



# Service and Maintenance Instructions

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
## SAFETY CONSIDERATIONS

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

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

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves.

Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

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

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

### **WARNING**

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

#### WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency or the gas supplier.

### **AVERTISSEMENT**

#### RISQUE D'INCENDIE OU D'EXPLOSION

Si les consignes de sécurité ne sont pas suivies à la lettre, cela peut entraîner la mort, de graves blessures ou des dommages matériels.

Ne pas entreposer ni utiliser d'essence ni autres vapeurs ou liquides inflammables à proximité de cet appareil ou de tout autre appareil.

#### QUE FAIRE SI UNE ODEUR DE GAZ EST DÉTECTÉE

- Ne mettre en marche aucun appareil.
- Ne toucher aucun interrupteur électrique; ne pas utiliser de téléphone dans le bâtiment.
- Quitter le bâtiment immédiatement.
- Appeler immédiatement le fournisseur de gaz en utilisant le téléphone d'un voisin. Suivre les instructions du fournisseur de gaz.
- Si le fournisseur de gaz n'est pas accessible, appeler le service d'incendie.

L'installation et l'entretien doivent être effectués par un installateur ou une entreprise d'entretien qualifié, ou le fournisseur de gaz.

### **WARNING**

#### ELECTRICAL OPERATION HAZARD

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

Before performing service or maintenance operations on unit, LOCKOUT/TAGOUT the main power switch to unit. Electrical shock and rotating equipment could cause severe injury.

### **WARNING**

#### UNIT OPERATION AND SAFETY HAZARD

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

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

### **WARNING**

#### FIRE, EXPLOSION HAZARD

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

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

### **CAUTION**

#### PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

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

## UNIT ARRANGEMENT AND ACCESS

### General

Figures 1 and 2 show general unit arrangement and access locations.

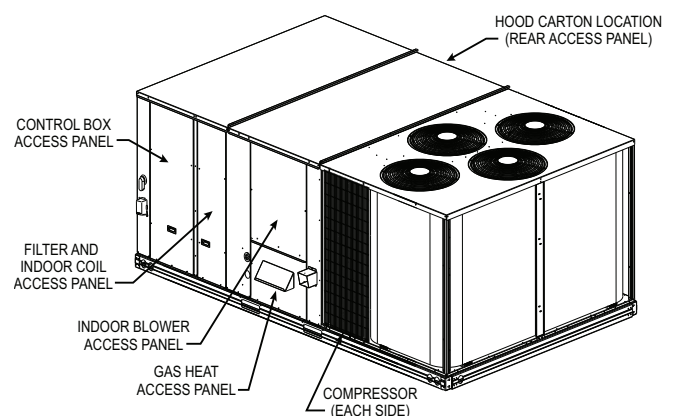
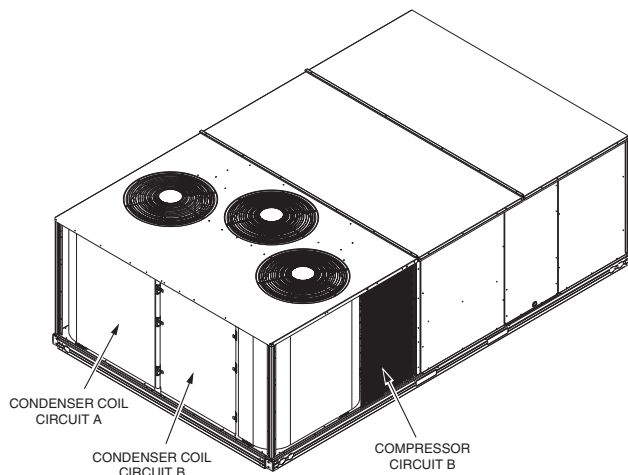


Fig. 1 — Typical Access Panel Locations (Front)



**Fig. 2 — Typical Access Panel Location (Back)**

### Routine Maintenance

These items should be part of a routine maintenance program, to be checked every month or two, until a specific schedule for each can be identified for this installation:

#### QUARTERLY INSPECTION (AND 30 DAYS AFTER INITIAL START)

- Return air filter replacement
- Outdoor hood inlet filters cleaned
- Belt tension checked
- Belt condition checked
- Pulley alignment checked
- Fan shaft bearing locking collar tightness checked
- Condenser coil cleanliness checked
- Condensate drain checked

### Seasonal Maintenance

These items should be checked at the beginning of each season (or more often if local conditions and usage patterns dictate):

#### AIR CONDITIONING

- Condenser fan motor mounting bolts tightness
- Compressor mounting bolts
- Condenser fan blade positioning
- Control box cleanliness and wiring condition
- Wire terminal tightness
- Refrigerant charge level
- Evaporator coil cleaning
- Evaporator blower motor amperage

#### HEATING

- Heat exchanger flue passageways cleanliness
- Gas burner condition
- Gas manifold pressure
- Heating temperature rise

#### ECONOMIZER OR OUTSIDE AIR DAMPER

- Inlet filters condition
- Check damper travel (economizer)
- Check gear and dampers for debris and dirt

#### AIR FILTERS AND SCREENS

Each unit is equipped with return air filters. If the unit has an economizer, it will also have an outside air screen. If a manual outside air damper is added, an inlet air screen will also be present. Each

of these filters and screens will need to be periodically replaced or cleaned.

#### RETURN AIR FILTERS

Return air filters are disposable fiberglass media type. Access to the filters is through the vertical panel to the right of the control box. Filters are situated on slide out racks for easy inspection and repair. (See Fig. 1.)

To remove the filters:

1. Remove vertical filter access door.
2. Reach inside and extract the filters from the filter rack.
3. Replace these filters as required with similar replacement filters of same size.
4. Re-install filter access panel.

**IMPORTANT: DO NOT OPERATE THE UNIT WITHOUT THESE FILTERS!**

#### OUTSIDE AIR HOOD

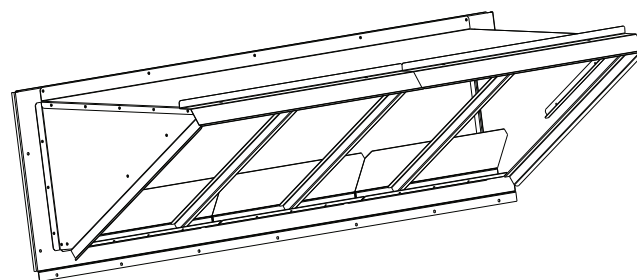
Outside air hood inlet screens are permanent aluminum-mesh type filters. Check these for cleanliness. Remove the screens when cleaning is required. Clean by washing with hot low-pressure water and soft detergent and replace all screens before restarting the unit. Observe the flow direction arrows on the side of each filter frame.

#### Economizer Inlet Air Screen

This air screen is retained by spring clips under the top edge of the hood. (See Fig. 3.)

To remove the filter, remove screws in horizontal filter retainers on leading edge of hood. Move filters into pocket at the end of hood and slide filters out.

To re-install filters, insert clean or new filters into pocket created at the end of the hood, then slide filters into place. Once positioned, re-install horizontal filter retainer.



**Fig. 3 — Filter Installation**

### SUPPLY FAN (BLOWER) SECTION

#### ⚠ CAUTION

#### ELECTRICAL SHOCK HAZARD

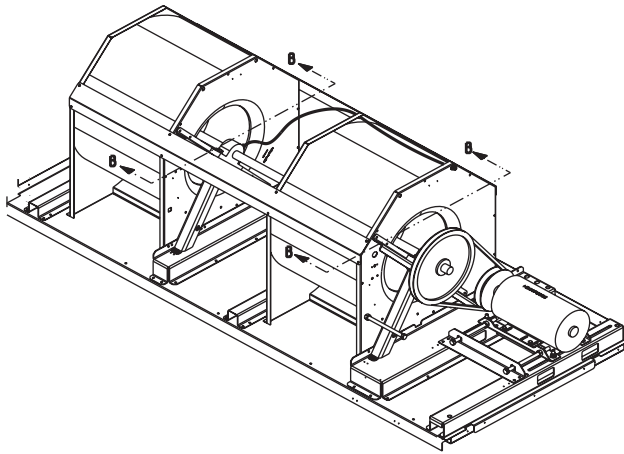
Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on the fan system, shut off all unit power and lockout/tag-out the unit disconnect switch. DO NOT reach into the fan section with power still applied to unit.

#### Supply Fan (Belt-Drive)

The supply fan system consists of a forward-curved centrifugal blower wheel on a solid shaft with two concentric type bearings, one on each side of the blower housing. A fixed-pitch driven pulley is attached to the fan shaft and an adjustable-pitch driver pulley

is on the motor. The pulleys are connected using a “V” type belt. (See Fig. 4.)



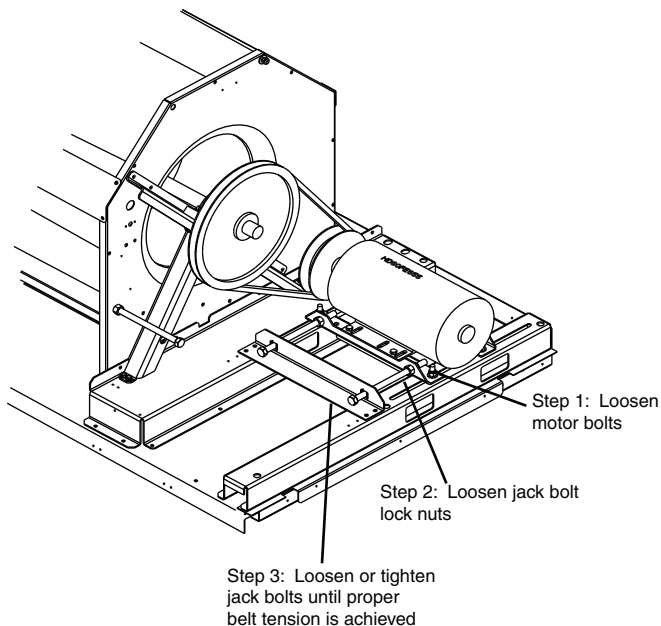
**Fig. 4 — Belt Drive Motor Mounting**

#### BELT

Check the belt condition and tension quarterly. Inspect the belt for signs of cracking, fraying or glazing along the inside surfaces. Check belt tension by using a spring-force tool (such as Browning's Part Number “Belt Tension Checker” or equivalent tool); tension should be 6 lb at a  $\frac{5}{8}$ -in. deflection when measured at the centerline of the belt span. This point is at the center of the belt when measuring the distance between the motor shaft and the blower shaft.

**NOTE:** Without the spring-tension tool, place a straight edge across the belt surface at the pulleys, then deflect the belt at mid-span using one finger to a  $\frac{1}{2}$ -in. deflection.

Adjust the belt tension by loosening the four motor mounting nuts and bolts where the motor bolts to the blower rail. There are two jack bolts and nuts that are used to slide the motor plate to either increase or decrease belt tension. There are locking nuts on the jack bolts that need to be loosened at the motor plate. Turn the jack bolts clockwise or counter clockwise until the correct belt tension is achieved. Ensure the fan shaft and motor shaft are parallel prior to tightening motor plate nuts. (See Fig. 5.)



**Fig. 5 — Adjusting Belt Tension**

#### **To replace the belt:**

1. Use a belt with same section type or similar size. Do not substitute a “FHP” type belt. When installing the new belt, do not use a tool (screwdriver or pry-bar) to force the belt over the pulley flanges, as this will stress the belt and cause a reduction in belt life.
2. Loosen the motor mounting plate front bolts and rear bolts.
3. Push the motor and its mounting plate towards the blower housing as close as possible to reduce the center distance between fan shaft and motor shaft.
4. Remove the belt by gently lifting the old belt over one of the pulleys.
5. Install the new belt by gently sliding the belt over both pulleys and then sliding the motor and plate away from the fan housing until proper tension is achieved.
6. Check the alignment of the pulleys, adjust if necessary.
7. Tighten all bolts.
8. Check the tension after a few hours of runtime and re-adjust as required.

#### ADJUSTABLE-PITCH PULLEY ON MOTOR

The motor pulley is an adjustable-pitch type that allows a servicer to implement changes in the fan wheel speed to match as-installed ductwork systems. The pulley consists of a fixed flange side that faces the motor (secured to the motor shaft) and a movable flange side that can be rotated around the fixed flange side that increases or reduces the pitch diameter of this driver pulley. (See Fig. 6.)

As the pitch diameter is changed by adjusting the position of the movable flange, the centerline on this pulley shifts laterally (along the motor shaft). This creates a requirement for a realignment of the pulleys after any adjustment of the movable flange. Also reset the belt tension after each realignment.

Check the condition of the motor pulley for signs of wear. Glazing of the belt contact surfaces and erosion on these surfaces are signs of improper belt tension and/or belt slippage. Pulley replacement may be necessary.

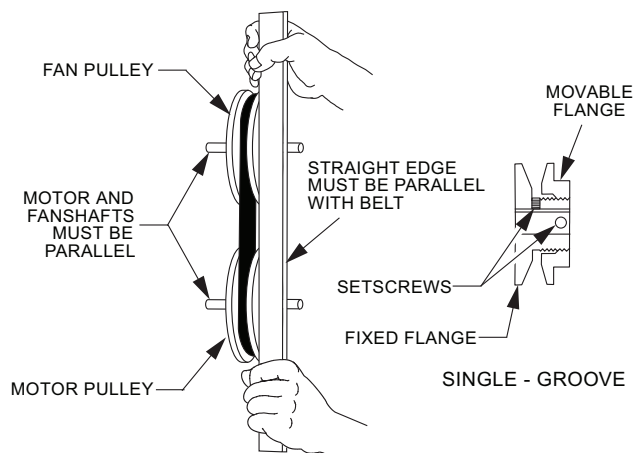
#### **To change fan speed:**

1. Shut off unit power supply and install lock-out tag.
2. Loosen belt by loosening fan motor mounting nuts. (See Fig. 4.)
3. Loosen movable pulley flange setscrew. (See Fig. 6.)
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed maximum speed specified.
5. Set movable flange at nearest keyway of pulley hub and tighten setscrew to torque specifications. Torque pulley set screw to  $72 \pm 5$  in-lb.

#### **To align fan and motor pulleys:**

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft. Make angular alignment by loosening motor from mounting.
3. Tighten fan pulley setscrews and motor mounting bolts to torque specifications.
4. Recheck belt tension.

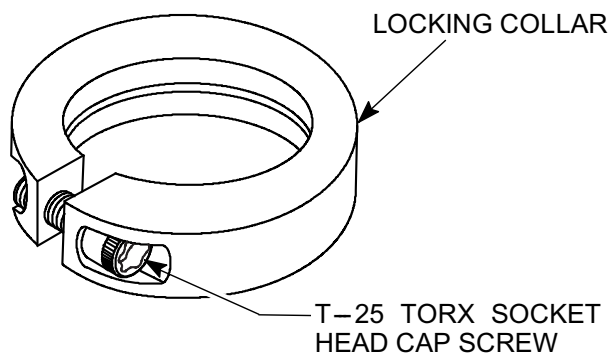




**Fig. 6 — Supply-Fan Pulley Adjustment**

## BEARINGS

This fan system uses bearings featuring concentric split locking collars. The collars are tightened through a cap screw bridging the split portion of the collar. The cap screw has a Torx T25 socket head. To tighten the locking collar: Hold the locking collar tightly against the inner race of the bearing and torque the cap screw to 65 to 70 in-lb (7.4 to 7.9 Nm). (See Fig. 7.)



**Fig. 7 — Tightening Locking Collar**

## MOTOR

When replacing the motor, also replace the external-tooth lock washer (star washer) under the motor mounting base; this is part of the motor grounding system. Ensure the teeth on the lock washer are in contact with the motor's painted base. Tighten motor mounting bolts to  $120 \pm 12$  in-lb.

## CHANGING FAN WHEEL SPEED BY CHANGING PULLEYS

The horsepower rating of the belt is primarily dictated by the pitch diameter of the smaller pulley in the drive system (typically the motor pulley in these units). Do not install a replacement motor pulley with a smaller pitch diameter than provided on the original factory pulley. Change fan wheel speed by changing the fan pulley (larger pitch diameter to reduce wheel speed, smaller pitch diameter to increase wheel speed) or select a new system (both pulleys and matching belt(s)).

Before changing pulleys to increase fan wheel speed, check the fan performance at the target speed and airflow rate to determine new motor loading (bhp). Use the fan performance tables or use the Packaged Rooftop Builder software program. Confirm that the motor in this unit is capable of operating at the new operating condition. Fan shaft loading increases dramatically as wheel speed is increased.

To reduce vibration, replace the motor's adjustable pitch pulley with a fixed pitch pulley (after the final airflow balance adjust-

ment). This will reduce the amount of vibration generated by the motor/belt-drive system.

To determine variable pitch pulley diameter, perform the following calculation:

1. Determine full open and full closed pulley diameter.
2. Subtract the full open diameter from the full closed diameter.
3. Divide that number by the number of pulley turns open from full closed.

This number is the change in pitch datum per turn open.

## EXAMPLE

- Pulley dimensions 2.9 to 3.9 in.(full close to full open)
- $3.9 - 2.9 = 1$
- 1 divided by 5 (turns from full close to full open)
- 0.2 change in pulley diameter per turn open
- $2.9 + 0.2 = 3.1$ -in. pulley diameter when pulley closed one turn from full open

## COOLING

### ⚠ WARNING

#### UNIT OPERATION AND SAFETY HAZARD

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

This system uses R-410A refrigerant, which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gage set, hoses, and recovery system must be designed to handle R-410A refrigerant. If unsure about equipment, consult the equipment manufacturer.

## Evaporator Coil

The evaporator coil is traditional round-tube, plate-fin technology. Tube and fin construction is of various optional materials and coatings (see Appendix A). Coils are multiple-row. On two compressor units, the evaporator coil is a face split design, meaning the two refrigerant circuits are independent in the coil. The bottom portion of the coil will always be circuit A, with the top of the coil being circuit B.

## COIL MAINTENANCE AND CLEANING RECOMMENDATION

Routine cleaning of coil surfaces is essential to maintain proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

### Remove Surface Loaded Fibers

Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush may be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage to the coating of a protected coil) if the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers must be completely removed prior to using low velocity clean water rinse.

### Periodic Clean Water Rinse

A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity

water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

### ***Routine Cleaning of Evaporator Coil Surfaces***

Monthly cleaning with Totaline® environmentally balanced coil cleaner is essential to extend the life of coils. This cleaner is available from Carrier Replacement parts division as part number P902-0301 for one gallon container, and part number P902-0305 for a 5 gallon container. It is recommended that all round tube coil cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline environmentally balanced coil cleaner is non-flammable, hypoallergenic, non-bacterial, and a USDA accepted biodegradable agent that will not harm coil or surrounding components such as electrical wiring, painted metal surfaces, or insulation. Use of non-recommended coil cleaners is strongly discouraged since coil and unit durability could be affected.

### ***Totaline Environmentally Balanced Coil Cleaner Application Equipment***

- 2½ gallon garden sprayer
- Water rinse with low velocity spray nozzle

#### **⚠ CAUTION**

##### **UNIT DAMAGE HAZARD**

Failure to follow this caution may result in accelerated corrosion of unit parts.

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean outdoor or indoor coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the environmentally balanced coil cleaner.

#### **⚠ CAUTION**

##### **UNIT DAMAGE HAZARD**

Failure to follow this caution may result in reduced unit performance or unit shutdown.

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase air-side pressure drop.

### ***Totaline Environmentally Balanced Coil Cleaner Application Instructions***

1. Proper eye protection such as safety glasses is recommended during mixing and application.
2. Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
3. Thoroughly wet finned surfaces with clean water and a low velocity garden hose, being careful not to bend fins.
4. Mix Totaline environmentally balanced coil cleaner in a 2½ gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100°F (38°C).

NOTE: Do NOT USE water in excess of 130°F (54°C), as the enzymatic activity will be destroyed.

1. Thoroughly apply Totaline environmentally balanced coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
2. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
3. Ensure cleaner thoroughly penetrates deep into finned areas.
4. Interior and exterior finned areas must be thoroughly cleaned.
5. Finned surfaces should remain wet with cleaning solution for 10 minutes.
6. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10 minute saturation is achieved.
7. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

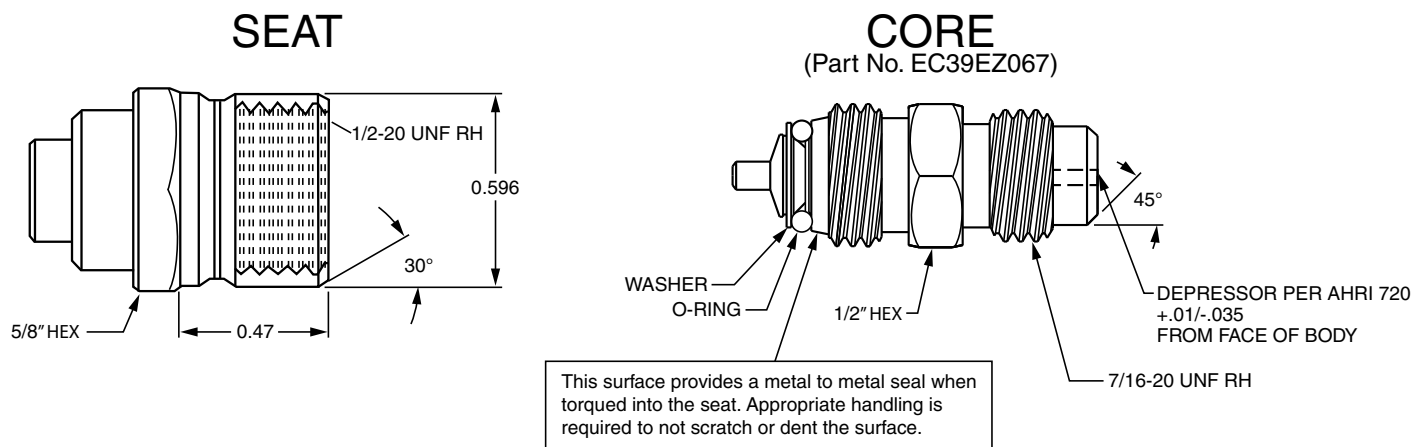
### ***Refrigerant System Pressure Access Ports***

There are two access ports in the system - on the suction tube near the compressor and on the discharge tube near the compressor. These are brass fittings with black plastic caps. The hose connection fittings are standard ¼-in. SAE male flare couplings.

The brass fittings are two-piece high flow valves, with a receptacle base brazed to the tubing and an integral spring-closed check valve core screwed into the base. (See Fig. 8.) This check valve is permanently assembled into this core body and cannot be serviced separately; replace the entire core body if necessary. Service tools are available from RCD that allow the replacement of the check valve core without having to recover the entire system refrigerant charge. Apply compressor refrigerant oil to the check valve core's bottom O-ring. Install the fitting body with 96 ± 10 in-lb of torque; do not overtighten.

### ***Troubleshooting Cooling System***

Refer to Table 1 for additional troubleshooting topics.



**Fig. 8 — CoreMax<sup>1</sup> Access Port Assembly**

**Table 1 — Cooling Service Analysis**

PROBLEM	CAUSE	REMEDY
<b>Compressor and Condenser Fan Will Not Start</b>	Power failure.	Call power company.
	Fuse blown or circuit breaker tripped.	Replace fuse or reset circuit breaker.
	Defective thermostat, contactor, transformer, or control relay.	Replace component.
	Insufficient line voltage.	Determine cause and correct.
	Incorrect or faulty wiring.	Check wiring diagram and rewire correctly.
	Thermostat setting too high.	Lower thermostat setting below room temperature.
<b>Compressor Will Not Start But Condenser Fan Runs</b>	Faulty wiring or loose connections in compressor circuit.	Check wiring and repair or replace.
	Compressor motor burned out, seized, or internal overload open.	Determine cause. Replace compressor.
	Defective run/start capacitor, overload, start relay.	Determine cause and replace.
	One leg of three-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
<b>Compressor Cycles (other than normally satisfying thermostat)</b>	Refrigerant overcharge or undercharge.	Recover refrigerant, evacuate system, and recharge to nameplate.
	Defective compressor.	Replace and determine cause.
	Insufficient line voltage.	Determine cause and correct.
	Blocked condenser.	Determine cause and correct.
	Defective run/start capacitor, overload, or start relay.	Determine cause and correct.
	Defective thermostat.	Replace thermostat.
	Faulty condenser-fan motor or capacitor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
<b>Compressor Operates Continuously</b>	Dirty air filter.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low.	Reset thermostat.
	Low refrigerant charge.	Locate leak; repair and recharge.
	Leaking valves in compressor.	Replace compressor.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser coil dirty or restricted.	Clean coil or remove restriction.
<b>Excessive Head Pressure</b>	Dirty air filter.	Replace filter.
	Dirty condenser coil.	Clean coil.
	Refrigerant overcharged.	Recover excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condenser air restricted or air short-cycling.	Determine cause and correct.
<b>Head Pressure Too Low</b>	Low refrigerant charge.	Check for leaks; repair and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
<b>Excessive Suction Pressure</b>	High head load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.

