEVEL
- ☐ CHECK FAN WHEELS AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND VERIFY SETSCREW IS TIGHT
- ☐ VERIFY THAT FAN SHEAVES ARE ALIGNED AND BELTS ARE PROPERLY TENSIONED
- ☐ VERIFY THAT SCROLL COMPRESSORS ARE ROTATING IN THE CORRECT DIRECTION
- ☐ VERIFY INSTALLATION OF THERMOSTAT
- ☐ VERIFY THAT CRANKCASE HEATERS HAVE BEEN ENERGIZED FOR AT LEAST 24 HOURS

II. 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)

RETURN-AIR TEMPERATURE _____ °F DB _____ °F WB (WET BULB)

COOLING SUPPLY AIR TEMPERATURE _____ °F

GAS HEAT SUPPLY AIR _____ °F

PRESSURES

GAS INLET PRESSURE		_____	IN. WG
GAS MANIFOLD PRESSURE	STAGE 1	_____	IN. WG
	STAGE 2	_____	IN. WG
REFRIGERANT SUCTION	CIRCUIT A	_____	PSIG
	CIRCUIT B	_____	PSIG
REFRIGERANT DISCHARGE	CIRCUIT A	_____	PSIG
	CIRCUIT B	_____	PSIG

- ☐ VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

GENERAL

☐ ECONOMIZER MINIMUM VENT AND CHANGEOVER SETTINGS TO JOB REQUIREMENTS (IF EQUIPPED)

☐ VERIFY SMOKE DETECTOR UNIT SHUTDOWN BY UTILIZING MAGNET TEST

III. HUMIDI-MIZER® SYSTEM START-UP

NOTE: Units equipped with either SystemVu™ or RTU-Open controls have Service Test menus or modes that can assist with the Humidi-MiZer System Start-Up function and provide the means to make the observations listed for this start-up.

STEPS

☐ 1. CHECK CTB FOR JUMPER 5, 6, 7
JUMPER 5, 6, 7 MUST BE CUT AND OPEN

☐ 2. OPEN HUMIDISTAT CONTACTS

☐ 3. START UNIT IN COOLING (CLOSE Y1)

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

F. CHECK FOR CORRECT RAMP-UP OF OUTDOOR FAN MOTOR AS CONDENSER COIL WARMS

☐ 4. CHECK UNIT CHARGE PER CHARGING CHART

☐ 5. .SWITCH UNIT TO HIGH-LATENT MODE (SUBCOOLER) BY CLOSING HUMIDISTAT WITH Y1 CLOSED

OBSERVE

☐ A. REDUCTION IN SUCTION PRESSURE (5 TO 7 PSI EXPECTED)

☐ B. DISCHARGE PRESSURE UNCHANGED

☐ C. LIQUID TEMPERATURE DROPS TO 50 TO 55°F RANGE

☐ D. LSV SOLENOID ENERGIZED (VALVE CLOSES)

☐ 6. SWITCH UNIT TO DEHUMID (REHEAT) BY OPENING Y1

OBSERVE

☐ A. SUCTION PRESSURE INCREASES TO NORMAL COOLING LEVEL

☐ B. DISCHARGE PRESSURE DECREASES (35 TO 50 PSI)

☐ C. LIQUID TEMPERATURE RETURNS TO NORMAL COOLING LEVEL

☐ D. LIQUID SOLENOID VALVE (LSV) ENERGIZED (VALVE CLOSES)

☐ E. DISCHARGE SOLENOID VALVE (DSV) ENERGIZED, VALVE OPENS

☐ 7. WITH UNIT IN DEHUMID MODE CLOSE W1
COMPRESSOR AND OUTDOOR FAN STOP; LSV AND DSV SOLENOIDS DE-ENERGIZED

☐ 8. OPEN W1 RESTORE UNIT TO DEHUMID MODE

☐ 9. OPEN HUMIDISTAT INPUT
COMPRESSOR AND OUTDOOR FAN STOP; LSV AND DSV SOLENOIDS DE-ENERGIZED

☐ 10. RESTORE SETPOINTS FOR THERMOSTAT AND HUMIDISTAT

REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS

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