1. CoreMax is a registered trademark of Fastest, Inc.

**Table 1 — Cooling Service Analysis (cont)**

PROBLEM	CAUSE	REMEDY
<b>Suction Pressure Too Low</b>	Dirty air filter.	Replace filter.
	Low refrigerant charge.	Check for leaks; repair and recharge.
	Metering device or low side restricted.	Remove source of restriction.
	Insufficient evaporator airflow.	Increase air quantity. Check filter and replace if necessary.
	Temperature too low in conditioned area.	Reset thermostat.
	Outdoor ambient below 25°F.	Install low-ambient kit.
<b>Evaporator Fan Will Not Shut Off</b>	Time off delay not finished.	Wait for 30-second off delay.
<b>Compressor Makes Excessive Noise</b>	Compressor rotating in wrong direction.	Reverse the 3-phase power leads.

## PURON® (R-410A) REFRIGERANT

This unit is designed for use with Puron (R-410A) refrigerant. Do not use any other refrigerant in this system.

Puron (R-410A) refrigerant is provided in pink (rose) colored cylinders. These cylinders are available with and without dip tubes; cylinders with dip tubes will have a label indicating this feature. For a cylinder with a dip tube, place the cylinder in the upright position (access valve at the top) when removing liquid refrigerant for charging. For a cylinder without a dip tube, invert the cylinder (access valve on the bottom) when removing liquid refrigerant.

Because Puron (R-410A) refrigerant is a blend, it is strongly recommended that refrigerant always be removed from the cylinder as a liquid. Admit liquid refrigerant into the system in the discharge line. If adding refrigerant into the suction line, use a commercial metering/expansion device at the gage manifold; remove liquid from the cylinder, pass it through the metering device at the gage set and then pass it into the suction line as a vapor. Do not remove Puron (R-410A) refrigerant from the cylinder as a vapor.

### Refrigerant Charge

Amount of refrigerant charge is listed on the unit's nameplate. Refer to Carrier GTAC2-5 Charging, Recovery, Recycling and Reclamation training manual and the following procedures.

Unit panels must be in place when unit is operating during the charging procedure to prepare the unit for charge adjustment.

## NO CHARGE

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant.

## LOW-CHARGE COOLING

Using Cooling Charging Charts (Fig. 9-13), vary refrigerant until the conditions of the appropriate chart are met. Note the charging charts are different from the type normally used. Charts are based on charging the units to the correct subcooling for the various operating conditions. Accurate pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the discharge line. Mount the temperature sensing device on the liquid line leaving the condenser coil and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air cfm must be within the normal operating range of the unit.

## TO USE COOLING CHARGING CHARTS

Select the appropriate unit charging chart from Fig. 9-13. Take the liquid-line temperature and read the discharge pressure gage. Refer to chart to determine what liquid-line temperature should be. If liquid-line temperature is high, add refrigerant. If liquid-line temperature is low, carefully recover some of the charge. Recheck the discharge pressure as charge is adjusted.

### EXAMPLE:

Model 48LC\*\*17

Liquid-Line Temperature ..... 85°F (29°C)

Discharge Pressure..... 350 psig (2413 kPa)

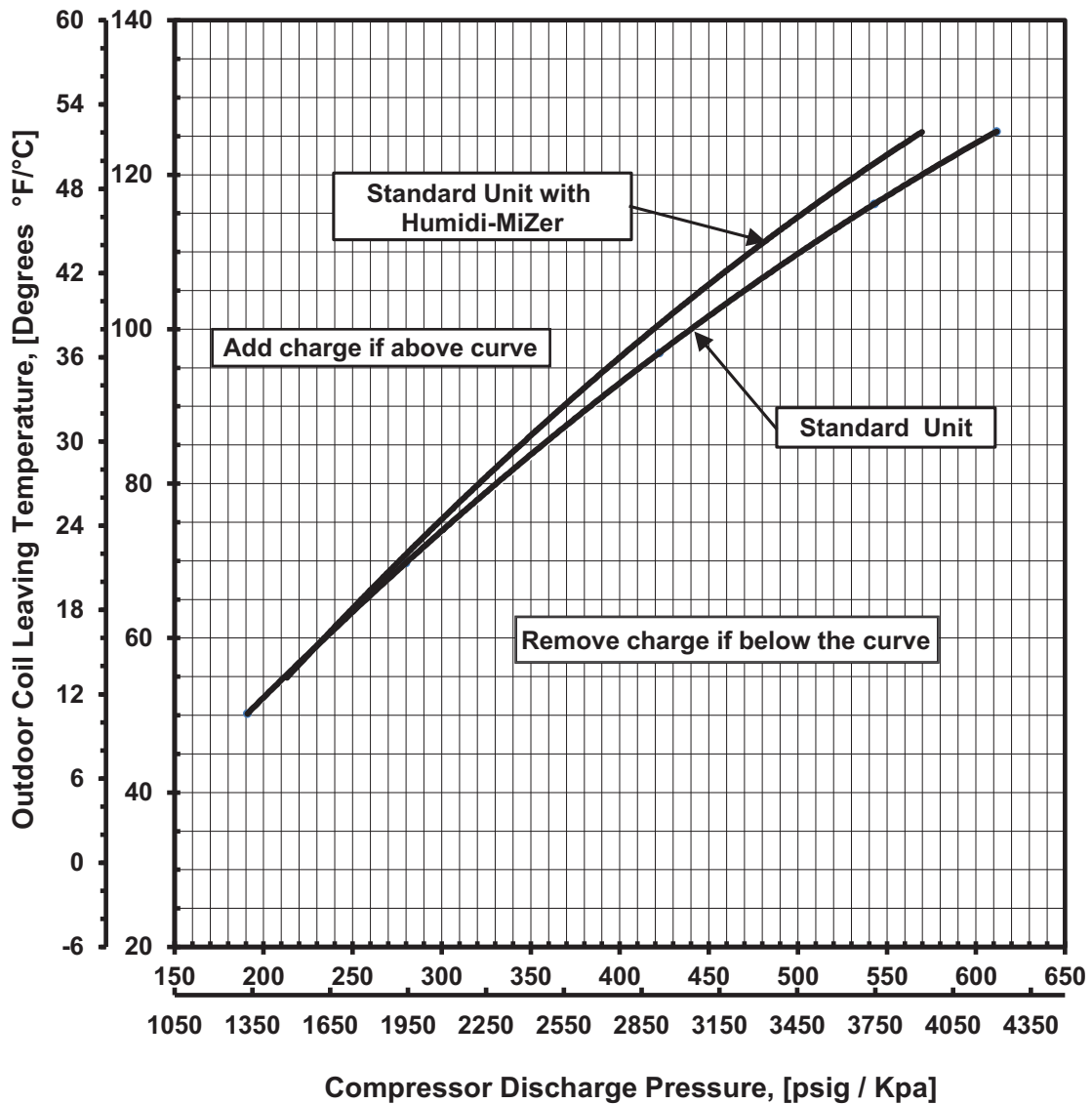


## COOLING CHARGING CHARTS

### 12.5 Ton R-410A CHARGING CHART

For Standard Units: Must run both compressors and OFM at high speed

For Humidi-MiZer Units: Must run Sub-Cooling Mode



50LC500756

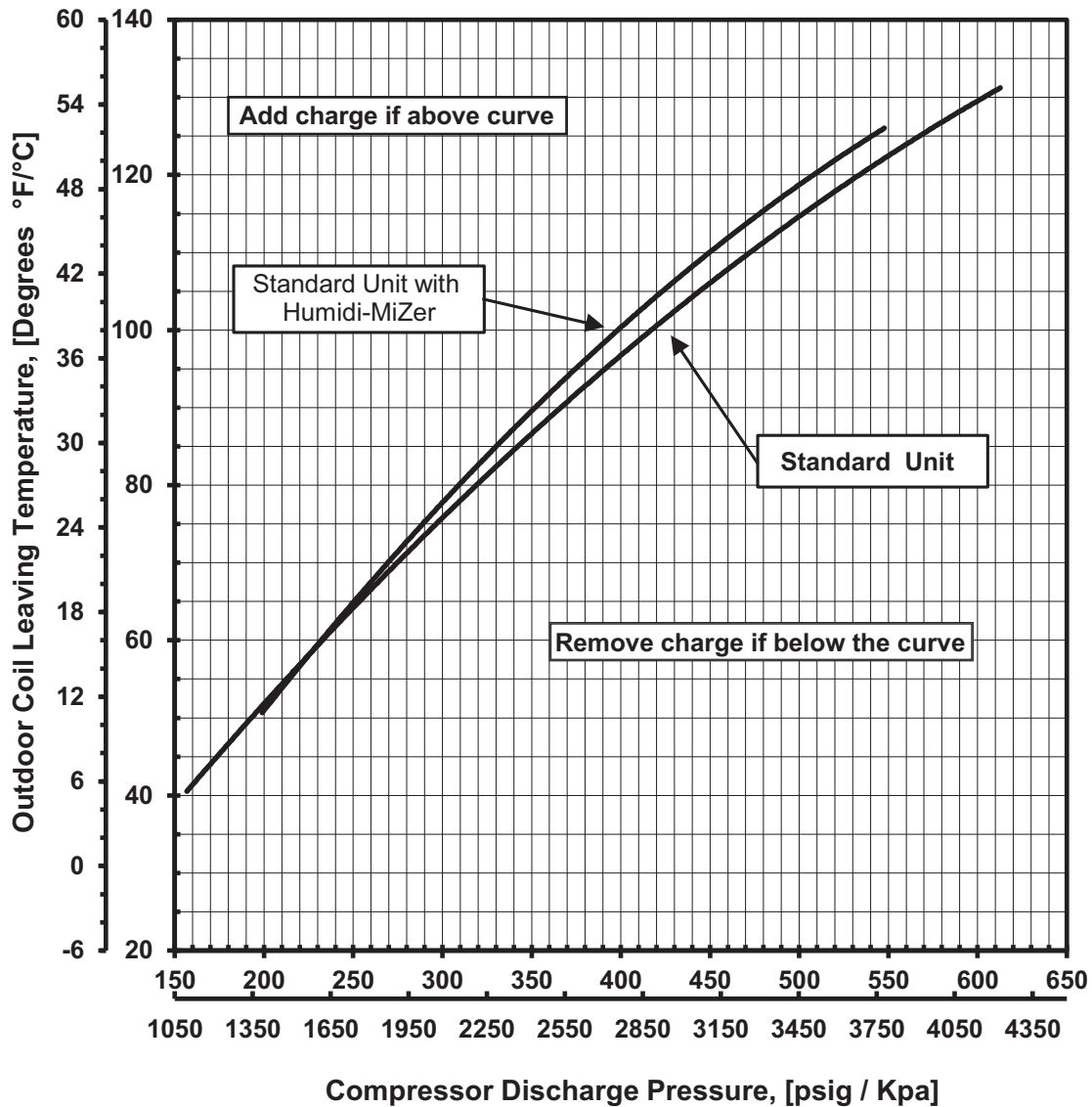
REV-B

Fig. 9 — 48LC\*\*14 Cooling Charging Chart

## 15 Ton R-410A CHARGING CHART

For Standard Units: Must run both compressors and OFM at high speed

For Humidi-MiZer Units: Must run Sub-Cooling Mode



50LC500757

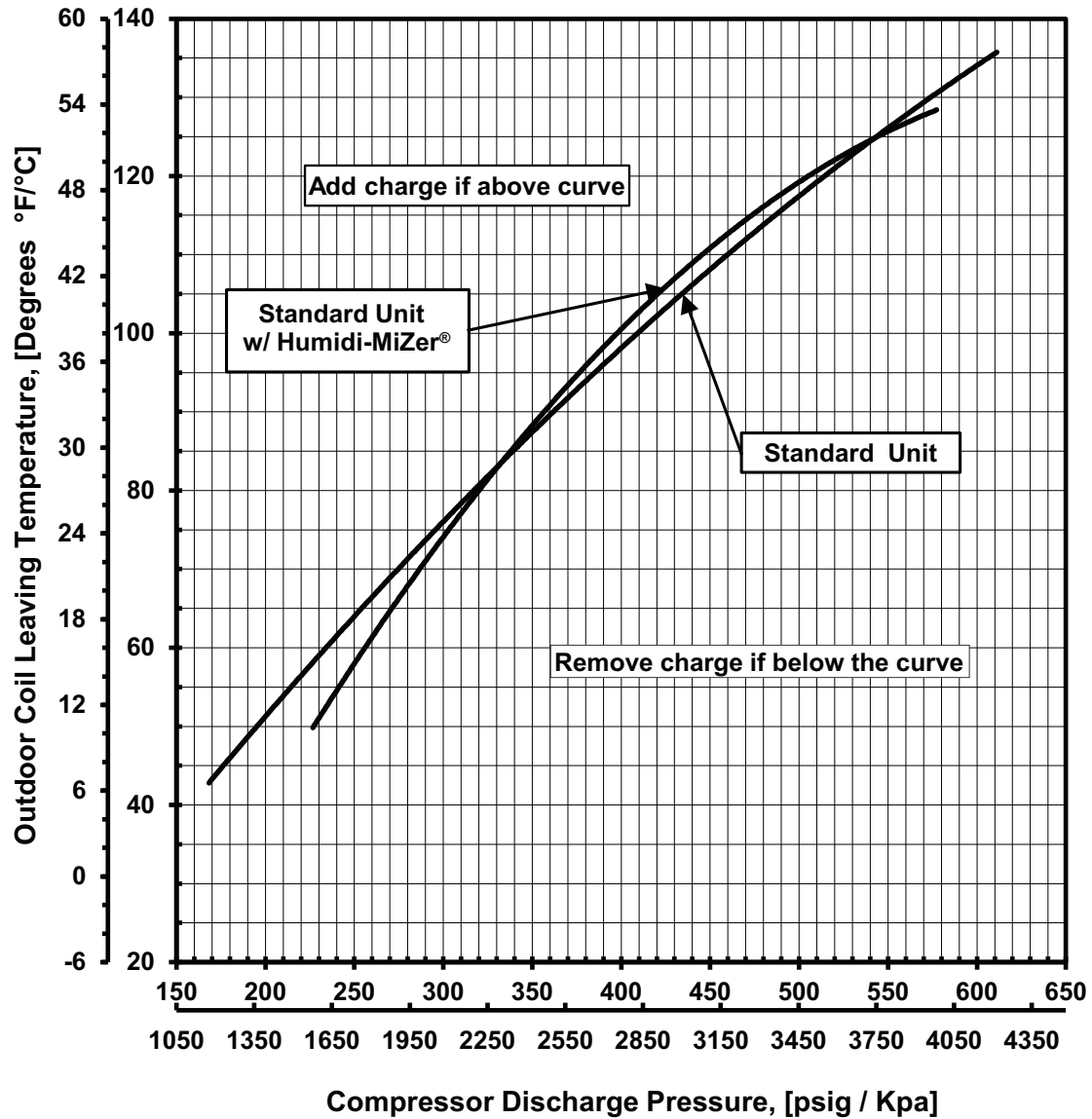
REV-B

Fig. 10 — 48LC\*\*17 Cooling Charging Chart

## 17.5 Ton R-410A CHARGING CHART

For Standard Units: Must run both compressors and OFM at high speed

For Humidi-MiZer Units: Must run Sub-Cooling Mode



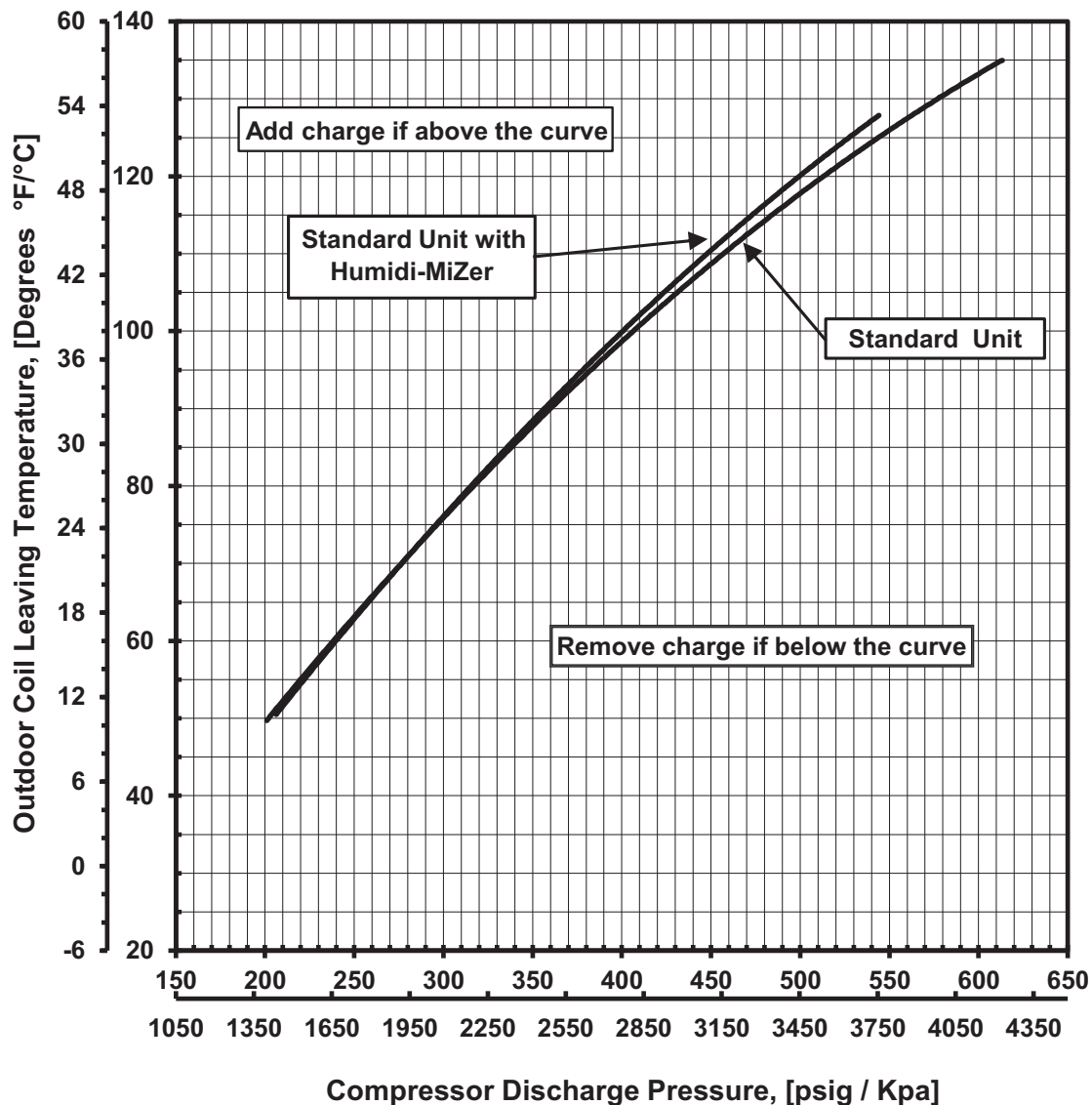
50LC500758

REV-B

Fig. 11 — 48LC\*\*20 Cooling Charging Chart

## 20 Ton R-410A CHARGING CHART

For Standard Units: Must run both compressors and OFM at high speed  
 For Humidi-MiZer Units: Must run Sub-Cooling Mode



50LC500759

REV-B

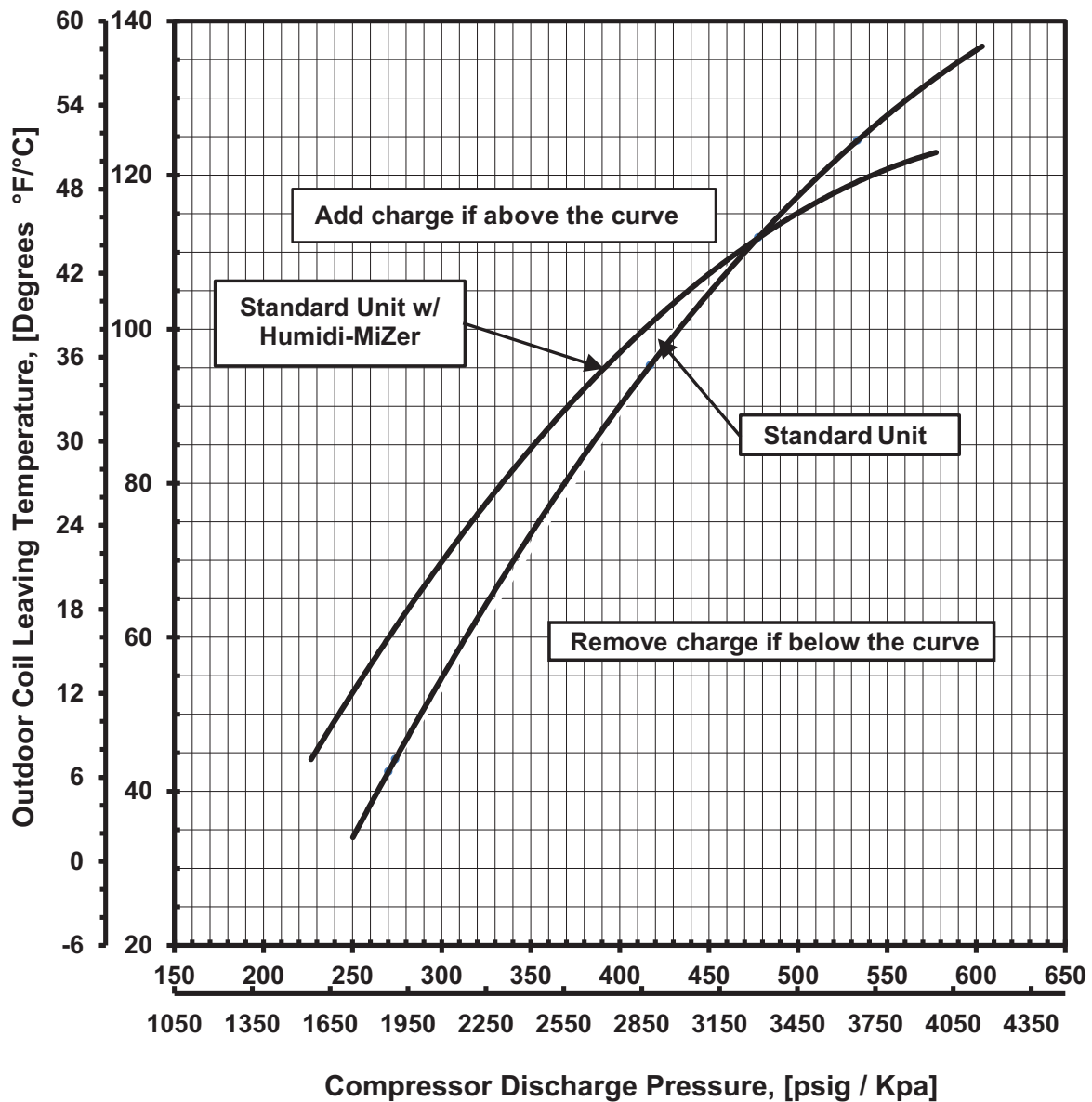
Fig. 12 — 48LC\*\*24 Cooling Charging Chart



## 22.5 Ton R-410A CHARGING CHART

For Standard Units: Must run both compressors and OFM at high speed

For Humidi-MiZer Units: Must run Sub-Cooling Mode



50LC500760

REV-B

Fig. 13 — 48LC\*\*26 Cooling Charging Chart

## Compressors

### LUBRICATION

Compressors are charged with the correct amount of oil at the factory.

#### ⚠ CAUTION

##### UNIT DAMAGE HAZARD

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

The compressor is in a R-410A refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere.

#### ⚠ 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.

### REPLACING COMPRESSOR

The compressor used with Puron refrigerant contains a POE oil. This oil has a high affinity for moisture. Do not remove the compressor's tube plugs until ready to insert the unit suction and discharge tube ends.

1. Remove all sources of power to the unit. Install lock-out tag.
2. Recover refrigerant using environmentally friendly procedures.
3. Remove electrical wires from compressor terminal. Caution must be used when removing wires from compressor terminals. Use pliers, gloves, safety glasses and do not face directly towards the compressor terminals. Terminal blow out could occur.
4. With refrigerant completely recovered, open both sides of manifold gage set. Refrigerant system should now be at ambient pressures.
5. Prior to applying heat and removing compressor, procure a wet quenching cloth and fire extinguisher.
6. Using torch, heat compressor discharge line and remove hot gas tube from compressor.
7. Using torch, heat compressor suction line and remove suction tube from compressor.
8. Remove system filter drier and replace with new.
9. Loosen four compressor retaining bolts and save components for installation of new compressor.
10. Using proper lifting techniques or devices, remove compressor from system.

Compressor mounting bolt torque is 65 to 75 in-lb (7.3 to 8.5 Nm).

### COMPRESSOR ROTATION

On 3-phase units with scroll compressors, it is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

NOTE: If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

4. Note that the evaporator fan is probably also rotating in the wrong direction.
5. Turn off power to the unit.
6. Reverse any two of the unit power leads.
7. Reapply power to the compressor.

The suction and discharge pressure levels should now move to their normal start-up levels.

NOTE: When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling.

### Filter Drier

Replace whenever refrigerant system is exposed to atmosphere. Only use factory specified liquid-line filter driers with working pressures no less than 650 psig. Do not install a suction-line filter drier in liquid line. A liquid-line filter drier designed for use with Puron (R-410A) refrigerant is required on every unit.

### Condenser-Fan Adjustment

1. Shut off unit power supply. Install lockout tag.
2. Remove condenser-fan assembly (grille, motor, and fan).
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in Fig. 14.
5. Tighten setscrews to 84 in-lb (9.5 Nm).
6. Replace condenser-fan assembly.

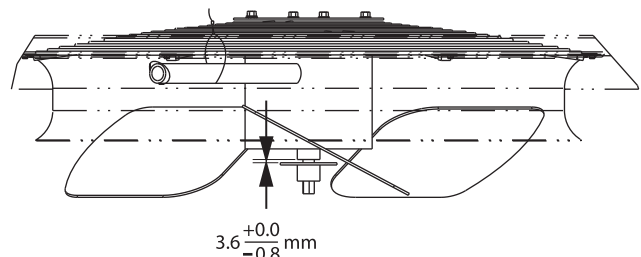


Fig. 14 — Condenser Fan Adjustment

### 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 models: 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 end panel of the unit. (See Fig. 15.)

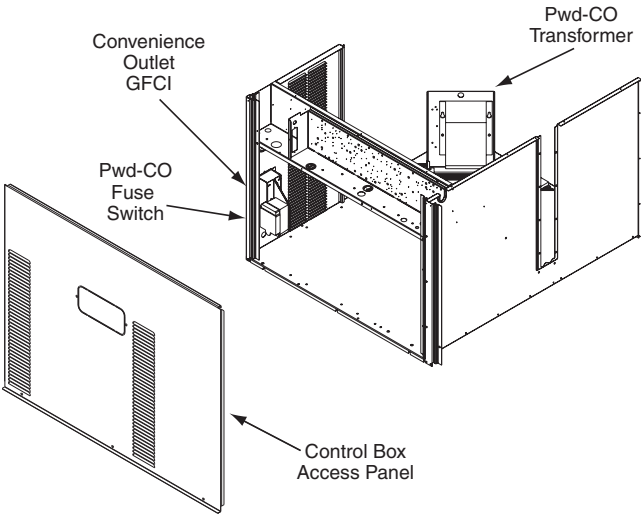


Fig. 15 — Convenience Outlet Location

### Wet in Use Convenience Outlet Cover

The unit has a “wet in use” convenience outlet cover that must be installed on panel containing the convenience outlet. This cover provides protection against moisture entering the GFCI receptacle. This cover is placed in the unit control box during shipment. See Fig. 16.

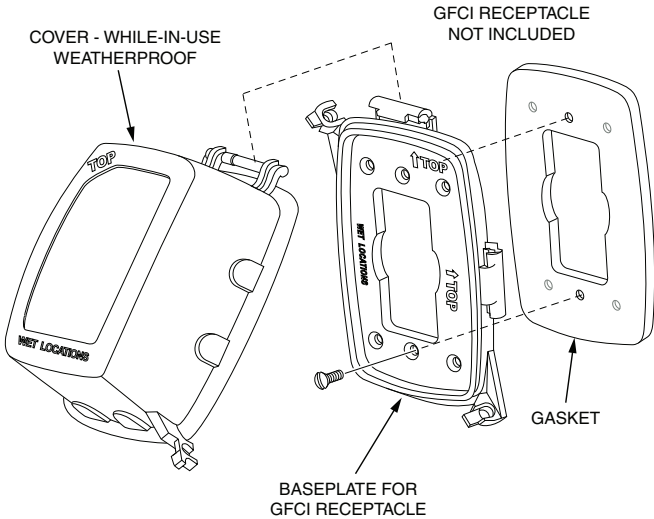


Fig. 16 — Convenience Outlet Cover

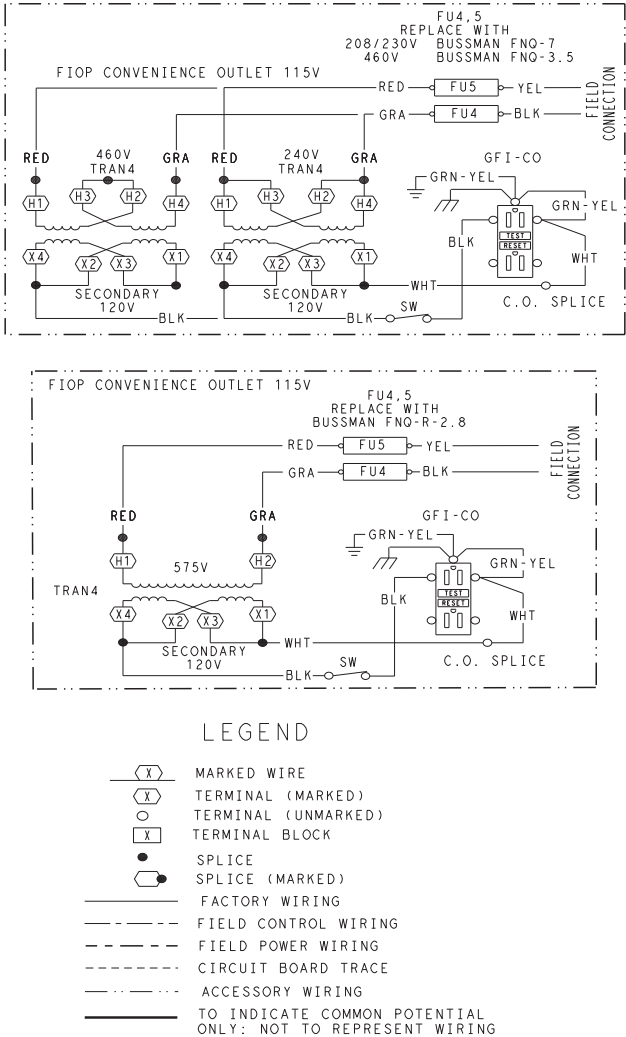
### Non-Powered Type

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

### Unit-Powered Type

A unit-mounted transformer is factory-installed to 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 unit’s control box access panel. (See Fig. 15.)

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 a unit-mounted non-fused disconnect or circuit-breaker switch; this will provide service power to the unit when the unit disconnect switch or circuit-breaker is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect or circuit-breaker is open. (See Fig. 17.)



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. 17 — Powered Convenience Outlet Wiring

### DUTY CYCLE

The unit-powered convenience outlet has a duty cycle limitation. The transformer is intended to provide power on an intermittent basis for service tools, lamps, etc; it is not intended to provide 15 amps loading for continuous duty loads (such as electric heaters for overnight use). Observe a 50% limit on circuit loading above 8 amps (i.e., limit loads exceeding 8 amps to 30 minutes of operation every hour).

## Maintenance

Periodically test the GFCI receptacle by pressing the TEST button on the face of the receptacle. This should cause the internal circuit 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.

## Fuse On Powered Type

The factory fuse is a Bussman<sup>1</sup> “Fusetron” T-15, non-renewable screw-in (Edison base) type plug fuse.

## 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.

## SMOKE DETECTORS

Smoke detectors are available as factory-installed options on 48LC models. Smoke detectors may be specified for supply air only, for return air without or with economizer, or in combination of supply air and return air. 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 unit terminal board may be necessary to complete the unit and smoke detector configuration to meet project requirements.

### System

The smoke detector system consists of a four-wire controller and one or two sensors. Its primary function is to shut down the rooftop unit in order to prevent smoke from circulating throughout the building. It is not to be used as a life saving device.

### Controller

The controller (see Fig. 18) includes a controller housing, a printed circuit board, and a clear plastic cover. The controller can be connected to one or two compatible duct smoke sensors. The clear plastic cover is secured to the housing with a single captive screw for easy access to the wiring terminals. The controller has three LEDs (for Power, Trouble and Alarm) and a manual test/reset button (on the cover face).

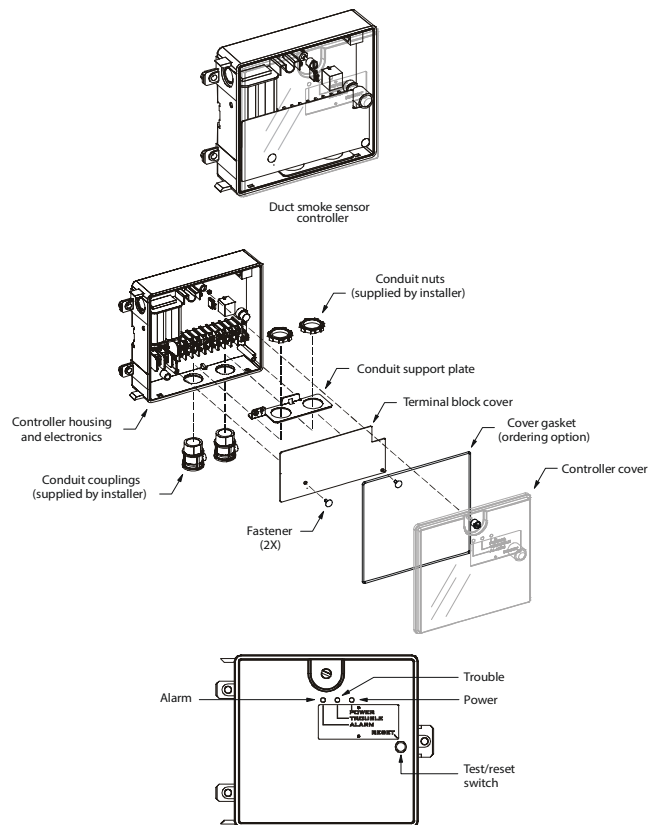


Fig. 18 — Controller Assembly

### Sensor

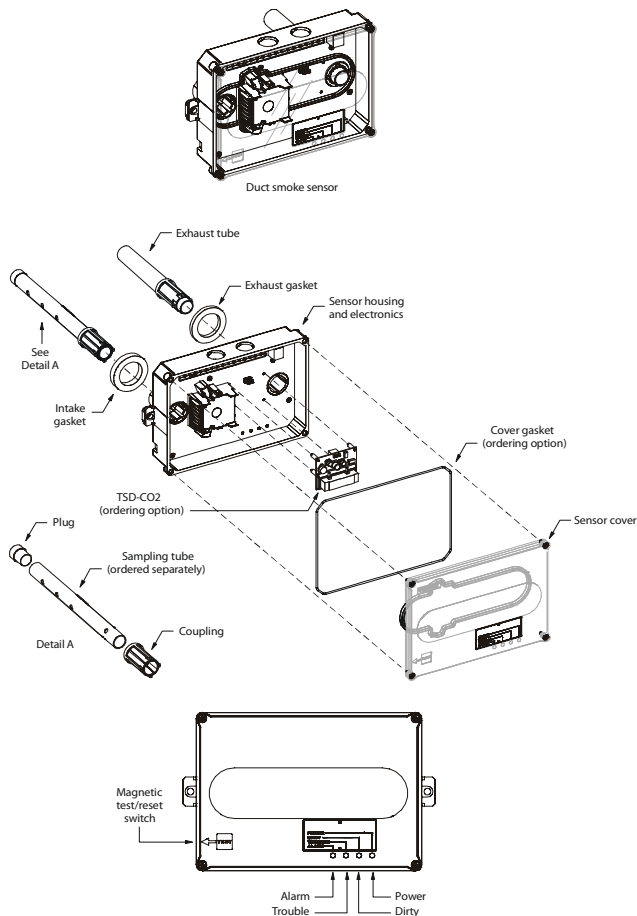
The sensor (see Fig. 19) includes a plastic housing, a printed circuit board, a clear plastic cover, a sampling tube inlet and an exhaust tube. The sampling tube (when used) and exhaust tube are attached during installation. The sampling tube varies in length depending on the size of the rooftop unit. The clear plastic cover permits visual inspections without having to disassemble the sensor. The cover attaches to the sensor housing using four captive screws and forms an airtight chamber around the sensing electronics. Each sensor includes a harness with an RJ45 terminal for connecting to the controller. Each sensor has four LEDs (for Power, Trouble, Alarm and Dirty) and a manual test/reset button (on the left side of the housing).

Air is introduced to the duct smoke detector sensor's sensing chamber through a sampling tube that extends into the HVAC duct and is directed back into the ventilation system through a (shorter) exhaust tube. The difference in air pressure between the two tubes pulls the sampled air through the sensing chamber. When a sufficient amount of smoke is detected in the sensing chamber, the sensor signals an alarm state and the controller automatically takes the appropriate action to shut down fans and blowers, change over air handling systems, notify the fire alarm control panel, etc. The sensor uses a process called differential sensing to prevent gradual environmental changes from triggering false alarms. A rapid change in environmental conditions, such as smoke from a fire, causes the sensor to signal an alarm state but dust and debris accumulated over time does not.

For installations using two sensors, the duct smoke detector does not differentiate which sensor signals an alarm or trouble condition.

1. Bussmann is a trademark of Cooper Technologies Company.



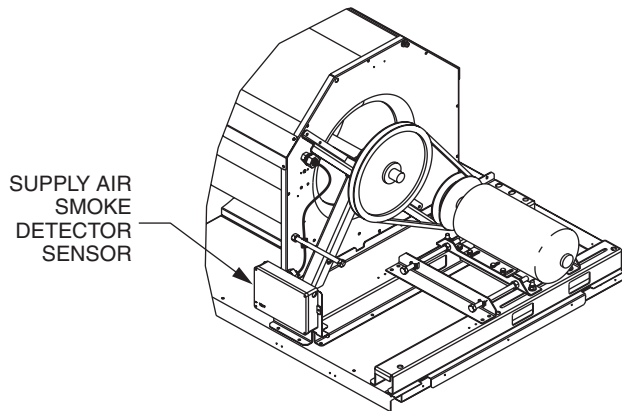


**Fig. 19 — Smoke Detector Sensor**

## Smoke Detector Locations

### SUPPLY AIR

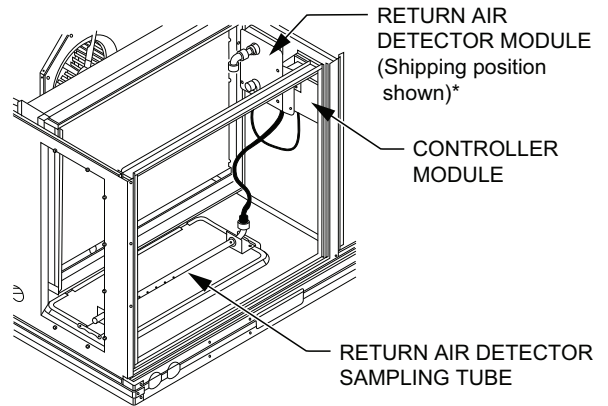
The supply-air smoke detector sensor is located to the left of the unit's indoor (supply) fan. (See Fig. 20.) Access is through the fan access panel. There is no sampling tube used at this location. The sampling tube inlet extends through the side plate of the fan housing (into a high pressure area). The controller is located on a bracket to the right of the return filter, accessed through the lift-off filter panel.



**Fig. 20 — Typical Supply Air Smoke Detector Sensor Location**

### RETURN AIR WITHOUT ECONOMIZER

The sampling tube is located across the return air opening on the unit basepan. (See Fig. 21.) The holes in the sampling tube face downward, into the return air stream. The sampling tube is connected via tubing to the return air sensor that is mounted on a bracket high on the partition between return filter and controller location. (This sensor is shipped in a flat-mounting location. Installation requires that this sensor be relocated to its operating location and the tubing to the sampling tube be connected. See installation steps below.)



\*RA detector must be moved from shipping position to operating position by installer.

**Fig. 21 — Typical Return Air Detector Location**

### Completing Installation of Return-Air Smoke Sensor

1. Unscrew the two screws holding the return air smoke detector assembly. See Fig. 22, 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. 22, Step 2.
3. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 22, Step 3.
4. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

### FIOP Smoke Detector Wiring and Response

All units: FIOP smoke detector is configured to automatically shut down all unit operations when smoke condition is detected. See Fig. 23.

#### HIGHLIGHT A

JMP 3 is factory-cut, transferring unit control to smoke detector.

#### HIGHLIGHT B

Smoke detector NC contact set will open on smoke alarm condition, de-energizing the ORN conductor.

#### HIGHLIGHT C

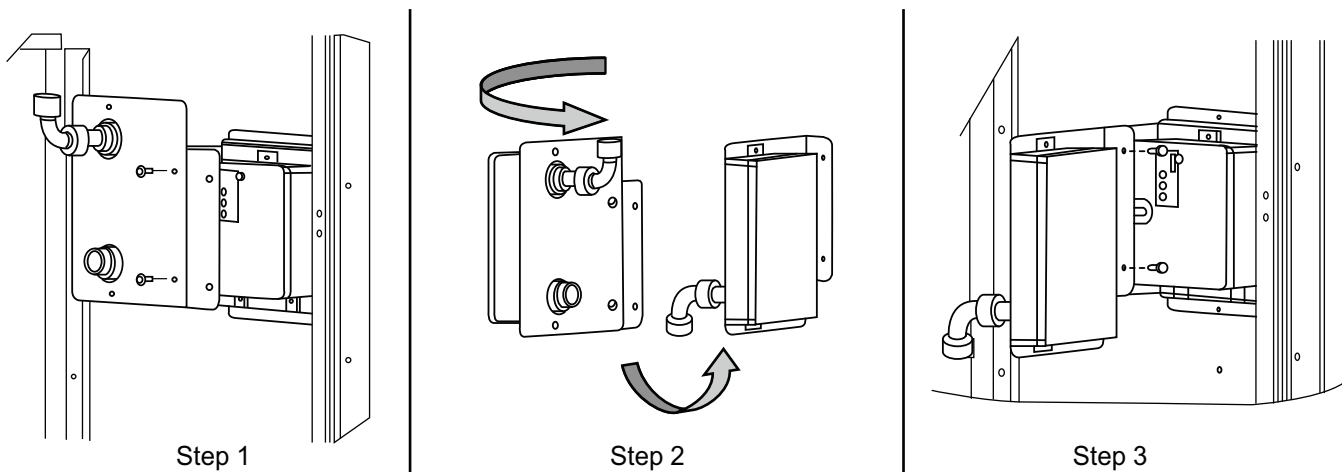
24-v power signal via ORN lead is removed at Smoke Detector input on LCTB; all unit operations cease immediately.

#### HIGHLIGHT D

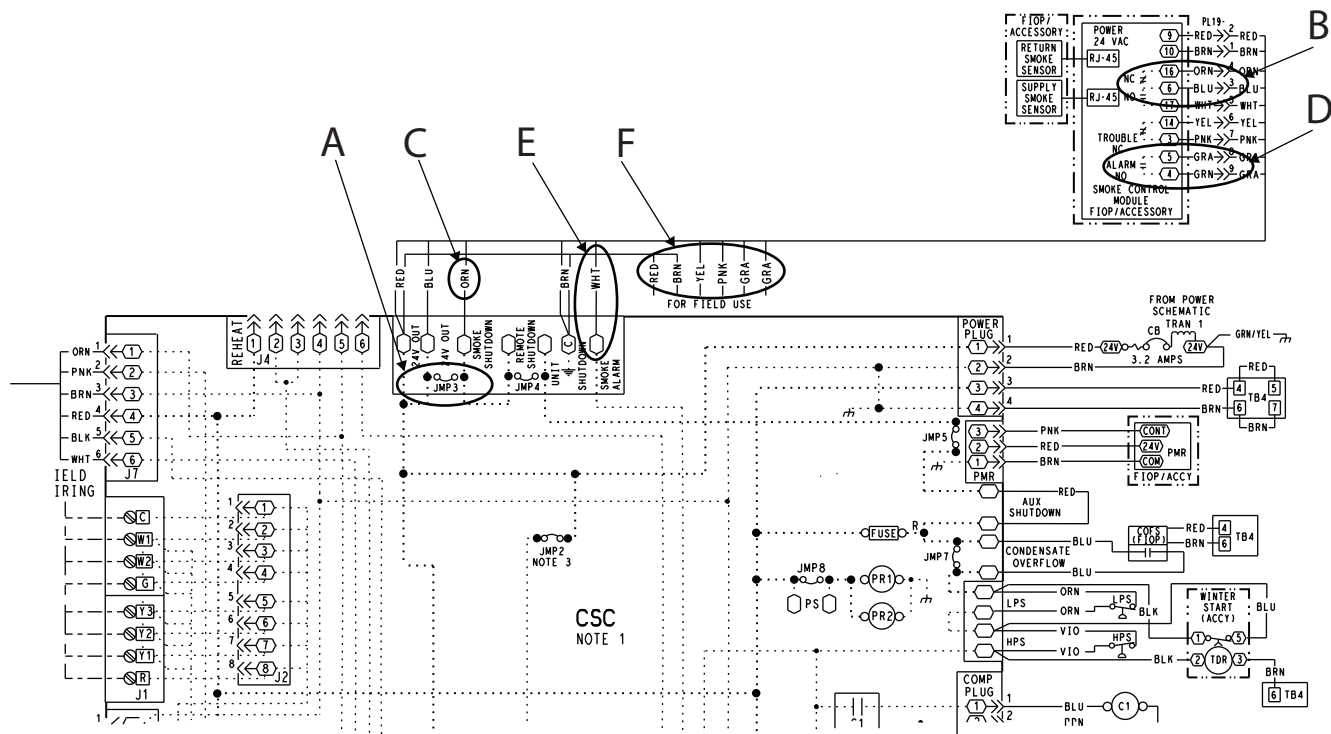
On smoke alarm condition, the smoke detector NO Alarm contact will close, supplying 24-v power to GRA conductor.

#### HIGHLIGHT E

WHT lead at Smoke Alarm input on LCTB provides 24-v signal to FIOP DDC control.



**Fig. 22 — Completing Installation of Return-Air Smoke Sensor**



**Fig. 23 — Typical Smoke Detector System Wiring**

## Sensor and Controller Tests

### SENSOR ALARM TEST

The sensor alarm test checks a sensor's ability to signal an alarm state. This test requires the use of a field-provided SD-MAG test magnet.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

This test places the duct detector into the alarm state. Unless part of the test, disconnect all auxiliary equipment from the controller before performing the test. If the duct detector is connected to a fire alarm system, notify the proper authorities before performing the test.

#### Sensor Alarm Test Procedure

1. Hold the test magnet where indicated on the side of the sensor housing for seven seconds.
2. Verify that the sensor's Alarm LED turns on.

3. Reset the sensor by holding the test magnet against the sensor housing for two seconds.
4. Verify that the sensor's Alarm LED turns off.

### CONTROLLER ALARM TEST

The controller alarm test checks the controller's ability to initiate and indicate an alarm state.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

This test places the duct detector into the alarm state. Disconnect all auxiliary equipment from the controller before performing the test. If the duct detector is connected to a fire alarm system, notify the proper authorities before performing the test.

#### Controller Alarm Test Procedure

1. Press the controller's test/reset switch for seven seconds.
2. Verify that the controller's Alarm LED turns on.

3. Reset the sensor by pressing the test/reset switch for two seconds.
4. Verify that the controller's Alarm LED turns off.

#### DIRTY CONTROLLER TEST

The dirty controller test checks the controller's ability to initiate a dirty sensor test and indicate its results.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

Pressing the controller's test/reset switch for longer than seven seconds will put the duct detector into the alarm state and activate all automatic alarm responses.

#### Dirty Controller Test Procedure

- Press the controller's test/reset switch for two seconds.
- Verify that the controller's Trouble LED flashes.

#### DIRTY SENSOR TEST

The dirty sensor test provides an indication of the sensor's ability to compensate for gradual environmental changes. A sensor that can no longer compensate for environmental changes is considered 100% dirty and requires cleaning or replacing. A field provided SD-MAG test magnet must be used to initiate a sensor dirty test. The sensor's Dirty LED indicates the results of the dirty test as shown in Table 2.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

Holding the test magnet against the sensor housing for more than seven seconds will put the duct detector into the alarm state and activate all automatic alarm responses.

**Table 2 — Dirty LED Test**

FLASHES	DESCRIPTION
1	0-25% dirty. (Typical of a newly installed detector)
2	25-50% dirty
3	51-75% dirty
4	76-99% dirty

#### Dirty Sensor Test Procedure

1. Hold the test magnet where indicated on the side of the sensor housing for two seconds.
2. Verify that the sensor's Dirty LED flashes.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

Changing the dirty sensor test operation will put the detector into the alarm state and activate all automatic alarm responses. Before changing dirty sensor test operation, disconnect all auxiliary equipment from the controller and notify the proper authorities if connected to a fire alarm system.

#### CHANGING THE DIRTY SENSOR TEST

By default, sensor dirty test results are indicated by:

- The sensor's Dirty LED flashing.
- The controller's Trouble LED flashing.
- The controller's supervision relay contacts toggle.

The operation of a sensor's dirty test can be changed so that the controller's supervision relay is not used to indicate test results. When two detectors are connected to a controller, sensor dirty test operation on both sensors must be configured to operate in the same manner.

#### To Configure the Dirty Sensor Test Operation

1. Hold the test magnet where indicated on the side of the sensor housing until the sensor's Alarm LED turns on and its Dirty LED flashes twice (approximately 60 seconds).
2. Reset the sensor by removing the test magnet then holding it against the sensor housing again until the sensor's Alarm LED turns off (approximately two seconds).

#### REMOTE STATION TEST

The remote station alarm test checks a test/reset station's ability to initiate and indicate an alarm state.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

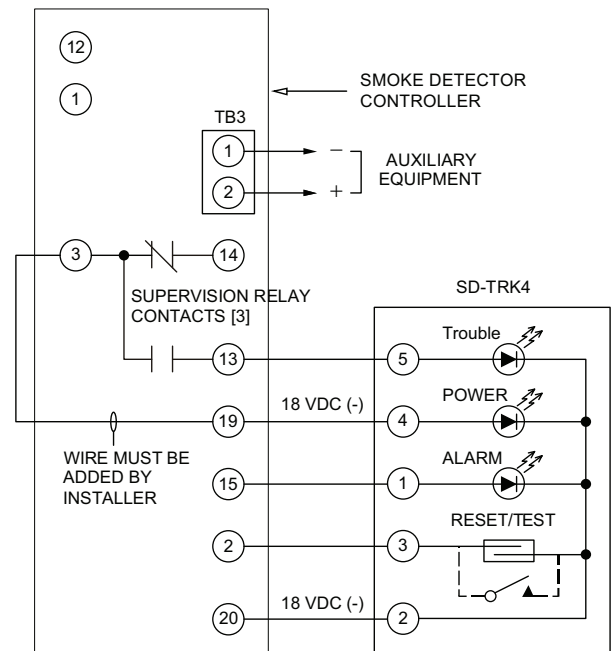
This test places the duct detector into the alarm state. Unless part of the test, disconnect all auxiliary equipment from the controller before performing the test. If the duct detector is connected to a fire alarm system, notify the proper authorities before performing the test.

#### SD-TRK4 REMOTE ALARM TEST PROCEDURE

1. Turn the key switch to the RESET/TEST position for seven seconds.
2. Verify that the test/reset station's Alarm LED turns on.
3. Reset the sensor by turning the key switch to the RESET/TEST position for two seconds.
4. Verify that the test/reset station's Alarm LED turns off.

#### REMOTE TEST/RESET STATION DIRTY SENSOR TEST

The test/reset station dirty sensor test checks the test/reset station's ability to initiate a sensor dirty test and indicate the results. It must be wired to the controller as shown in Fig. 24 and configured to operate the controller's supervision relay. For more information, see "Changing the Dirty Sensor Test."



**Fig. 24 — Remote Test/Reset Station Connections**

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

If the test/reset station's key switch is left in the RESET/TEST position for longer than seven seconds, the detector will automatically go into the alarm state and activate all automatic alarm responses.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

Holding the test magnet to the target area for longer than seven seconds will put the detector into the alarm state and activate all automatic alarm responses.

#### DIRTY SENSOR TEST USING AN SD-TRK4

1. Turn the key switch to the RESET/TEST position for two seconds.
2. Verify that the test/reset station's Trouble LED flashes.

### Detector Cleaning

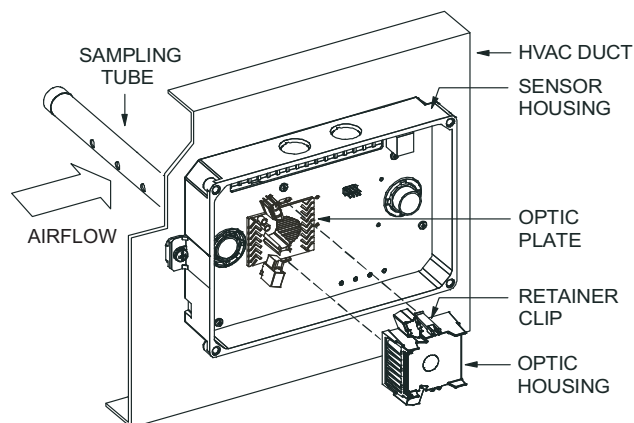
#### CLEANING THE SMOKE DETECTOR

Clean the duct smoke sensor when the Dirty LED is flashing continuously or sooner if conditions warrant.

**IMPORTANT:** Failure to follow this notice may result in personnel and authority concern.

If the smoke detector is connected to a fire alarm system, first notify the proper authorities that the detector is undergoing maintenance then disable the relevant circuit to avoid generating a false alarm.

1. Disconnect power from the duct detector then remove the sensor's cover. (See Fig. 25.)
2. Using a vacuum cleaner, clean compressed air, or a soft bristle brush, remove loose dirt and debris from inside the sensor housing and cover. Use isopropyl alcohol and a lint-free cloth to remove dirt and other contaminants from the gasket on the sensor's cover.
3. Squeeze the retainer clips on both sides of the optic housing then lift the housing away from the printed circuit board.
4. Gently remove dirt and debris from around the optic plate and inside the optic housing.
5. Replace the optic housing and sensor cover.
6. Connect power to the duct detector then perform a sensor alarm test.



**Fig. 25 — Sensor Cleaning Diagram**

### Indicators

#### NORMAL STATE

The smoke detector operates in the normal state in the absence of any trouble conditions and when its sensing chamber is free of smoke. In the normal state, the Power LED on both the sensor and the controller are on and all other LEDs are off.

#### ALARM STATE

The smoke detector enters the alarm state when the amount of smoke particulate in the sensor's sensing chamber exceeds the alarm threshold value. (See Table 3.) Upon entering the alarm state:

- The sensor's Alarm LED and the controller's Alarm LED turn on.
- The contacts on the controller's two auxiliary relays switch positions.
- The contacts on the controller's alarm initiation relay close.
- The controller's remote alarm LED output is activated (turned on).
- The controller's high impedance multiple fan shutdown control line is pulled to ground Trouble state.

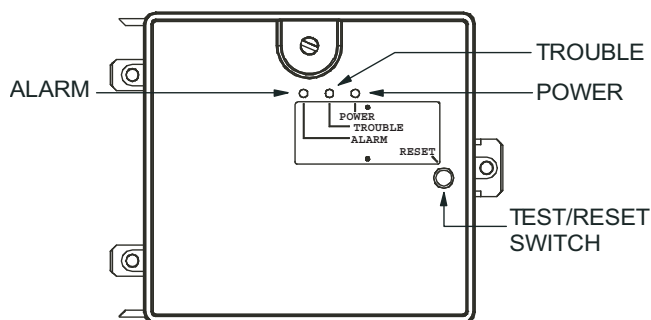
The SuperDuct duct smoke detector enters the trouble state under the following conditions:

- A sensor's cover is removed and 20 minutes pass before it is properly secured.
- A sensor's environmental compensation limit is reached (100% dirty).
- A wiring fault between a sensor and the controller is detected.

An internal sensor fault is detected upon entering the trouble state:

- The contacts on the controller's supervisory relay switch positions. (See Fig. 26.)
- If a sensor trouble, the sensor's Trouble LED the controller's Trouble LED turn on.
- If 100% dirty, the sensor's Dirty LED turns on and the controller's Trouble LED flashes continuously.
- If a wiring fault between a sensor and the controller, the controller's Trouble LED turns on but not the sensor's.

**NOTE:** All troubles are latched by the duct smoke detector. The trouble condition must be cleared and then the duct smoke detector must be reset in order to restore it to the normal state.



**Fig. 26 — Controller Assembly**

**Table 3 — Detector Indicators**

CONTROL OR INDICATOR	DESCRIPTION
<b>Magnetic test/reset switch</b>	Resets the sensor when it is in the alarm or trouble state. Activates or tests the sensor when it is in the normal state.
<b>Alarm LED</b>	Indicates the sensor is in the alarm state.
<b>Trouble LED</b>	Indicates the sensor is in the trouble state.
<b>Dirty LED</b>	Indicates the amount of environmental compensation used by the sensor (flashing continuously = 100%)
<b>Power LED</b>	Indicates the sensor is energized.

## Troubleshooting

### CONTROLLER'S TROUBLE LED IS ON

1. Check the Trouble LED on each sensor connected to the controller. If a sensor's Trouble LED is on, determine the cause and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

### CONTROLLER'S TROUBLE LED IS FLASHING

1. One or both of the sensors is 100% dirty.
2. Determine which Dirty LED is flashing then clean that sensor assembly as described in the detector cleaning section.

### SENSOR'S TROUBLE LED IS ON

1. Check the sensor's Dirty LED. If it is flashing, the sensor is dirty and must be cleaned.
2. Check the sensor's cover. If it is loose or missing, secure the cover to the sensor housing.
3. Replace sensor assembly.

### SENSOR'S POWER LED IS OFF

1. Check the controller's Power LED. If it is off, determine why the controller does not have power and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

### CONTROLLER'S POWER LED IS OFF

1. Make sure the circuit supplying power to the controller is operational. If not, make sure JP2 and JP3 are set correctly on the controller before applying power.
2. Verify that power is applied to the controller's supply input terminals. If power is not present, replace or repair wiring as required.

### REMOTE TEST/RESET STATION'S TROUBLE LED DOES NOT FLASH WHEN PERFORMING A DIRTY TEST, BUT THE CONTROLLER'S TROUBLE LED DOES

1. Verify that the remote test/station is wired as shown in Fig. 24. Repair or replace loose or missing wiring.
2. Configure the sensor dirty test to activate the controller's supervision relay. See "Changing sensor dirty test operation."

### SENSOR'S TROUBLE LED IS ON, BUT THE CONTROLLER'S TROUBLE LED IS OFF

Remove JP1 on the controller.

## PROTECTIVE DEVICES

### Compressor Protection

#### OVERCURRENT

Each compressor has internal linebreak motor protection. Reset is automatic after compressor motor has cooled.

#### OVERTEMPERATURE

Each compressor has an internal protector to protect it against excessively high discharge gas temperatures. Reset is automatic.

#### HIGH PRESSURE SWITCH

Each system is provided with a high pressure switch mounted on the discharge line. The switch is stem-mounted and brazed into the discharge tube. Trip setting is 630 psig  $\pm$  10 psig (4344  $\pm$  69 kPa) when hot. Reset is automatic at 505 psig (3482 kPa).

#### LOW PRESSURE SWITCH

Each system is protected against a loss of charge and low evaporator coil loading condition by a low pressure switch located on the suction line near the compressor. The switch is stem-mounted. Trip setting is 54 psig  $\pm$  5 psig (372  $\pm$  34 kPa). Reset is automatic at 117  $\pm$  5 psig (807  $\pm$  34 kPa).

#### SUPPLY (INDOOR) FAN MOTOR PROTECTION

Disconnect and lockout power when servicing fan motor.

2.9 and 3.7 bhp motors are equipped with an overtemperature or protection device. The type of device depends on the motor size. See Table 4.

The high static option supply fan motor is equipped with a pilot-circuit Thermix combination overtemperature/overcurrent protection device. This device resets automatically. Do not bypass this switch to correct trouble. Determine the cause and correct it.

The Thermik device is a snap-action overtemperature protection device that is imbedded in the motor windings. It is a pilot-circuit device that is wired into the unit's 24-v control circuit. When this switch reaches its trip setpoint, it opens the 24-v control circuit and causes all unit operation to cease. This device resets automatically when the motor windings cool. Do not bypass this switch to correct trouble. Determine the cause and correct it.

The external motor overload device is a specially-calibrated circuit breaker that is UL recognized as a motor overload controller. It is an overcurrent device. When the motor current exceeds the circuit breaker setpoint, the device opens all motor power leads and the motor shuts down. Reset requires a manual reset at the overload switch. This device (designated IFCB) is located on the side of the supply fan housing, behind the fan access panel.

Troubleshooting supply fan motor overload trips: The supply fan used in 48LC units is a forward-curved centrifugal wheel. At a constant wheel speed, this wheel has a characteristic that causes the fan shaft load to DECREASE when the static pressure in the unit-duct system increases and to INCREASE when the static pressure in the unit-duct system decreases (and fan airflow rate increases). Motor overload conditions typically develop when the unit is operated with an access panel removed, with unfinished duct work, in an economizer-open mode, or a leak develops in the duct system that allows a bypass back to unit return opening.



**Table 4 — Overcurrent Device Type**

MOTOR SIZE (bhp)	OVERLOAD DEVICE	RESET
1.7	Internal Linebreak	Automatic
2.4	Internal Linebreak	Automatic
2.9	Thermik	Automatic
3.7	Thermik	Automatic
4.7	External (Circuit Breaker)	Manual

#### CONDENSER FAN MOTOR PROTECTION

The condenser fan motor is internally protected against overtemperature.

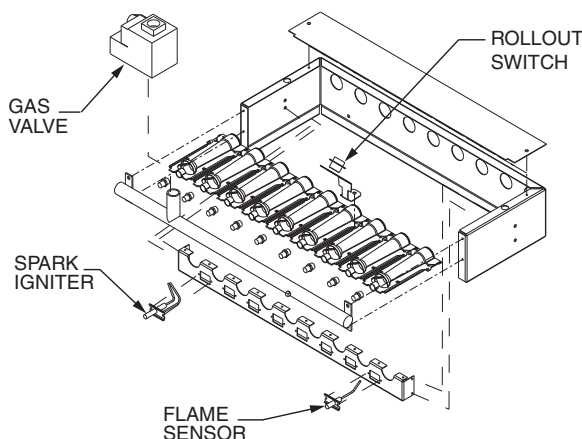
#### Control Circuit, 24-v

The control circuit is protected against overcurrent conditions by a circuit breaker mounted on control transformer TRAN. Reset is manual.

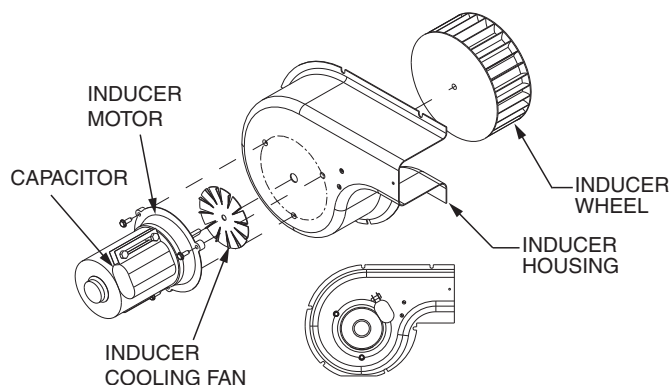
### GAS HEATING SYSTEM

#### General

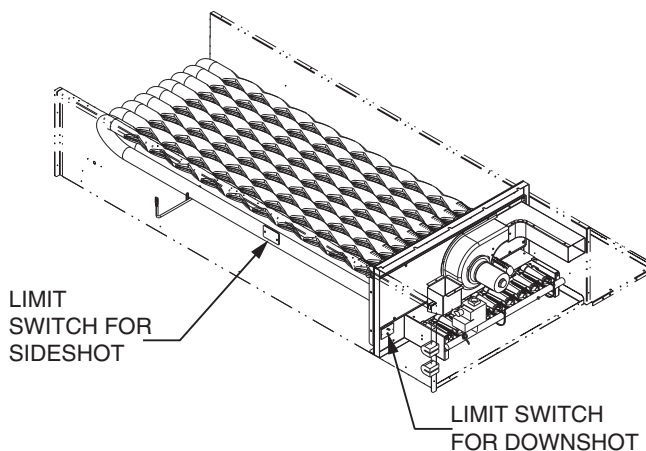
The heat exchanger system consists of a gas valve feeding multiple inshot burners off a manifold. The burners fire into matching primary tubes. The primary tubes discharge into combustion plenum where gas flow converges into secondary tubes. The secondary tubes exit into the induced draft fan wheel inlet. The induced fan wheel discharges into a flue passage and flue gases exit out a flue hood on the side of the unit. The induced draft fan motor includes a Hall Effect sensor circuit that confirms adequate wheel speed via the Integrated Gas Control (IGC) board. Safety switches include a Rollout Switch (at the top of the burner compartment) and a limit switch (mounted through the fan deck, over the tubes). (See Fig. 27-29.)



**Fig. 27 — Burner Section Details**



**Fig. 28 — Inducer Assembly**



**Fig. 29 — Limit Switch Location**

### Fuel Types and Pressures

#### NATURAL GAS

The 48LC unit is factory-equipped for use with Natural Gas (NG) fuel at elevation under 2000 ft (610 m). See section “Orifice Replacement” for information in modifying this unit for installation at elevations above 2000 ft (610 m).

Gas line pressure entering the unit’s main gas valve must be within specified ranges. (See Table 5.) Adjust unit gas regulator valve as required or consult local gas utility.

Manifold pressure is factory-adjusted for NG fuel use. Adjust as required to obtain best flame characteristic. (See Table 6.)

**Table 5 — Natural Gas Supply Line Pressure Ranges**

UNIT MODEL	UNIT SIZE	MIN	MAX
48LC	All	4.0 in. wg (996 Pa)	13.0 in. wg (3240 Pa)

**Table 6 — Natural Gas Manifold Pressure Ranges**

UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE	RANGE
48LC	All	3.5 in. wg (872 Pa)	1.7 in. wg (423 Pa)	2.0 to 5.0 in. wg (Hi) (498 to 1245 Pa)

#### LIQUID PROPANE

Accessory packages are available for field-installation that will convert the 48LC unit to operate with Liquid Propane (LP) fuels. These kits include new orifice spuds, new springs for gas valves and a supply line low pressure switch. See section on “Orifice Replacement” for details on orifice size selections.

Fuel line pressure entering unit gas valve must remain within specified range. (See Table 7.)

Manifold pressure for LP fuel use must be adjusted to specified range. (See Table 8.) Follow instructions in the accessory kit to make initial readjustment.

**Table 7 — Liquid Propane Supply Line Pressure Ranges**

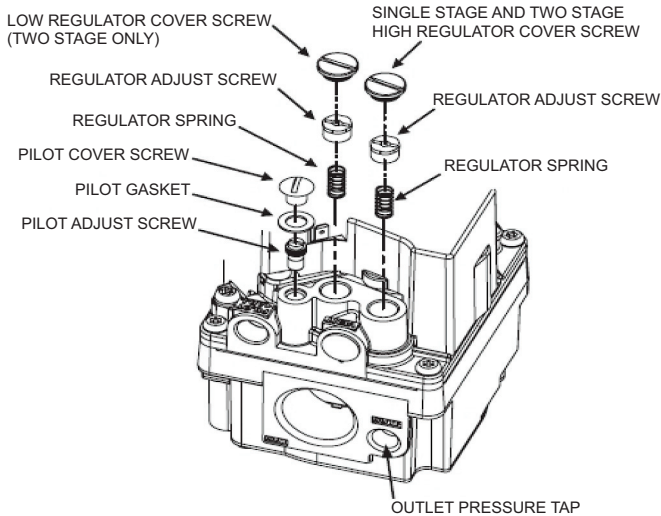
UNIT MODEL	UNIT SIZE	MIN	MAX
48LC	All	11.0 in. wg (2740 Pa)	13.0 in. wg (3240 Pa)

**Table 8 — Liquid Propane Manifold Pressure Ranges**

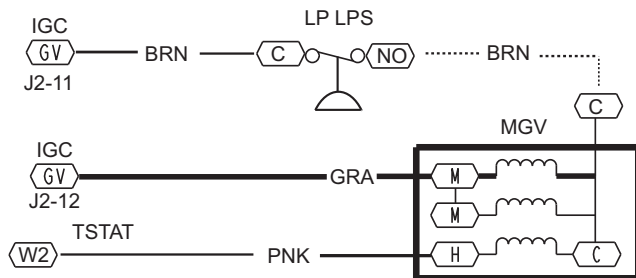
UNIT MODEL	UNIT SIZE	HIGH FIRE	LOW FIRE
48LC	All	10.0 in. wg (2490 Pa)	5.0 in. wg (1245 Pa)

### SUPPLY PRESSURE SWITCH

The LP conversion kit includes a supply low pressure switch. The switch contacts (from terminal C to terminal NO) will open the gas valve power whenever the supply line pressure drops below the setpoint. (See Fig. 30 and 31.) If the low pressure remains open for 15 minutes during a call for heat, the IGC circuit will initiate a Ignition Fault (5 flashes) lockout. Reset of the low pressure switch is automatic on rise in supply line pressure. Reset of the IGC requires a recycle of unit power after the low pressure switch has closed.



**Fig. 30 — LP Low Pressure Switch (Installed)**



**Fig. 31 — LP Supply Line Low Pressure Switch Wiring**

This switch also prevents operation when the propane tank level is low which can result in gas with a high concentration of impurities, additives, and residues that have settled to the bottom of the tank. Operation under these conditions can cause harm to the heat exchanger system. Contact your fuel supplier if this condition is suspected.

### Flue Gas Passageways

To inspect the flue collector box and upper areas of the heat exchanger:

1. Remove the combustion blower wheel and motor assembly according to directions in "Combustion-Air Blower" section. (See Fig. 32.)
2. Remove the flue cover to inspect the heat exchanger.
3. Clean all surfaces as required using a wire brush.

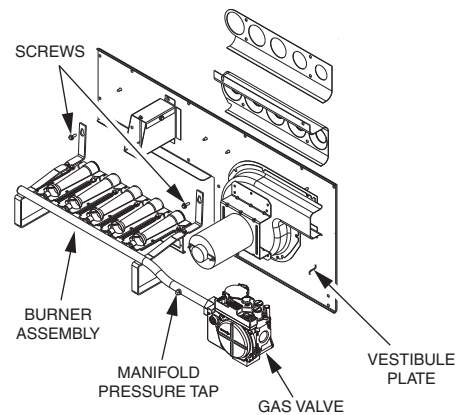
### Combustion-Air Blower

Clean periodically to assure proper airflow and heating efficiency. Inspect blower wheel every fall and periodically during heating season. For the first heating season, inspect blower wheel bi-monthly to determine proper cleaning frequency.

To access burner section, slide the sliding burner partition out of the unit.

To inspect blower wheel, shine a flashlight into draft hood opening. If cleaning is required, remove motor and wheel as follows:

1. Remove the 7 screws that attach induced-draft motor housing to vestibule plate. (See Fig. 32.)
2. The blower wheel can be cleaned at this point. If additional cleaning is required, continue with Steps 4 and 5.
3. To remove blower from the motor shaft, remove 2 setscrews.
4. To remove motor, remove the 4 screws that hold the motor to mounting plate. Remove the motor cooling fan by removing one setscrew. Then remove nuts that hold motor to mounting plate.
5. To reinstall, reverse the procedure outlined above.



**Fig. 32 — Heat Exchanger Assembly**

### Burners and Ignitors

#### CAUTION

#### EQUIPMENT DAMAGE HAZARD

Failure to follow this CAUTION can result in premature wear and damage to equipment.

When working on gas train, do not hit or plug orifice spuds.

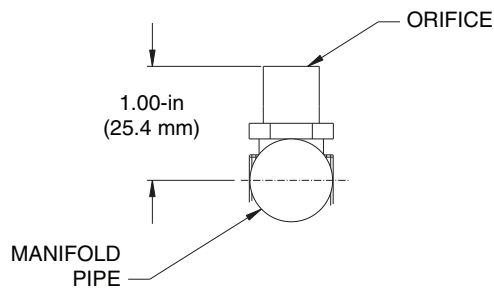
### MAIN BURNERS

To access burners, remove burner access panel and slide out burner partition. At the beginning of each heating season, inspect for deterioration or blockage due to corrosion or other causes. Observe the main burner flames and adjust, if necessary.

#### Orifice projection

Refer to Fig. 33 for maximum projection dimension for orifice face to manifold tube.



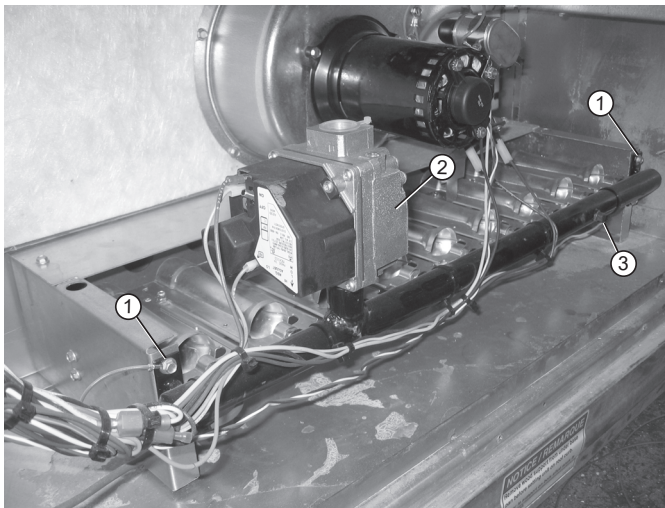


**Fig. 33 — Orifice Projection**

## REMOVAL AND REPLACEMENT OF GAS TRAIN

See Fig. 27, 32, and 34.

1. Shut off gas at the manual shut off located on the gas supply line, then turn off gas valve switch located on gas valve (ON/OFF).
2. Shut off power to unit and install lockout tag.
3. Disconnect gas piping at unit gas valve.
4. Remove wires connected to gas valve. Mark each wire.
5. Remove igniter wires and sensor wires at the Integrated Gas Unit Controller (IGC). (See Fig. 35.)
6. Remove the 2 screws that attach the burner rack to the vestibule plate. (See Fig. 32.)
7. Slide the burner tray out of the unit. (See Fig. 34.)
8. To reinstall, reverse the procedure outlined above.

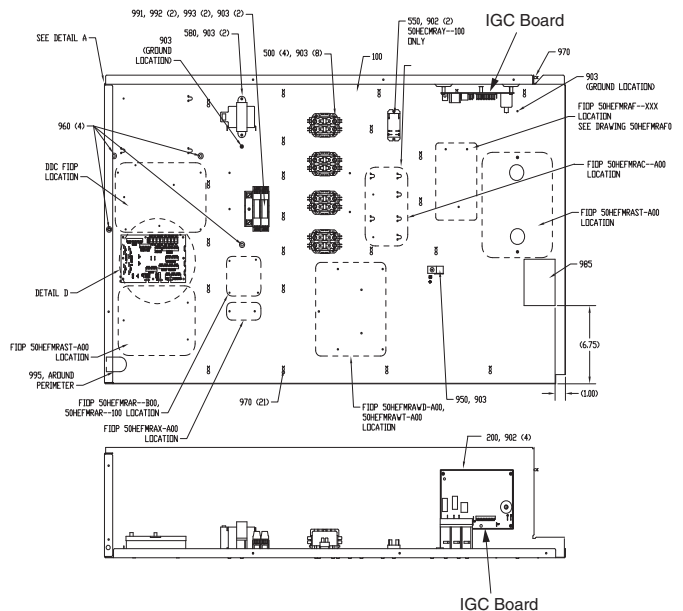


ITEM NUMBER	DESCRIPTION
1	Gas Manifold Mounting Screws (qty 2)
2	Gas Valve Inlet Plug
3	Propane Conversion Label (apply label where indicated)
4	Gas Manifold Pressure Tap

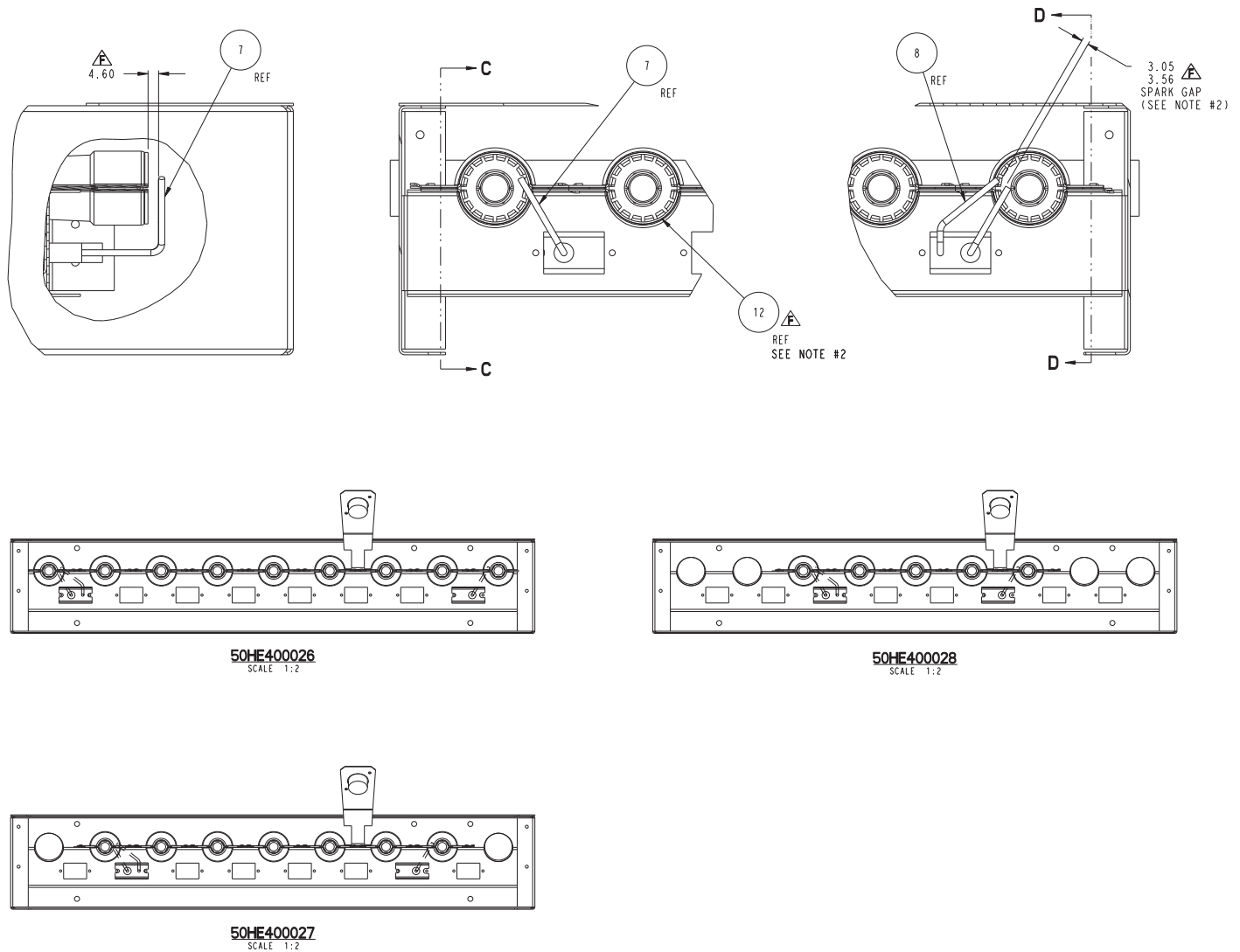
**Fig. 34 — Burner Tray Details**

## CLEANING AND ADJUSTMENT

1. Remove burner rack from unit as described in Removal and Replacement of Gas Train section, above.
2. Inspect burners; if dirty, remove burners from rack. (Mark each burner to identify its position before removing from the rack.)
3. Use a soft brush to clean burners and cross-over port as required.
4. Adjust spark gap. The gap should be 0.12 to 0.14-in. (3.06 to 3.60 mm) and spaced 0.18-in. (4.60 mm) from the end of the burner. (See Fig. 36.)
5. If factory orifice has been removed, check that each orifice is tight at its threads into the manifold pipe and that orifice projection does not exceed maximum valve. (See Fig. 33).
6. Reinstall burners on rack in the same locations as factory-installed. (The outside crossover flame regions of the outermost burners are pinched off to prevent excessive gas flow from the side of the burner assembly. If the pinched cross-overs are installed between two burners, the flame will not ignite properly.)
7. Reinstall burner rack as described in “Removal and Replacement of Gas Train” section.



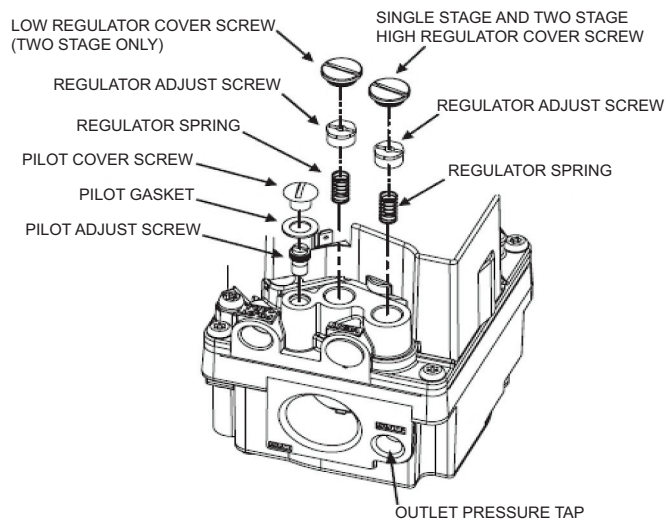
**Fig. 35 — Unit Control Box/IGC Location**



**Fig. 36 — Spark Adjustment**

## GAS VALVE

All unit sizes are equipped with 2-stage gas valves. See Fig. 37 for locations of adjustment screws and features on the gas valves.



**Fig. 37 — Gas Valve**

To adjust gas valve pressure settings:

**IMPORTANT:** Leak check (using a mixture of soapy water or leak detection fluid) all gas connections including the main service connection, gas valve, gas spuds, and manifold pipe plug. All leaks must be repaired before firing unit.

## Check Unit Operation and Make Necessary Adjustments

**NOTE:** Gas supply pressure at gas valve inlet must be within specified ranges for fuel type and unit size. (See Tables 5-8.)

1. Shut off electrical power supplies to unit and install lockout tag.
2. Shut off manual gas shut off valve located on gas supply line.
3. Remove manifold pressure tap plug from manifold and connect pressure gage or manometer. (See Fig. 34.)
4. Turn on electrical supply.
5. Open manual shut off valve, then turn on unit main gas valve.
6. Set room thermostat to call for heat. Verify high-stage heat operation before attempting to adjust manifold pressure.
7. When main burners ignite, check all fittings, manifold, and orifices for leaks.
8. Adjust high-stage pressure to specified setting by turning the plastic adjustment screw clockwise to increase pressure, counter-clockwise to decrease pressure.

9. Set room thermostat to call for low-stage heat. Adjust low-stage pressure to specified setting.
10. Replace regulator cover screw(s) when finished.
11. With burner access panel removed, observe unit heating operation in both high stage and low stage operation. Observe burner flames to see if they are blue in appearance, and that the flames are approximately the same for each burner.
12. Turn off unit, close manual gas shut off valve, remove pressure manometer and replace the 1/8-in. pipe fitting on the gas manifold. (See Fig. 34.)

### Limit Switch

Remove blower access panel. Limit switch is located on the fan deck. (See Fig. 29.)

### Burner Ignition

Unit is equipped with a direct spark ignition 100% lockout system. The Integrated Gas Unit Controller (IGC) is located in the control box. (See Fig. 35.) The IGC contains a self-diagnostic LED (light-emitting diode). A single LED (see Fig. 38) on the IGC provides a visual display of operational or sequential problems when the power supply is uninterrupted. When a break in power occurs, the IGC will be reset (resulting in a loss of fault history) and the indoor (evaporator) fan ON/OFF times will be reset. The LED error code can be observed through the viewport. During servicing, refer to the label on the control box cover or Table 9 for an explanation of LED error code descriptions. See Table 11 for IGC connections.

If lockout occurs, unit may be reset by interrupting power supply to unit for at least five seconds. See Fig. 39 for a typical IGC wiring diagram.

**Table 9 — LED Error Code Description\***

LED INDICATION	ERROR CODE DESCRIPTION
<b>ON</b>	Normal Operation
<b>OFF</b>	Hardware Failure
<b>2 Flashes</b>	Limit Switch Fault
<b>3 Flashes</b>	Flame Sense Fault
<b>4 Flashes</b>	4 Consecutive Limit Switch Faults
<b>5 Flashes</b>	Ignition Lockout Fault
<b>6 Flashes</b>	Induced-Draft Motor Fault
<b>7 Flashes</b>	Rollout Switch Fault
<b>8 Flashes</b>	Internal Control Fault
<b>8 Flashes</b>	Software Lockout

### LEGEND

**LED** — Light Emitting Diode

\* A 3 second pause exists between LED error code flashes. If more than one error code exists, all applicable codes will be displayed in numerical sequence.

**IMPORTANT:** Refer to Troubleshooting Tables 13 and 14 for additional information.

### Orifice Replacement

This unit uses orifice type LH32RFnnn (where nnn indicates orifice reference size). When replacing unit orifices, order the necessary parts via Carrier RCD. See Table 10 for available orifice sizes. See Table 12 for orifice sizes for Natural Gas and LP fuel usage at various elevations above sea level. Check that each replacement orifice is tight at its threads into the manifold pipe and that orifice projection does not exceed maximum value. (See Fig. 33.)

**Table 10 — Orifice Sizes**

ORIFICE DRILL SIZE	CARRIER PART NUMBER	DRILL DIA. (in.)
<b>#30</b>	LH32RF129	0.1285
<b>1/8</b>	LH32RF125	0.1250
<b>#31</b>	LH32RF120	0.1200
<b>#32</b>	LH32RF116	0.1160
<b>#33</b>	LH32RF113	0.1130
<b>#34</b>	LH32RF111	0.1110
<b>#35</b>	LH32RF110	0.1100
<b>#36</b>	LH32RF105	0.1065
<b>#37</b>	LH32RF104	0.1040
<b>#38</b>	LH32RF102	0.1015
<b>#39</b>	LH32RF103	0.0995
<b>#40</b>	LH32RF098	0.0980
<b>#41</b>	LH32RF096	0.0960
<b>#42</b>	LH32RF094	0.0935
<b>#43</b>	LH32RF089	0.0890
<b>#44</b>	LH32RF086	0.0860
<b>#45</b>	LH32RF082	0.0820
<b>#46</b>	LH32RF080	0.0810
<b>#47</b>	LH32RF079	0.0785
<b>#48</b>	LH32RF076	0.0760
<b>#49</b>	LH32RF073	0.0730
<b>#50</b>	LH32RF070	0.0700
<b>#51</b>	LH32RF067	0.0670
<b>#52</b>	LH32RF065	0.0635
<b>#53</b>	LH32RF060	0.0595
<b>#54</b>	LH32RF055	0.0550
<b>#55</b>	LH32RF052	0.0520
<b>#56</b>	LH32RF047	0.0465
<b>#57</b>	LH32RF043	0.0430
<b>#58</b>	LH32RF042	0.0420

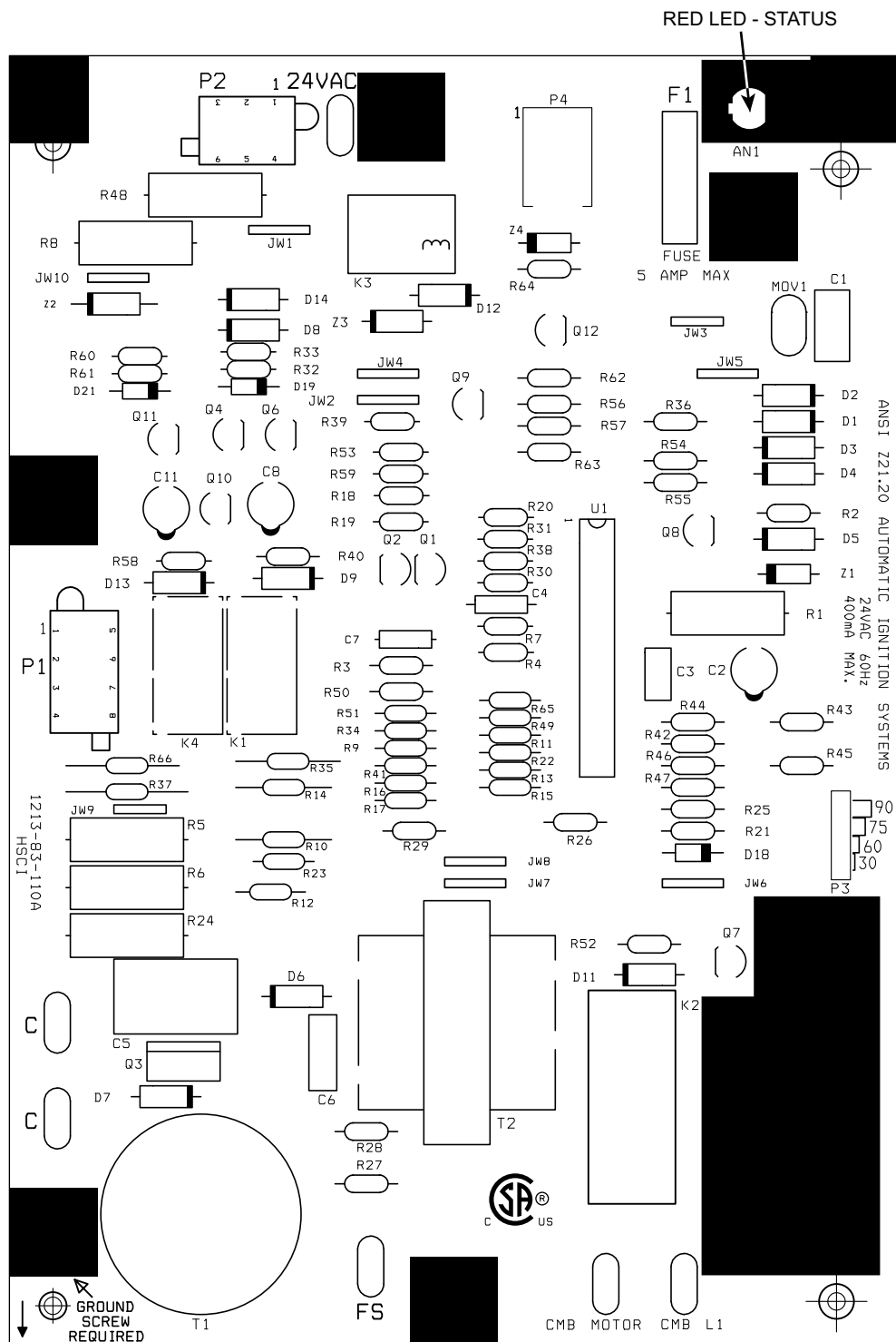


Fig. 38 — Integrated Gas Control (IGC) Board

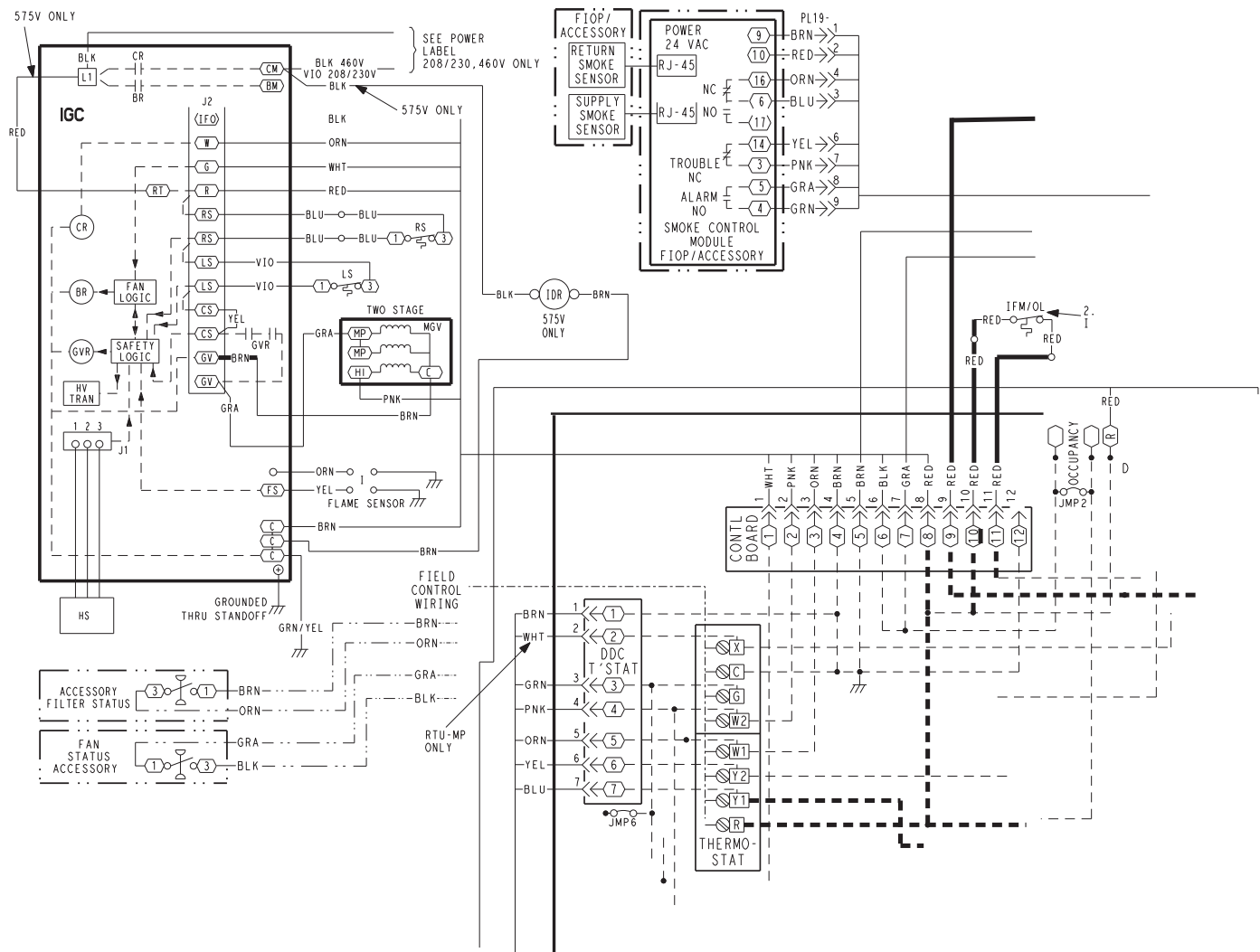


Fig. 39 — Typical IGC Wiring Diagram

Table 11 — IGC Connections

TERMINAL LABEL	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
<b>INPUTS</b>				
RT, C	Input power from TRAN 1	control box	24 VAC	—
SS	Speed sensor	gas section	analog input	J1, 1-3
FS, T1	Flame sensor	gas section	switch input	—
W	Heat stage 1	LCTB	24 VAC	J2, 2
RS	Rollout switch	gas section	switch input	J2, 5-6
LS	Limit switch	fan section	switch input	J2, 7-8
CS	Centrifugal switch (not used)	—	switch input	J2, 9-10
<b>OUTPUTS</b>				
L1, CM	Induced draft combustion motor	gas section	line VAC	—
IFO	Indoor fan	control box	relay	J2, 1
GV	Gas valve (heat stage 1)	gas section	relay	J2, 11-12

**Table 12 — Altitude Compensation\***

NATURAL GAS		NOMINAL HEAT INPUT					
ELEVATION		220K BTUH		310K BTUH		400K BTUH	
Feet	Meters	Orifice Size	Input (btu/hr)	Orifice Size	Input (btu/hr)	Orifice Size	Input (btu/hr)
0-2000	0-610	30	220,000	30	310,000	30	400,000
2000	610	30	202,400	30	285,200	30	368,000
3000	914	31 <sup>1</sup>	193,600	31 <sup>1</sup>	272,800	31 <sup>1</sup>	352,000
4000	1219	31 <sup>1</sup>	184,800	31 <sup>1</sup>	260,400	31 <sup>1</sup>	336,000
5000	1524	31 <sup>1</sup>	176,000	31 <sup>1</sup>	248,000	31 <sup>1</sup>	320,000
6000	1829	31 <sup>1</sup>	167,200	31 <sup>1</sup>	235,600	31 <sup>1</sup>	304,000
7000	2134	32 <sup>1</sup>	158,400	32 <sup>1</sup>	235,600	32 <sup>1</sup>	288,000
8000	2438	32 <sup>1</sup>	149,600	32 <sup>1</sup>	210,800	32 <sup>1</sup>	272,000
9000	2743	34 <sup>1</sup>	140,800	34 <sup>1</sup>	198,400	34 <sup>1</sup>	256,000
10000	3048	35 <sup>2</sup>	132,000	35 <sup>2</sup>	186,000	35 <sup>2</sup>	240,000
11000	3353	37 <sup>2</sup>	123,200	37 <sup>2</sup>	173,600	37 <sup>2</sup>	224,000
12000	3658	37 <sup>2</sup>	114,400	37 <sup>2</sup>	161,200	37 <sup>2</sup>	208,000
13000	3962	39 <sup>2</sup>	105,600	39 <sup>2</sup>	148,800	39 <sup>2</sup>	192,000
14000	4267	39 <sup>2</sup>	96,800	39 <sup>2</sup>	136,400	39 <sup>2</sup>	176,000

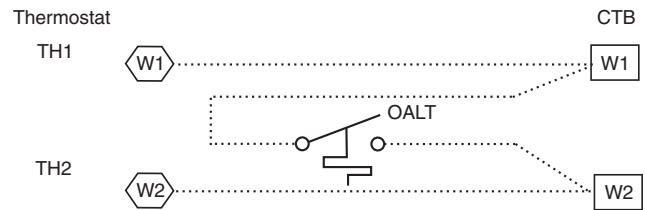
PROPANE GAS		NOMINAL HEAT INPUT					
ELEVATION		220K BTUH		310K BTUH		400K BTUH	
Feet	Meters	Orifice Size	Input (btu/hr)	Orifice Size	Input (btu/hr)	Orifice Size	Input (btu/hr)
0-2000	0-610	48 <sup>5</sup>	220,000	48 <sup>5</sup>	310,000	48 <sup>5</sup>	400,000
2000	610	49 <sup>3</sup>	202,400	49 <sup>3</sup>	285,200	49 <sup>3</sup>	368,000
3000	914	49 <sup>3</sup>	193,600	49 <sup>3</sup>	272,800	49 <sup>3</sup>	352,000
4000	1219	49 <sup>3</sup>	184,800	49 <sup>3</sup>	260,400	49 <sup>3</sup>	336,000
5000	1524	50 <sup>3</sup>	176,000	50 <sup>3</sup>	248,000	50 <sup>3</sup>	320,000
6000	1829	50 <sup>3</sup>	167,200	50 <sup>3</sup>	235,600	50 <sup>3</sup>	304,000
7000	2134	50 <sup>3</sup>	158,400	50 <sup>3</sup>	223,200	50 <sup>3</sup>	288,000
8000	2438	51 <sup>3</sup>	149,600	51 <sup>3</sup>	210,800	51 <sup>3</sup>	272,000
9000	2743	51 <sup>3</sup>	140,800	51 <sup>3</sup>	198,400	51 <sup>3</sup>	256,000
10000	3048	52 <sup>4</sup>	132,000	52 <sup>4</sup>	186,000	52 <sup>4</sup>	240,000
11000	3353	52 <sup>4</sup>	123,200	52 <sup>4</sup>	173,600	52 <sup>4</sup>	224,000
12000	3658	53 <sup>4</sup>	114,400	53 <sup>4</sup>	161,200	53 <sup>4</sup>	208,000
13000	3962	53 <sup>4</sup>	105,600	53 <sup>4</sup>	148,800	53 <sup>4</sup>	192,000
14000	4267	53 <sup>4</sup>	96,800	53 <sup>4</sup>	136,400	53 <sup>4</sup>	176,000

\* As the height above sea level increases, there is less oxygen per cubic ft. of air. Therefore, heat input rate should be reduced at higher altitudes.  
KIT NO.:

**XX<sup>1</sup>** — CRNGELEV001A00  
**XX<sup>2</sup>** — CRNGELEV002A00  
**XX<sup>3</sup>** — CRLPELEV005A00  
**XX<sup>4</sup>** — CRLPELEV006A00  
**XX<sup>5</sup>** — CRLPKIT9001A00

## Minimum Heating Entering Air Temperature

When operating on first stage heating, the minimum temperature of air entering the dimpled heat exchanger is 50°F (10°C) continuous and 45°F (7°C) intermittent for standard heat exchangers and 40°F (4°C) continuous and 35°F (2°C) intermittent for stainless steel heat exchangers. To operate at lower mixed-air temperatures, a field-supplied outdoor-air thermostat must be used to initiate both stages of heat when the temperature is below the minimum required temperature to ensure full fire operation. Wire the outdoor-air thermostat OALT (part no. HH22AG106) in series with the second stage gas valve. See Fig. 40. Set the outdoor-air thermostat at 35°F for stainless steel heat exchangers or 45°F (7°C) for standard heat exchangers. This temperature setting will bring on the second stage of heat whenever the ambient temperature is below the thermostat setpoint. Indoor comfort may be compromised when heating is initiated using low entering air temperatures with insufficient heating temperature rise.



**Fig. 40 — OALT Connections**

## Troubleshooting Heating System

Refer to Tables 13 and 14 for additional troubleshooting topics.

**Table 13 — Heating Service Analysis**

PROBLEM	CAUSE	REMEDY
<b>Burners Will Not Ignite</b>	Misaligned spark electrodes.	Check flame ignition and sensor electrode positioning. Adjust as needed.
	No gas at main burners.	Check gas line for air, purge as necessary. After purging gas line of air, allow gas to dissipate for at least 5 minutes before attempting to relight unit. Check gas valve.
	Water in gas line.	Drain water and install drip leg to trap water.
	No power to furnace.	Check power supply, fuses, wiring, and circuit breaker.
	No 24 v power supply to control circuit.	Check transformer. Transformers with internal overcurrent protection require a cool down period before resetting.
	Miswired or loose connections.	Check all wiring and wire nut connections.
	Burned-out heat anticipator in thermostat.	Replace thermostat.
	Broken thermostat wires.	Run continuity check. Replace wires, if necessary.
<b>Inadequate Heating</b>	Dirty air filter.	Clean or replace filter as necessary.
	Gas input to unit too low.	Check gas pressure at manifold. Check gas meter for input. If too low, increase manifold pressure, or replace with correct orifices.
	Unit undersized for application.	Replace with proper unit or add additional unit.
	Restricted airflow.	Clean filter, replace filter, or remove any restrictions.
	Blower speed too low.	Use high speed tap, increase fan speed, or install optional blower, as suitable for individual units.
	Limit switch cycles main burners.	Check rotation of blower, thermostat heat anticipator settings, and temperature rise of unit. Adjust as needed.
	Too much outdoor air.	Adjust minimum position. Check economizer operation.
<b>Poor Flame Characteristics</b>	Incomplete combustion (lack of combustion air) results in: Aldehyde odors, CO, sooting flame, or floating flame.	Check all screws around flue outlets and burner compartment. Tighten as necessary.
		Cracked heat exchanger.
		Overfired unit — reduce input, change orifices, or adjust gas line or manifold pressure.
		Check vent for restriction. Clean as necessary. Check orifice to burner alignment.
<b>Burners Will Not Turn Off</b>	Unit is locked into Heating mode for a one minute minimum.	Wait until mandatory one-minute time period has elapsed or reset power to unit.



**Table 14 — IGC Board LED Alarm Codes**

LED FLASH CODE	DESCRIPTION	ACTION TAKEN BY CONTROL	RESET METHOD	PROBABLE CAUSE
<b>On</b>	Normal Operation	—	—	—
<b>Off</b>	Hardware Failure	No gas heating.	—	Loss of power to the IGC. Check 5 amp fuse on IGC, power to unit, 24V circuit breaker, transformer, and wiring to the IGC.
<b>2 Flashes</b>	Limit Switch Fault	Gas valve and igniter Off. Indoor fan and inducer On.	Limit switch closed, or heat call (W) Off.	High temperature limit switch is open. Check the operation of the indoor (evaporator) fan motor. Ensure that the supply-air temperature rise is within the range on the unit nameplate. Check wiring and limit switch operation.
<b>3 Flashes</b>	Flame Sense Fault	Indoor fan and inducer On.	Flame sense normal. Power reset for LED reset.	The IGC sensed a flame when the gas valve should be closed. Check wiring, flame sensor, and gas valve operation.
<b>4 Flashes</b>	Four Consecutive Limit Switch Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	4 consecutive limit switch faults within a single call for heat. See Limit Switch Fault.
<b>5 Flashes</b>	Ignition Fault	No gas heating.	Heat call (W) Off. Power reset for LED reset.	Unit unsuccessfully attempted ignition for 15 minutes. Check igniter and flame sensor electrode spacing, gaps, etc. Check flame sense and igniter wiring. Check gas valve operation and gas supply.
<b>6 Flashes</b>	Induced Draft Motor Fault	If heat off: no gas heating. If heat on: gas valve Off and inducer On.	Inducer sense normal, or heat call (W) Off.	Inducer sense On when heat call Off, or inducer sense Off when heat call On. Check wiring, voltage, and operation of IGC motor. Check speed sensor wiring to IGC.
<b>7 Flashes</b>	Rollout Switch Lockout	Gas valve and igniter Off. Indoor fan and inducer On.	Power reset.	Rollout switch has opened. Check gas valve operation. Check induced-draft blower wheel is properly secured to motor shaft.
<b>8 Flashes</b>	Internal Control Lockout	No gas heating.	Power reset.	IGC has sensed internal hardware or software error. If fault is not cleared by resetting 24 v power, replace the IGC. Check gas valve connections to IGC terminals. BRN lead must be on Pin 11.
<b>9 Flashes</b>	Temporary Software Lockout	No gas heating.	1 hour auto reset, or power reset.	Electrical interference is disrupting the IGC software.

**LEGEND**

**IGC** — Integrated Gas Unit Control

**LED** — Light-Emitting Diode

**NOTES:**

1. There is a 3-second pause between alarm code displays.
2. If more than one alarm code exists, all applicable alarm codes will be displayed in numerical sequence.
3. Alarm codes on the IGC will be lost if power to the unit is interrupted.

## PRE-START-UP

### **WARNING**

#### PERSONAL INJURY HAZARD

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

1. Follow recognized safety practices and wear approved Personal Protective Equipment (PPE), including safety glasses and gloves when checking or servicing refrigerant system.
2. Do not use a torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear PPE and proceed as follows:
  - a. Shut off all electrical power and gas to unit. Apply applicable lockout/tag-out procedures.
  - b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
  - c. Do not use a torch. Cut component connection tubing with tubing cutter and remove component from unit.
  - d. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.
3. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
4. Do not remove compressor terminal cover until all electrical power is disconnected and approved lockout/tag-out procedures are in place.
5. Relieve all pressure from system before touching or disturbing anything inside terminal box whenever refrigerant leak is suspected around compressor terminals.
6. Never attempt to repair a soldered connection while refrigerant system is under pressure.

### **WARNING**

#### ELECTRICAL OPERATION HAZARD

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

The unit must be electrically grounded in accordance with local codes and NEC ANSI/NFPA 70 (American National Standards Institute/National Fire Protection Association).

Proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.

### **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.

3. Make the following inspections:
  - a. Inspect for shipping and handling damages such as broken lines, loose parts, or disconnected wires, etc.
  - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution.
  - c. Inspect all field-wiring and factory-wiring connections. Be sure that connections are completed and tight. Be sure that wires are not in contact with refrigerant tubing or sharp edges.
  - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
  - a. Make sure that condenser-fan blade are correctly positioned in fan orifice. See "Condenser-Fan Adjustment" section for more details.
  - b. Make sure that air filter(s) is in place.
  - c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
  - d. Make sure that all tools and miscellaneous loose parts have been removed.

## START-UP, GENERAL

### Unit Preparation

Make sure that unit has been installed in accordance with installation instructions and applicable codes.

### Gas Piping

Check gas piping for leaks.

### **WARNING**

#### FIRE, EXPLOSION HAZARD

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

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

### Return-Air Filters

Make sure correct filters are installed in unit (see Appendix B - Physical Data). Do not operate unit without return-air filters.

## Outdoor-Air Inlet Screens

Outdoor-air inlet screen must be in place before operating unit.

## Compressor Mounting

Compressors are internally spring mounted. Do not loosen or remove compressor hold down bolts.

## Internal Wiring

Check all factory and field electrical connections for tightness. Tighten as required.

## Refrigerant Service Ports

Each unit system has two 1/4-in. SAE flare (with check valves) service ports: one on the suction line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

## Compressor Rotation

On 3-phase units with scroll compressors, it is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

4. Note that the evaporator fan is probably also rotating in the wrong direction.
5. Turn off power to the unit and install lockout tag.
6. Reverse any two of the unit power leads.
7. Re-energize to the compressor. Check pressures.

The suction and discharge pressure levels should now move to their normal start-up levels.

NOTE: When the compressor is rotating in the wrong direction, the unit will make an elevated level of noise and will not provide cooling.

## Cooling

Set space thermostat to OFF position. To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch at AUTO. position. Adjust thermostat to a setting approximately 5°F (3°C) below room temperature. Both compressors start on closure of contactors.

Check unit charge. Refer to Refrigerant Charge section.

Reset thermostat at a position above room temperature. Both compressors will shut off. Evaporator fan will shut off immediately.

To shut off unit, set system selector switch at OFF position. Resetting thermostat at a position above room temperature shuts unit off temporarily until space temperature exceeds thermostat setting.

## Main Burners

Main burners are factory set and should require no adjustment.

To check ignition of main burners and heating controls, move thermostat setpoint above room temperature and verify that the burners light and evaporator fan is energized. Check heating effect, then lower the thermostat setting below the room temperature and verify that the burners and evaporator fan turn off.

Refer to Table 12 for the correct orifice to use at high altitudes.

## Heating

1. Purge gas supply line of air by opening union ahead of the gas valve. If gas odor is detected, tighten union and wait 5 minutes before proceeding.
2. Turn on electrical supply and manual gas valve.

3. Set system switch selector at HEAT position and fan switch at AUTO or ON position. Set heating temperature lever above room temperature.
4. The induced-draft motor will start.
5. After a call for heating, the main burners should light within 5 seconds. If the burner does not light, then there is a 22 second delay before another 5 second try. If the burner still does not light, the time delay is repeated. If the burner does not light within 15 minutes, there is a lockout. To reset the control, break the 24 v power to W1.
6. The evaporator-fan motor will turn on 45 seconds after burner ignition.
7. The evaporator-fan motor will turn off in 45 seconds after the thermostat temperature is satisfied.
8. Adjust airflow to obtain a temperature rise within the range specified on the unit nameplate.

NOTE: The default value for the evaporator-fan motor on/off delay is 45 seconds. The Integrated Gas Unit Controller (IGC) modifies this value when abnormal limit switch cycles occur. Based upon unit operating conditions, the on delay can be reduced to 0 seconds and the off delay can be extended to 180 seconds.

If the limit switch trips at the start of the heating cycle during the evaporator on delay, the time period of the on delay for the next cycle will be 5 seconds less than the time at which the switch tripped. (Example: If the limit switch trips at 30 seconds, the evaporator-fan on delay for the next cycle will occur at 25 seconds.) To prevent short-cycling, a 5 second reduction will only occur if a minimum of 10 minutes has elapsed since the last call for heating.

The evaporator-fan off delay can also be modified. Once the call for heating has ended, there is a 10-minute period during which the modification can occur. If the limit switch trips during this period, the evaporator-fan off delay will increase by 15 seconds. A maximum of 9 trips can occur, extending the evaporator-fan off delay to 180 seconds.

To restore the original default value, reset the power to the unit.

To shut off unit, set system selector switch at OFF position. Resetting heating selector lever below room temperature will temporarily shut unit off until space temperature falls below thermostat setting.

## Ventilation (Continuous Fan)

Set fan and system selector switches at ON and OFF positions, respectively. Evaporator fan operates continuously to provide constant air circulation. When the evaporator-fan selector switch is turned to the OFF position, there is a 30 second delay before the fan turns off.

## FIELD CONTROL WIRING

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

## THERMOSTAT

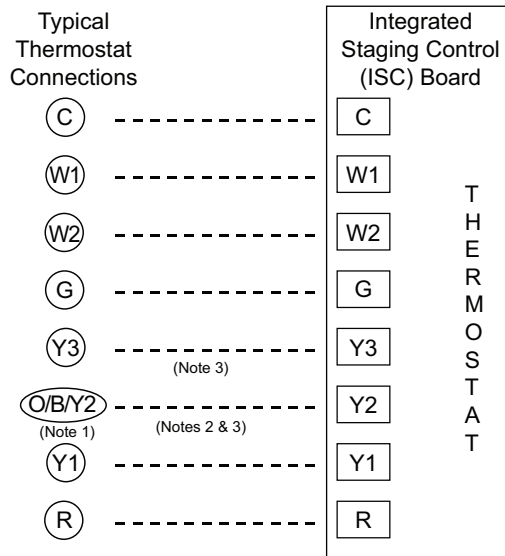
Install a Carrier-approved accessory 3-stage thermostat according to installation instructions included with the accessory. If a 3-stage cooling thermostat is not available, use a 2-stage cooling thermostat instead, but note that this will limit cooling to just 2 stages. Locate the thermostat accessory 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 [95°F] minimum). For 50 to 75 ft (15 to 23 m), use no. 16 AWG insulated wire (35°C [95°F] minimum). For over 75 ft (23 m), use no. 14 AWG insulated wire (35°C [95°F] minimum). All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

#### UNIT WITHOUT THRU-BASE CONNECTION KIT

Correctly rated low voltage wire can be routed through the rubber grommet located on the corner post adjacent to the control box access panel. Route wire through the grommet and then route the wire behind the corner post utilizing the factory provided wire ties secured to the control box. This will ensure separation of the field low voltage wire and the high voltage circuit. Route the low voltage wire to the Integrated Staging Control (ISC) board. See Fig. 41.



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

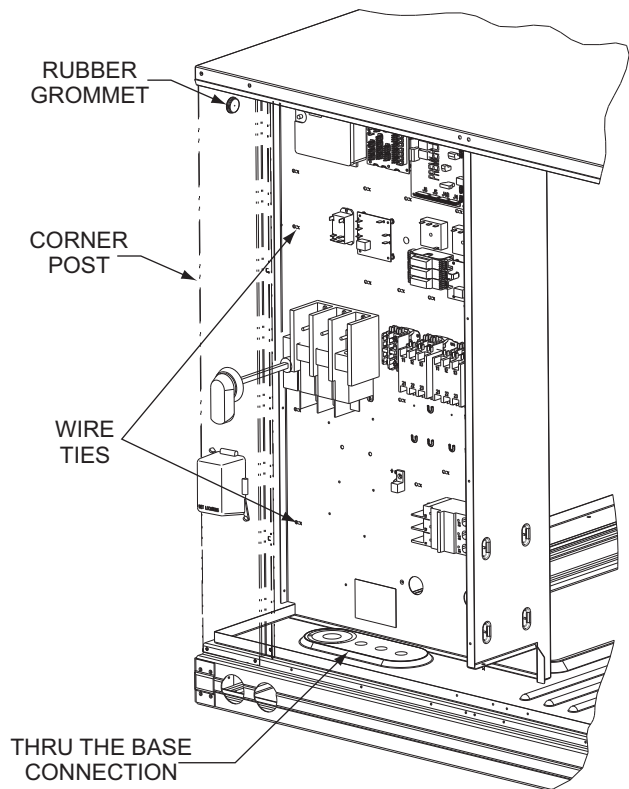
Note 2: Y2 to Y3 connection required for 2 stage cooling operation and when integrated economizer function is desired.

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.

--- Field Wiring

**Fig. 41 — Typical Low-Voltage Control Connections**

NOTE: If utilizing the through the base connections, route the low voltage wire through the wire ties to the Integrated Staging Control (ISC) board (see Fig. 42).



**Fig. 42 — Field Control Wiring Raceway**

#### HEAT ANTICIPATOR SETTINGS

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

#### TRANSFORMER CONNECTION FOR 208-V POWER SUPPLY

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 208-v 1/4-in. male terminal on the primary side of the transformer. Refer to unit label diagram for additional information.

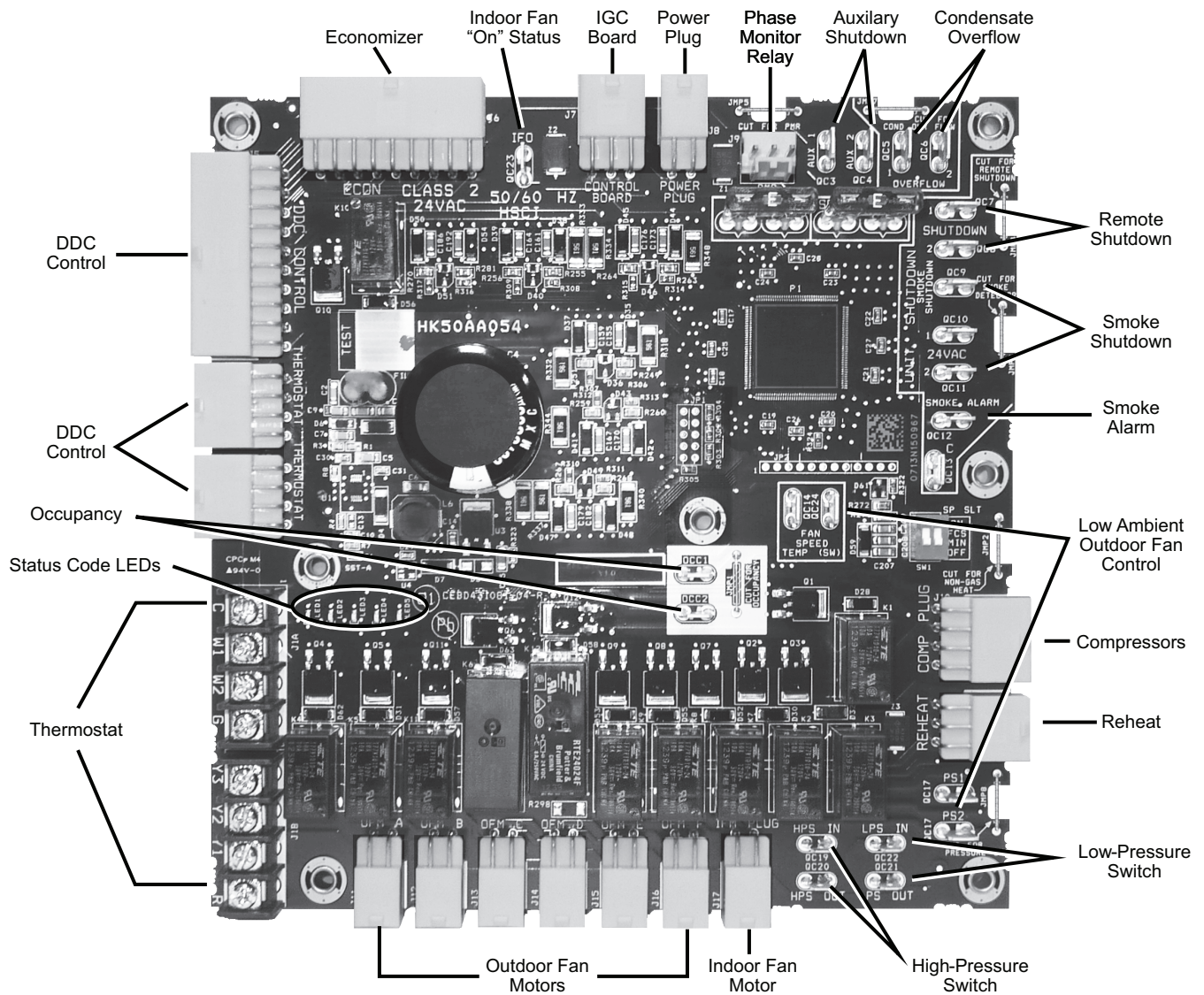
#### RTU Open Control System

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

#### SystemVu™ (Factory Option)

For details on operating 48LC 14-26 units equipped with the factory installed SystemVu control option, refer to the 48/50LC 07-26 Single Package Rooftop Units with SystemVu Controls Version 1.X Controls, Start-Up, Operation and Troubleshooting manual.

## Integrated Staging Control (ISC) Board



**Fig. 43 — Integrated Staging Control (ISC) Board**

**Table 15 — 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.



## ISC BOARD - SEQUENCE OF OPERATION

### General

The Carrier Integrated Staging Control (ISC) is intended for use with a standard thermostat or direct digital control (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. 43 for LED locations and Table 15 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 through 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 through 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.

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

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)

### ECONOMIZER (OPTIONAL)

When the Economizer is in Free Cooling Mode and a demand for cooling exist (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.

If field-installed accessory CO<sub>2</sub> sensors are connected to the economizer, a demand controlled ventilation strategy will begin to operate. As the CO<sub>2</sub> level in the zone increases above the CO<sub>2</sub> setpoint, the minimum position of the damper will be increased proportionally. As the CO<sub>2</sub> 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. 44) is in the up 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 down position, the outdoor fans will run in the Minimum Fan Speed Mode (MIN) set to 160 rpm regardless of the cooling demand.

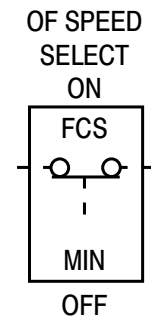


Fig. 44 — Outdoor Fan Speed Select Switch

The 48LC 14-26 units have a SPST normally open Low Ambient Switch (LAS) wired across the TS and OF terminal and a jumper placed across the PS terminal (see Fig. 45). When the LAS is active, the switch will close making contact to the OF terminal. This is done for units that require all outdoor fans to run at the same pre-set factory low ambient speed Table 16 shows the operation of the outdoor fan for each unit.

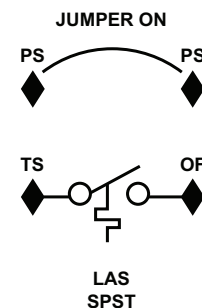


Fig. 45 — Schematic of SPST Low Ambient Switch

**Table 16 — Low Ambient Temperature Outdoor Fan Control**

48LC**	NO. OF FANS ON	NO. OF FANS OFF	SWITCH	OUTDOOR FAN SELECT SWITCH	RPM
14	3	0	SPST	Up	250
17	4	0	SPST	Up	250
20	4	0	SPST	Up	250
24	6	0	SPST	Up	250
26	6	0	SPST	Up	250

## 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 “hall effect” sensor, 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 “hall effect” sensor, 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.

## EconoMiSer® X (Factory Option)

The EconoMiSer X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 46). The W7220 can be configured with optional sensors.



**Fig. 46 — W7220 Economizer Module**

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

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

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

## SYSTEM COMPONENTS

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

### Economizer Module

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

### S-Bus Enthalpy Control Sensors

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

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

The CO<sub>2</sub> sensor can be added for Demand Controlled Ventilation (DCV).

## SPECIFICATIONS

### W7220 Economizer Module

The module is designed for use with 2 to 10 vdc or bus communicating actuator. The module includes terminals for CO<sub>2</sub> sensor, mixed air sensor, and an outdoor dry bulb sensor. Enthalpy and other options are available with bus sensors.

### User Interface

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

### Electrical

- Rated Voltage — 20 to 30 vac RMS, 50/60 Hz
- Transformer — 100 va maximum system input



- Nominal Power Consumption (at 24 vac, 60 Hz) — 11.5 VA without sensors or actuators
- Relay Digital Output Rating at 30 vac (maximum power from Class 2 input only) — 1.5A run: 3.5A inrush at 0.45PF (200,000 cycles) or 7.5A inrush at 0.45PF (100,000 cycles)
- External Sensors Power Output — 21 vdc  $\pm$  5% at 48mA

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

## INPUTS

### Sensors

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

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

2-wire (18 to 22 AWG);

Temperature range:  $-40^{\circ}\text{F}$  to  $150^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$  to  $66^{\circ}\text{C}$ )

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

Temperature and Humidity, C7400S1000 (optional)

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

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

Temperature accuracy:  $0^{\circ}\text{F}/+2^{\circ}\text{F}$  ( $-18^{\circ}\text{C}/-17^{\circ}\text{C}$ )

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

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

### 4 Binary Inputs

1-wire 24 vac + common GND (see page 39 for wiring details).

24 vac power supply

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

## OUTPUTS

### Actuator Signal

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

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

All Relay Outputs (at 30 vac):

Running: 1.5A maximum

Inrush: 7.5A maximum

## ENVIRONMENTAL

### Operating Temperature

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

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

### Storage Temperature

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

### Shipping Temperature

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

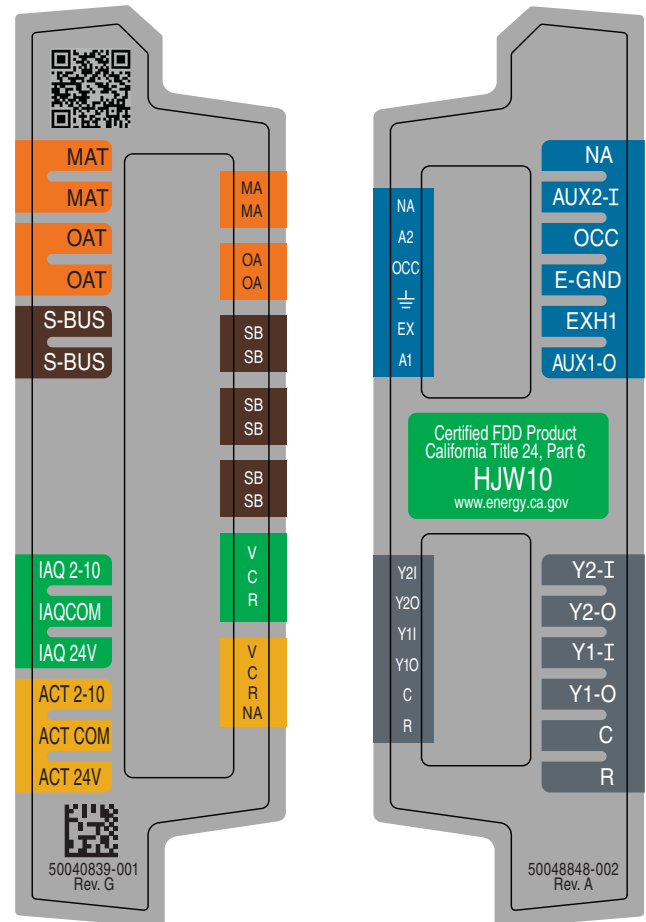
### Relative Humidity

5% to 95% RH non-condensing

## ECONOMIZER MODULE WIRING DETAILS

Use Fig. 47 and Tables 17 and 18 to locate the wiring terminals for the Economizer module.

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



**Fig. 47 — W7220 Wiring Terminals**

**Table 17 — Economizer Module (Left Hand Terminal Blocks)**

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

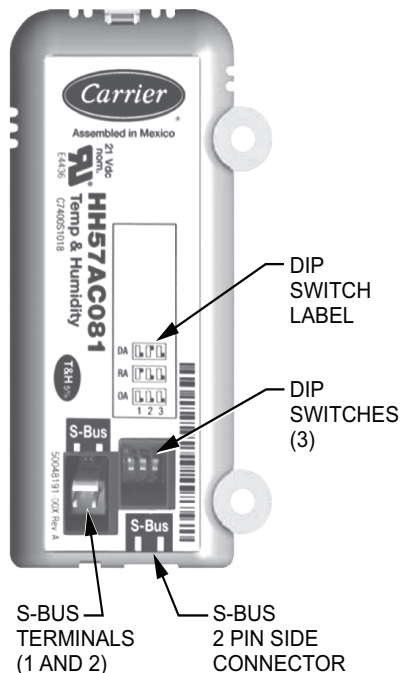
\*Sylk is a trademark of Honeywell International Inc.

**Table 18 — Economizer Module  
(Right Hand Terminal Blocks)**

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

#### S-Bus Sensor Wiring

The labels on the sensors and controller are color coded for ease of installation. Orange labeled sensors can only be wired to orange terminals on the controller. Brown labeled sensors can only be wired to S-bus (brown) terminals. Use Fig. 48 and Table 19 to locate the wiring terminals for each S-Bus and enthalpy control sensor.



**Fig. 48 — S-Bus Sensor DIP Switches**

**Table 19 — HH57AC081 Sensor Wiring Terminations**

TERMINAL		TYPE	DESCRIPTION
NUMBER	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)

Use Fig. 48 and Table 20 to set the DIP switches for the desired use of the sensor.

**Table 20 — HH57AC081 Sensor DIP Switch**

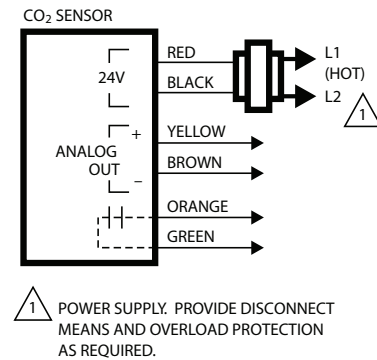
USE	DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3		
	1	2	3
DA	OFF	ON	OFF
RA	ON	OFF	OFF
OA	OFF	OFF	OFF

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

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

#### CO<sub>2</sub> Sensor Wiring

When using a CO<sub>2</sub> sensor, the black and brown common wires are internally connected and only one is connected to “IAQ COM” on the W7220. Use the power from the W7220 to power the CO<sub>2</sub> sensor OR make sure the ground for the power supplies are common. See Fig. 49 for CO<sub>2</sub> sensor wiring.



**Fig. 49 — CO<sub>2</sub> Sensor Wiring**

#### INTERFACE OVERVIEW

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

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

#### User Interface

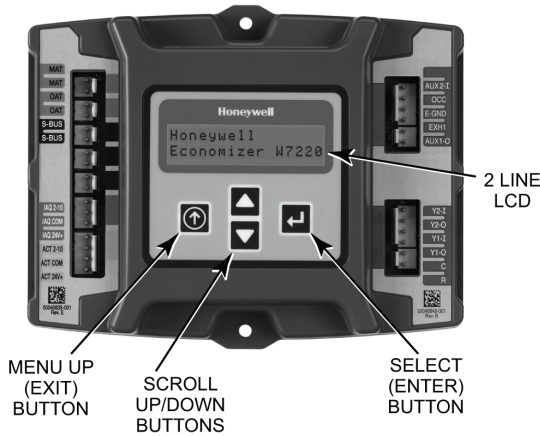
The user interface consists of a 2-line LCD display and a 4-button keypad on the front of the economizer controller.

#### Keypad

Use the four navigation buttons (see Fig. 50) to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

To use the keypad when working with menus:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↵ (Enter) button to display the first item in the currently displayed menu.
- Press the ⬆ (Menu Up/Exit) button to exit a menu's item and return to the list of menus.



**Fig. 50 — W7220 Controller Navigation Buttons**

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 or decrement.

1. Press the ↵ (Enter) button to accept the displayed value and store it in nonvolatile RAM. "CHANGE STORED" displays.
2. Press the ↵ (Enter) button to return to the current menu parameter.
3. Press the ⬆ (Menu Up/Exit) button to return to the previous menu.

### Menu Structure

Table 21 illustrates the complete hierarchy of menus and parameters for the EconoMi\$er® X system.

The Menus in display order are:

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

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

### SETUP AND CONFIGURATION

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

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

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

### Time-Out and Screensaver

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

**Table 21 — W7220 Menu Structure\***

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	EXPANDED PARAMETER NAME NOTES
STATUS	ECON AVAIL	NO	YES/NO	FIRST STAGE COOLING DEMAND (Y1-IN) YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	FIRST STAGE COOLING RELAY OUTPUT YES = outside air being used for first stage cooling
	OCCUPIED	NO	YES/NO	OCCUPIED YES = OCC signal received from space thermostat or unitary controller YES = 24 vac on terminal OCC NO = 0 vac on terminal OCC
	HEAT PUMP	N/A**	COOL HEAT	HEAT PUMP MODE Displays COOL or HEAT when system is set to heat pump (Non-conventional)
	COOL Y1—IN	OFF	ON/OFF	FIRST STAGE COOLING DEMAND (Y1-IN) Y1-I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 vac on terminal Y1-I OFF = 0 vac on terminal Y1-I
	COOL Y1—OUT	OFF	ON/OFF	FIRST STAGE COOLING RELAY OUTPUT Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1-OUT terminal)
	COOL Y2—IN	OFF	ON/OFF	SECOND STAGE COOLING DEMAND (Y2-IN) Y2-I signal from space thermostat or unitary controller for second stage cooling. ON = 24 vac on terminal Y2-I OFF = 0 vac on terminal Y2-I
	COOL Y2—OUT	OFF	ON/OFF	SECOND STAGE COOLING RELAY OUTPUT Cool Stage 2 Relay Output to mechanical cooling (Y2-OUT terminal)
	MA TEMP	____ °F (or ____ °C)	–40°F to 150°F (–40°C to 66°C)	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed air from MAT sensor. Displays ____ °F if not connected, short or out of range.
	DA TEMP	____ °F (or ____ °C)	–40°F to 150°F (–40°C to 66°C)	DISCHARGE AIR TEMPERATURE, after Heating section Displays when Discharge Air Syk Bus sensor is connected and displays measured discharge temperature. Displays ____ °F if sensor sends invalid value, if not connected, short or out of range.
	OA TEMP	____ °F (or ____ °C)	–40°F to 140°F (–40°C to 60°C)	OUTSIDE AIR TEMP Displays measured value of outdoor air temperature. Displays ____ °F if sensor sends invalid value, short or out of range.
	OA HUM	__ %	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA Syk Bus sensor. Displays __ % if not connected short, or out of range.
	RA TEMP	____ °F (or ____ °C)	0°F to 140°F (–18°C to 60°C)	RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT Syk Bus sensor. Displays ____ °F if sensor sends invalid value, if not connected, short or out of range
	RA HUM	__ %	0 to 100%	RETURN AIR RELATIVE HUMIDITY Displays measured value of return air humidity from RA Syk Bus sensor. Displays __ % if sensor sends invalid value, if not connected, short or out of range
	IN CO2	____ ppm	0 to 2000 ppm	SPACE/RETURN AIR CO <sub>2</sub> Displays value of measured CO <sub>2</sub> from CO <sub>2</sub> sensor. Invalid if not connected, short or out of range. May be adjusted in Advanced menu by Zero offset and Span.
	DCV STATUS	N/A	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS Displays ON if above set point and OFF if below set point, and ONLY if a CO <sub>2</sub> sensor is connected.
	DAMPER OUT	2.0v	2.0 to 10.0v	Displays voltage output to the damper actuator.***
	ACT POS	N/A	0 to 100%	Displays actual position of actuator
	ACT COUNT	N/A	1 to 65,535	Displays number of times actuator has cycled. 1 cycle equals 180 degrees 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 Displays ON when damper position reaches programmed percentage set point. Output of EXH1 terminal: ON = relay closed OFF = relay open

**Table 21 — W7220 Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	EXPANDED PARAMETER NAME NOTES
<b>STATUS (cont)</b>	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage set point. ON = 24 vac output OFF = No output Displays only if AUX1 O = EXH2
	ERV	OFF	ON/OFF	ENERGY RECOVERY VENTILATOR Output of AUX1 O terminal; displays only if AUX1 O = ERV ON = 24 vac output OFF = No Output
	MECH COOL ON or HEAT STAGES ON	0	0, 1, or 2	Displays stage of mechanical cooling that is active. Displays the stage of heat pump heating that is active.
	FAN SPEED	N/A	LOW or HIGH	SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit.
	W (HEAT IN)	N/A	ON/OFF	HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.
<b>SETPOINTS</b>	MAT SET	53°F (12°C)	38°F to 70°F (3°C to 21°C); increment by 1 degree	SUPPLY AIR SETPOINT The economizer will modulate the OA damper to maintain the mixed air temperature at the set point
	LOW T LOCK	32°F (0°C)	–45°F to 80°F (–43°C to 27°C); increment by 1 degree	COMPRESSOR LOW TEMPERATURE LOCKOUT Set point determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. At or below the set point, the Y1-O and Y2-O will not be energized on the controller.
	DRYBLB SET	63°F (17°C)	48°F to 80°F (9°C to 27°C); increment by 1 degree	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Dry bulb set point will only appear if using dry bulb changeover. Set point determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.
	ENTH CURVE	ES3	ES1,ES2,ES3,ES4, or ES5	ENTHALPY CHANGEOVER CURVE ES curve will only appear if using enthalpy changeover. Enthalpy boundary “curves” for economizing using single enthalpy. See page 49 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION Displays only if CO <sub>2</sub> sensor is connected. Set point for Demand Controlled Ventilation of space. Above the set point, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the set point.
	MIN POS	2.8 V	2 to 10 vdc	VENTILATION MINIMUM POSITION Displays ONLY if a CO <sub>2</sub> sensor is NOT connected. With 2-speed fan units, MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V.
	VENTMAX	2.8 V	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Vbz (ventilation max cfm) set point. VENTMAX is the same setting as MIN POS would be if unit did not have CO <sub>2</sub> sensor.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 vdc	With 2-speed fan units, VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V
	VENTMIN	2.25 V	2 to 10 vdc or 100 to 9990 cfm increment by 10	DCV MINIMUM DAMPER POSITION Displays only if a CO <sub>2</sub> sensor is connected. Used for Va (ventilation min cfm) set point. This is the ventilation for less than maximum occupancy of the space.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO <sub>2</sub> sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 vdc	With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V
	ERV OAT SP††	32°F (0°C)	0°F to 50°F (–18°C to 10°C); increment by 1 degree	ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV

**Table 21 — W7220 Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	EXPANDED PARAMETER NAME NOTES
<b>SETPOINTS (cont)</b>	EXH1 SET	50%	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SETPOINT Set point for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units, Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	EXH2 SET	75%	0 to 100%; increment by 1	EXHAUST FAN STAGE 2 SETPOINT Set point for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EHX2. With 2-speed fan units, Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75%
<b>SYSTEM SETUP</b>	INSTALL	01/01/10	N/A	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 or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.
	AUX2 IN	W	Shutdown (SD) Heat (W1) HP(O) HP(B)	In CONV mode: SD = Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in 2-speed fan mode. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN SPEED	2 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan, but positions the OA and RA dampers to heating or cooling mode. NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In.
	FAN CFM	5000 cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVCAL ENA = AUTO This is the capacity of the RTU. The value is found on the nameplate label for the specific unit.
	AUX1 OUT	NONE	NONE ERV EXH2 SYS	Select OUTPUT for AUX1 O relay • NONE = not configured (output is not used) • ERV = Energy Recovery Ventilator†† • EXH2 = second damper position 24 vac out 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 "INPUT" to the OCC terminal. If no occupancy output from the thermostat, then change program to "ALWAYS" OR add a jumper from terminal R to OCC terminal.
	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.
<b>ADVANCED SETUP</b>	MA LO SET	45°F (7°C)	35°F to 65°F (2°C to 18°C); Increment by 1 degree	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to activate Freeze Protection (close damper or modulate to MIN POS if temp falls below set value).
	FREEZE POS	CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; Increment by 10	CO <sub>2</sub> ppm level to match CO <sub>2</sub> sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 50	CO <sub>2</sub> ppm span to match CO <sub>2</sub> sensor; e.g.: 500-1500 sensor output would be 500 CO <sub>2</sub> zero and 1000 CO <sub>2</sub> span.
	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF	COOLING STAGE 3 DELAY Delay after stage 2 cool has been active. Turns on second stage of cooling when economizer is first stage call and mechanical cooling is second stage call. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.
	DA LO ALM	45°F (7°C)	NONE 35°F to 65°F (2°C to 18°C); Increment by 5°F	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.



**Table 21 — W7220 Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	EXPANDED PARAMETER NAME NOTES
<b>ADVANCED SETUP (cont)</b>	DA HI ALM	80°F (27°C)	NONE 70°F to 180°F (21°C to 82°C); Increment by 5°F	Used for alarm for when the DA air temperature is too high. Sets upper range of alarm; above this temperature, the alarm will show on the display.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all (RA, OA, MA, CO <sub>2</sub> ) sensors. This operation is not operable with a 2-speed fan unit.
	MAT T CAL	0.0°F	± 2.5°F	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OAS T CAL	0.0°F	± 2.5°F	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	±10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	RA T CAL	0.0°F	± 2.5°F	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	±10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	DA T CAL	0.0°F	± 2.5°F	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON SECOND STAGE ECONOMIZING When in economizing mode, this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.
<b>CHECKOUT***</b>	DAMPER MINIMUM POSITION	N/A	N/A	The checkout for the damper minimum position is based on the system. See Table 22.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure to pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	N/A	N/A	Positions damper to the fully closed position
	CONNECT Y1–O	N/A	N/A	Closes the Y1-O relay (Y1-O)
	CONNECT Y2–O	N/A	N/A	Closes the Y2-O relay (Y2-O)
	CONNECT AUX1–O	N/A	N/A	Energizes the AUX output. If Aux setting is: • NONE — no action taken • ERV — 24 vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation.†† • SYS — 24 vac out. Issues a system alarm
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 1 relay (EXH1)
<b>ALARMS</b>	Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen			
	MA T SENS ERR	N/A	N/A	SUPPLY AIR TEMPERATURE SENSOR ERROR Mixed air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	CO2 SENS ERR	N/A	N/A	CO <sub>2</sub> SENSOR ERROR CO <sub>2</sub> sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK T ERR	N/A	N/A	OUTSIDE AIR S-BUS SENSOR ERROR
	OA SYLK H ERR	N/A	N/A	Outdoor air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR
	RA SYLK H ERR	N/A	N/A	Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	DA SYLK T ERR	N/A	N/A	DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring, then replace if the alarm continues.
	ACT ERROR	N/A	N/A	ACTUATOR ERROR Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.

**Table 21 — W7220 Menu Structure\* (cont)**

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT†	EXPANDED PARAMETER NAME NOTES
<b>ALARMS (cont)</b>	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on set point menu. Check if Mixed air temperature on STATUS menu is below the Lo Set point on Advanced menu. When conditions are back in normal range, the alarm will go away.
	SHUTDOWN ACTIVE	N/A	N/A	AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX2 IN terminal.
	DMP CAL RUNNING	N/A	N/A	DAMPER CALIBRATION ROUTINE RUNNING If DCV Auto enable has been programmed, this alarm will display when the W7220 is completing a calibration on the dampers. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up is in the Advanced setup menu.
	DA SENS ALM	N/A	N/A	DISCHARGE AIR TEMPERATURE SENSOR ALARM Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air.
	SYS ALARM	N/A	N/A	When AUX1-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 vac out.
	ACT UNDER V	N/A	N/A	ACTUATOR VOLTAGE LOW Voltage received by actuator is above expected range.
	ACT OVER V	N/A	N/A	ACTUATOR VOLTAGE HIGH Voltage received by actuator is below expected range.
	ACT STALLED	N/A	N/A	ACTUATOR STALLED Actuator stopped before achieving commanded position.

**LEGEND**

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

\* Table 21 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example, if you do not have a DCV (CO<sub>2</sub>) sensor, then none of the DCV parameters appear.

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

\*\* N/A = Not Applicable.

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

\*\*\* After 10 minutes without a command or mode change, the controller will change to normal operation.

**NOTES:**

1. STATUS → OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at CTB terminal G. This signal passes through the Central Terminal Board's OCCUPANCY jumper 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 SPEED = 2SPEED

For damper minimum position settings and checkout menu readings, see Table 22. For dry bulb operation with a 1-speed indoor fan, with or without DCV, see Tables 23 and 24. For enthalpy operation with a 1-speed indoor fan, with or without DCV, see Tables 25 and 26. For dry bulb operation with a 2 speed indoor fan, with or without DCV, see Tables 27 and 28. For enthalpy operation with a 2 speed indoor fan, with or without DCV, see Tables 29 and 30.

**Table 22 — Damper Minimum Position Settings and Readings on Checkout Menu**

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

**Table 23 — Dry Bulb Operation without DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

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

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

**Table 24 — Dry Bulb Operation with DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

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

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

**Table 25 — Enthalpy Operation without DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

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

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

**Table 26 — Enthalpy Operation with DCV (CO<sub>2</sub> Sensor) — 1 Speed Fan**

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

\*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

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

**Table 27 — Dry Bulb Operation without DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	Y1-I	Y2-I	FAN SPEED	Y1-O	Y2-O	OCCUPIED	UNOCCUPIED
NONE	No	Off	Off	Low	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	MIN POS L to Full-Open	Closed to Full-Open
		On	On	High	DELAY* 24-v/On	0-v/Off†	MIN POS H to Full-Open	Closed to Full-Open

\*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

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

**Table 28 — Dry Bulb Operation with DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

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

\*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

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

**Table 29 — Enthalpy Operation without DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

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

\*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

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

**Table 30 — Enthalpy Operation with DCV (CO<sub>2</sub> Sensor) — 2 Speed Fan**

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

\*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

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

#### ENTHALPY SETTINGS

When the OA temperature, enthalpy and dew point are below the respective set points, the outdoor air can be used for economizing. Figure 51 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (set points ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 32 for ENTH CURVE set point values.

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

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

Figure 51 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.

#### TWO-SPEED FAN OPERATION

The W7220 controller has the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position, see Table 31.

**Table 31 — Fan Speed**

STATE	FAN SPEED
OCC	Low
Y1	Low
Y2	High
W	High

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

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

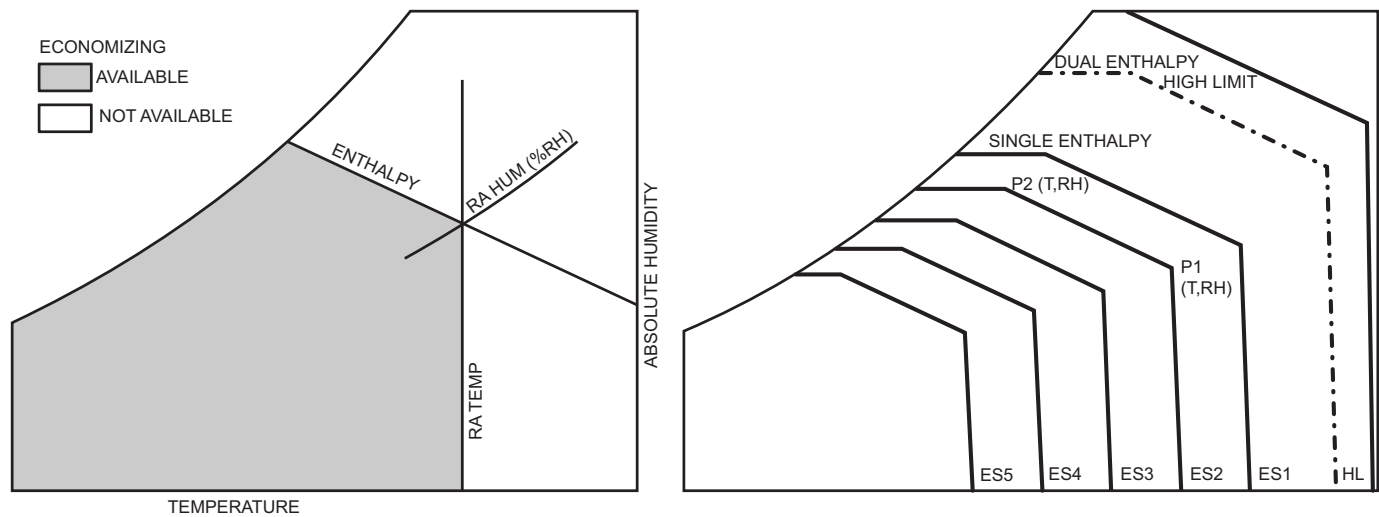
After the delay, one of two actions will happen:

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

OR

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





**Fig. 51 — Single Enthalpy Curve Boundaries**

**Table 32 — Single Enthalpy and Dual Enthalpy High Limit Curves**

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

## CHECKOUT

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

NOTE: For information about menu navigation and use of the keypad see Interface Overview on page 39.

### Power Up

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

### Initial Menu Display

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

### Power Loss (Outage or Brownout)

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

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

### Status

Use the Status menu (see Table 21) to check the parameter values for the various devices and sensors configured.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 39.

### Checkout Tests

Use the Checkout menu (see page 44) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 39.

To perform a Checkout test:

1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the ↵ (Enter) button to select the item. RUN? appears.
3. Press the ↵ (Enter) button to start the test. The unit pauses and then displays IN PROGRESS. When the test is complete, DONE appears.
4. 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 start-up and shut-down between checkout tests so that you do not short-cycle the compressors.

## TROUBLESHOOTING

### Alarms

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

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




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

cycles through the active alarms. You can also navigate to the Alarms menu at any time.

### ***Clearing Alarms***

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

To clear an alarm, perform the following:

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

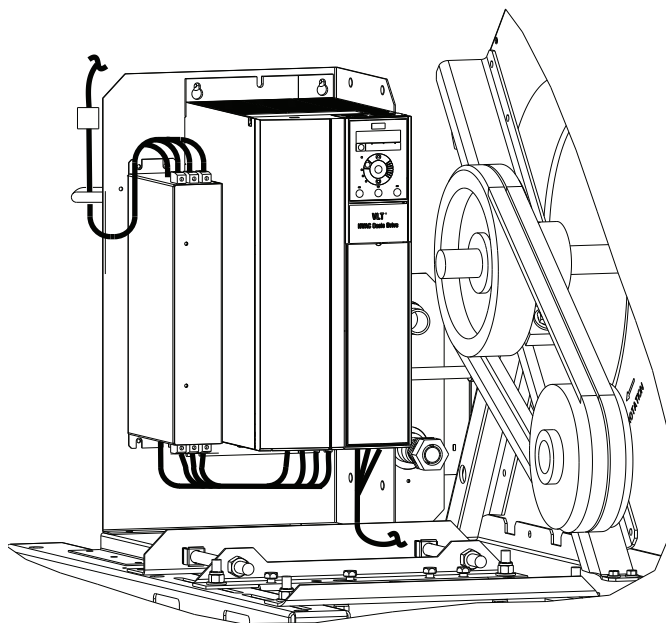
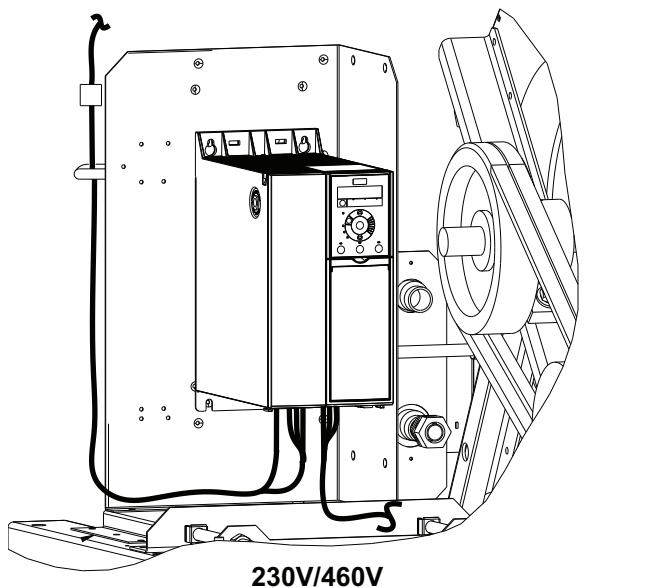
NOTE: If the alarm still exists after clearing it, it is redisplayed within 5 seconds.

### **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 2010 standard section 6.4.3.10.b, during the first stage of cooling operation the SAV system will adjust the fan motor to provide two-thirds ( $\frac{2}{3}$ ) 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  $\frac{2}{3}$  speed. See Fig. 52 for the VFD and Fig. 53 for the VFD location.



**Fig. 52 — Variable Frequency Drive (VFD)**



575V ONLY

Fig. 53 — VFD Location

### Multi-Speed VFD Display Kit (Field-Installed Option)

NOTE: The Remote VFD Keypad is part of the Multi-Speed VFD display kit (PN: CRDISKIT002A00) which is a field-installed option. It is not included with the 50LC size 14-26 base units.

The VFD keypad (as shown in Fig. 54) consists of the following sections.

### ALPHA NUMERIC DISPLAY

The LCD display is backlit with 2 alpha-numeric lines. All data is displayed on the LCD.

### 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 Fig. 55.)

### NAVIGATION KEYS AND STATUS LEDs

The Navigation keys and Status LEDs are detailed in Fig. 56.

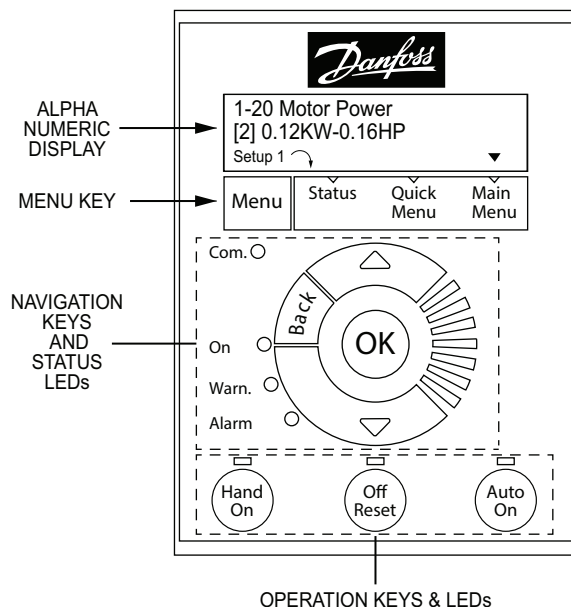
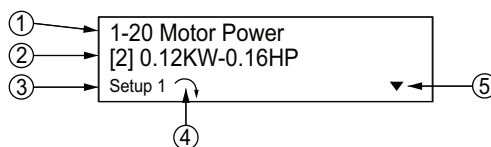
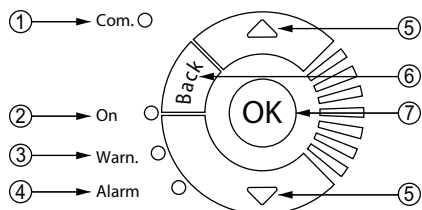


Fig. 54 — VFD Keypad



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.

Fig. 55 — LCD Alpha Numeric Display

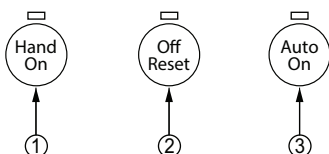


1	<b>Com. LED:</b> Flashes when bus communications is communicating.
2	<b>Green LED/On:</b> Control selection is working.
3	<b>Yellow LED/Warn.:</b> Indicates a warning.
4	<b>Flashing Red LED/Alarm:</b> Indicates an alarm.
5	<b>Arrows ▲ ▼:</b> Use the Up and Down arrow keys to navigate between parameter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

**Fig. 56 — Navigation Keys and Status LEDs**

### OPERATION KEYS AND LEDS

Figure 57 details the functions of the Operating keys. An illuminated yellow LED above the key indicates the active key.



1	<b>Hand On key:</b> Starts the motor and enables control of the variable frequency drive (VFD) via the VFD Keypad option. <b>NOTE:</b> 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	<b>Off/Reset key:</b> Stops the motor (off). If in alarm mode the alarm will be reset.
3	<b>Auto On key:</b> The variable frequency drive is controlled either via control terminals or serial communication.

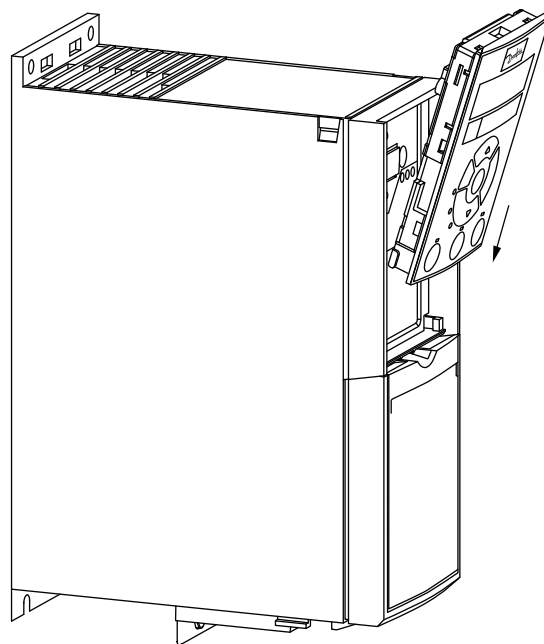
**Fig. 57 — Operating Keys**

### CONNECTING THE KEYPAD TO THE VFD

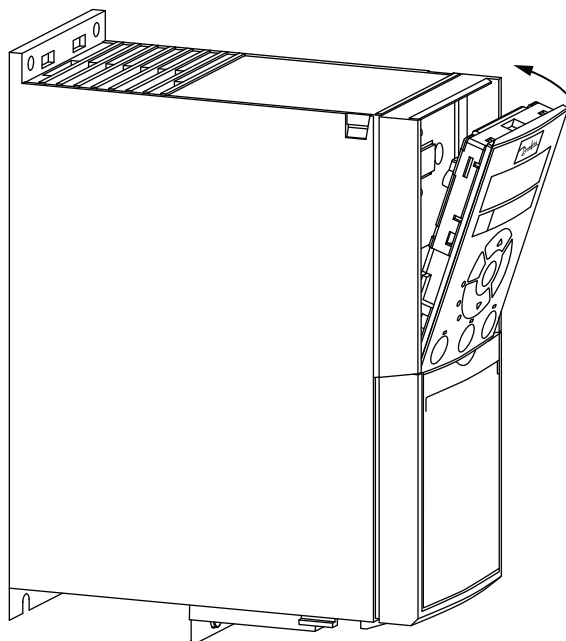
The VFD keypad can be mounted directly to the variable frequency drive, provided there is easy access to the front panel of the VFD. If there is no easy access to the VFD front panel, use the cable included with the kit to connect the keypad to the VFD.

#### Connecting the Keypad Directly to the VFD

1. Place the bottom of the VFD keypad into the variable frequency drive as shown in Fig. 58.
2. Push the top of the VFD keypad into the variable frequency drive as shown in Fig. 59.



**Fig. 58 — Align Bottom of VFD Keypad with Opening in VFD Front Panel**

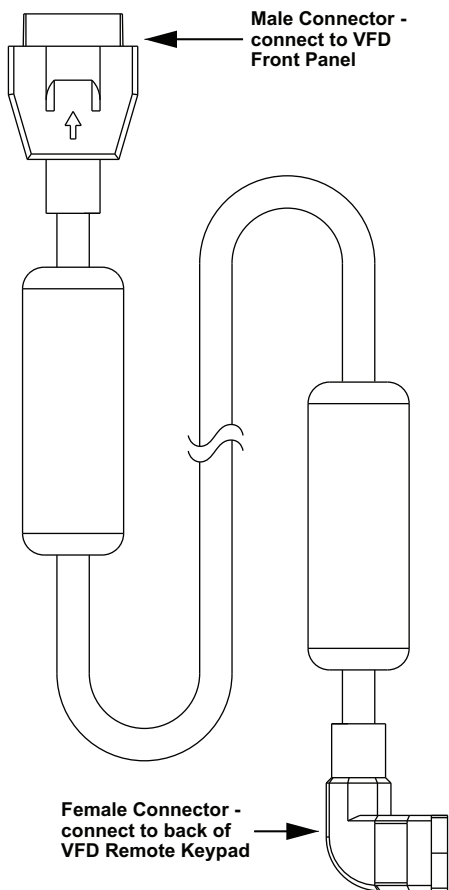


**Fig. 59 — Secure Keypad in Place**

#### 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). See Fig. 60.

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.

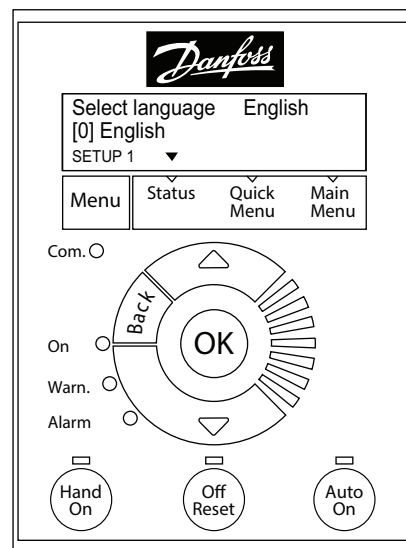


**Fig. 60 — VFD Remote Keypad Cable**

#### PROGRAM THE VFD FOR 3 DISCRETE INDOOR FAN SPEEDS

**IMPORTANT:** 50LC 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 (P/N: CRDISKIT002A00). If the VFD keypad is not already installed, install it. See “Connecting the Keypad to the VFD” for details.



**Fig. 61 — Keypad with Power Up Screen Displayed**

#### To program the VFD for 3 discrete indoor fan motor speeds

1. At Power-Up:  
At the first power up, the LCD displays the Select Language screen (see Fig. 61). 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.
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 shows the following.

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

- c. Press the OK key and 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 shows 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 shows 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: The Max Amps is greater than the nameplate value. Check the VFD Unit Parameters (see Tables 33-37 on pages 59-63) 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 shows 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 33-37. 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 33-37. 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 33-37. 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 33-37. 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 shows 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) key 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 table below to enter the required Preset Reference values.

[0]0.00%	Stop
[1]LL.LL%	Low Speed (see Tables 33-37, column labeled "Preset References 3—10[1]" for the proper % for each unit)
[2]MM.MM%	Medium Speed (see Tables 33-37, 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 33-37 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 33 — VFD Unit Parameters - 48LC Size 14

					Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)
Motor Option	Voltage	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
STD	208/230V	HD58FE654	HK30WA371	131L9796	[1]	[102]	[10]	230	60	9.2	1735
	460V	HD58FE654	HK30WA377	131L9864	[1]	[122]	[10]	460	60	4.2	1735
	575V	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710
MID	208/230V	HD60FK658	HK30WA372	131L9797	[1]	[102]	[13]	230	60	13.6	1745
	460V	HD60FK658	HK30WA379	131L9866	[1]	[122]	[13]	460	60	6.8	1745
	575V	HD60FE576	HK30WA387	134F0217	[1]	[132]	[13]	575	60	6.0	1745
HIGH	208/230V	HD60FK657	HK30WA373	131L9798	[1]	[102]	[14]	230	60	21.2	1760
	460V	HD60FK657	HK30WA380	131L9867	[1]	[122]	[14]	460	60	9.7	1760
	575V	HD60FL576	HK30WA384	131N0229	[1]	[132]	[14]	575	60	7.2	1745
ULTRA	208/230V	HD62FK654	HK30WA374	131L9799	[1]	[102]	[15]	230	60	28.0	1760
	460V	HD62FK654	HK30WA381	131L9868	[1]	[122]	[15]	460	60	13.7	1760
	575V	HD62FL576	HK30WA384	131N0229	[1]	[132]	[15]	575	60	8.9	1750

		Start Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference							
Motor Option	Voltage	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]	3-10 [3]	3-10 [4]	3-10 [5]	3-10 [6]	3-10 [7]
STD	208/230V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
MID	208/230V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
HIGH	208/230V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
ULTRA	208/230V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	53.43%	79.57%	100%	100%	0%	0%	0%

		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	Reset Mode	Auto. Restart Time (S)	RFI Filter
Motor Option	Voltage	3-41	3-42	4-18	5-10	5-11	5-12	5-13	14-20	14-21	14-50
STD	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
MID	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
HIGH	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
ULTRA	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]

Table 34 — VFD Unit Parameters - 48LC Size 17

					Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)
Motor Option	Voltage	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
STD	208/230V	HD58FE654	HK30WA371	131L9796	[1]	[102]	[10]	230	60	9.2	1735
	460V	HD58FE654	HK30WA377	131L9864	[1]	[122]	[10]	460	60	4.2	1735
	575V	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710
MID	208/230V	HD60FK657	HK30WA373	131L9798	[1]	[102]	[14]	230	60	21.2	1760
	460V	HD60FK657	HK30WA380	131L9867	[1]	[122]	[14]	460	60	9.7	1760
	575V	HD60FL576	HK30WA384	131N0229	[1]	[132]	[14]	575	60	7.2	1745
HIGH	208/230V	HD62FK654	HK30WA374	131L9799	[1]	[102]	[15]	230	60	28.0	1760
	460V	HD62FK654	HK30WA381	131L9868	[1]	[122]	[15]	460	60	13.7	1760
	575V	HD62FL576	HK30WA384	131N0229	[1]	[132]	[15]	575	60	8.9	1750
ULTRA	208/230V	HD64FK654	HK30WA375	131L9800	[1]	[102]	[16]	230	60	37.3	1755
	460V	HD64FK654	HK30WA386	131L9869	[1]	[122]	[16]	460	60	16.9	1755
	575V	HD64FL576	HK30WA388	131N0233	[1]	[132]	[16]	575	60	12.6	1755

		Start Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference							
Motor Option	Voltage	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]	3-10 [3]	3-10 [4]	3-10 [5]	3-10 [6]	3-10 [7]
STD	208/230V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
MID	208/230V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
HIGH	208/230V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
ULTRA	208/230V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	56.64%	82.40%	100%	100%	0%	0%	0%

		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	Reset Mode	Auto. Restart Time (S)	RFI Filter
Motor Option	Voltage	3-41	3-42	4-18	5-10	5-11	5-12	5-13	14-20	14-21	14-50
STD	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
MID	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
HIGH	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
ULTRA	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]

Table 35 — VFD Unit Parameters - 48LC Size 20

					Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)
Motor Option	Voltage	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
STD	208/230V	HD60FE656	HK30WA372	131L9797	[1]	[102]	[11]	230	60	11.7	1750
	460V	HD60FE656	HK30WA378	131L9865	[1]	[122]	[11]	460	60	5.4	1750
	575V	HD58FE577	HK30WA383	131N0227	[1]	[132]	[11]	575	60	4.9	1710
MID	208/230V	HD60FK657	HK30WA373	131L9798	[1]	[102]	[14]	230	60	21.2	1760
	460V	HD60FK657	HK30WA380	131L9867	[1]	[122]	[14]	460	60	9.7	1760
	575V	HD60FL576	HK30WA384	131N0229	[1]	[132]	[14]	575	60	7.2	1745
HIGH	208/230V	HD62FK654	HK30WA374	131L9799	[1]	[102]	[15]	230	60	28.0	1760
	460V	HD62FK654	HK30WA381	131L9868	[1]	[122]	[15]	460	60	13.7	1760
	575V	HD62FL576	HK30WA384	131N0229	[1]	[132]	[15]	575	60	8.9	1750
ULTRA	208/230V	HD64FK654	HK30WA375	131L9800	[1]	[102]	[16]	230	60	37.3	1755
	460V	HD64FK654	HK30WA386	131L9869	[1]	[122]	[16]	460	60	16.9	1755
	575V	HD64FL576	HK30WA388	131N0233	[1]	[132]	[16]	575	60	12.6	1755

		Start Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference							
Motor Option	Voltage	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]	3-10 [3]	3-10 [4]	3-10 [5]	3-10 [6]	3-10 [7]
STD	208/230V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
MID	208/230V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
HIGH	208/230V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
ULTRA	208/230V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.57%	61.63%	100%	100%	0%	0%	0%

		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	Reset Mode	Auto. Restart Time (S)	RFI Filter
Motor Option	Voltage	3-41	3-42	4-18	5-10	5-11	5-12	5-13	14-20	14-21	14-50
STD	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
MID	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
HIGH	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
ULTRA	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]



Table 36 — VFD Unit Parameters - 48LC Size 24

					Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)
Motor Option	Voltage	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
STD	208/230V	HD60FK657	HK30WA373	131L9798	[1]	[102]	[14]	230	60	21.2	1760
	460V	HD60FK657	HK30WA380	131L9867	[1]	[122]	[14]	460	60	9.7	1760
	575V	HD60FL576	HK30WA384	131N0229	[1]	[132]	[14]	575	60	7.2	1745
MID	208/230V	HD62FK654	HK30WA374	131L9799	[1]	[102]	[15]	230	60	28.0	1760
	460V	HD62FK654	HK30WA381	131L9868	[1]	[122]	[15]	460	60	13.7	1760
	575V	HD62FL576	HK30WA384	131N0229	[1]	[132]	[15]	575	60	8.9	1750
HIGH	208/230V	HD64FK654	HK30WA375	131L9800	[1]	[102]	[16]	230	60	37.3	1755
	460V	HD64FK654	HK30WA386	131L9869	[1]	[122]	[16]	460	60	16.9	1755
	575V	HD64FL576	HK30WA388	131N0233	[1]	[132]	[16]	575	60	12.6	1755

		Start Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference							
Motor Option	Voltage	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]	3-10 [3]	3-10 [4]	3-10 [5]	3-10 [6]	3-10 [7]
STD	208/230V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
MID	208/230V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
HIGH	208/230V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	52.33%	64.48%	100%	100%	0%	0%	0%

		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	Reset Mode	Auto. Restart Time (S)	RFI Filter
Motor Option	Voltage	3-41	3-42	4-18	5-10	5-11	5-12	5-13	14-20	14-21	14-50
STD	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
MID	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
HIGH	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]

Table 37 — VFD Unit Parameters - 48LC Size 26

					Regional Settings	Grid Type	Motor Power	Motor Voltage	Motor Frequency (Hz)	Motor Current (Must-Hold Amps)	Motor Nominal Speed (rpm)
Motor Option	Voltage	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
STD	208/230V	HD60FK657	HK30WA373	131L9798	[1]	[102]	[14]	230	60	21.2	1760
	460V	HD60FK657	HK30WA380	131L9867	[1]	[122]	[14]	460	60	9.7	1760
	575V	HD60FL576	HK30WA384	131N0229	[1]	[132]	[14]	575	60	7.2	1745
MID	208/230V	HD62FK654	HK30WA374	131L9799	[1]	[102]	[15]	230	60	28.0	1760
	460V	HD62FK654	HK30WA381	131L9868	[1]	[122]	[15]	460	60	13.7	1760
	575V	HD62FL576	HK30WA384	131N0229	[1]	[132]	[15]	575	60	8.9	1750
HIGH	208/230V	HD64FK654	HK30WA375	131L9800	[1]	[102]	[16]	230	60	37.3	1755
	460V	HD64FK654	HK30WA386	131L9869	[1]	[122]	[16]	460	60	16.9	1755
	575V	HD64FL576	HK30WA388	131N0233	[1]	[132]	[16]	575	60	12.6	1755

		Start Delay (Sec)	Flying Start	Min Speed for Function (Hz)	Motor Thermal Protection	Preset Reference							
Motor Option	Voltage	1-71	1-73	1-82	1-90	3-10 [0]	3-10 [1]	3-10 [2]	3-10 [3]	3-10 [4]	3-10 [5]	3-10 [6]	3-10 [7]
STD	208/230V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
MID	208/230V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
HIGH	208/230V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	460V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%
	575V	2.0	[1]	1.0	[4]	0%	60.00%	72.00%	100%	100%	0%	0%	0%

		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	Reset Mode	Auto. Restart Time (S)	RFI Filter
Motor Option	Voltage	3-41	3-42	4-18	5-10	5-11	5-12	5-13	14-20	14-21	14-50
STD	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
MID	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
HIGH	208/230V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	460V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]
	575V	10.00	10.00	100%	[8]	[16]	[17]	[18]	[3]	600	[0]

## FASTENER TORQUE VALUES

Table 38 — Torque Values

LOCATION	TORQUE VALUES	
Supply fan motor mounting	120 ± 12 in-lb	13.5 ± 1.4 Nm
Supply fan motor adjustment plate	120 ± 12 in-lb	13.5 ± 1.4 Nm
Motor pulley setscrew	72 ± 5 in-lb	8.1 ± 0.6 Nm
Fan pulley setscrew	72 ± 5 in-lb	8.1 ± 0.6 Nm
Blower wheel hub setscrew	72 ± 5 in-lb	8.1 ± 0.6 Nm
Bearing locking collar setscrew	65 to 70 in-lb	7.3 to 7.9 Nm
Compressor mounting bolts	65 to 75 in-lb	7.3 to 7.9 Nm
Condenser fan motor mounting bolts	20 ± 2 in-lb	2.3 ± 0.2 Nm
Condenser fan hub setscrew	84 ± 12 in-lb	9.5 ± 1.4 Nm

## SEQUENCE OF OPERATION

## General

The Carrier Integrated Staging Control Board (ISC) is intended for use with a standard thermostat 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. 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.

The ISC board can be remotely shutdown by removing Jumper 4 and wiring to the Remote Shutdown terminal. The Smoke Control Module can shut down the unit by removing Jumper 3 and wiring to the Smoke Shutdown terminal. A smoke alarm can be obtained by wiring 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.

## 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.

## Cooling

In the Cooling Mode, the small and large compressors will be sequenced to maintain the thermostat/DDC temperature setpoint. Table 39 shows the cooling operation based on the following conditions.

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

**Table 39 — Cooling Operation**

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)

## 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, only 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. Once the mixed air temperature rises above 48°F (9°C), the control returns to normal. The power exhaust fans will be energized and de-energized, if installed, as the outdoor-air damper opens and closes.

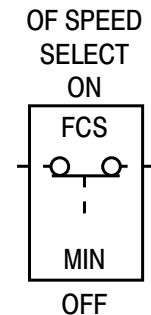
If field-installed accessory CO<sub>2</sub> sensors are connected to the economizer, a demand controlled ventilation strategy will begin to operate. As the CO<sub>2</sub> level in the zone increases above the CO<sub>2</sub> setpoint, the minimum position of the damper will be increased proportionally. As the CO<sub>2</sub> 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.

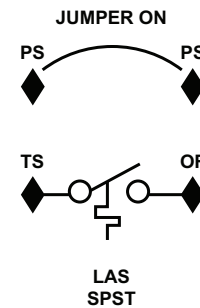
## Low Ambient Cooling Operation down to 40°F (4°C)

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. 62) is in the up 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 down position, the outdoor fans will run in the Minimum Fan Speed Mode (MIN) set to 160 rpm regardless of the cooling demand.

The 48LC 14-26 units have a SPST normally open Low Ambient Switch wired across the TS and OF terminal and a jumper placed across the PS terminal (See Fig. 63). When the LAS is active, the switch will close making contact to the OF terminal. This is done for units that require all outdoor fans to run at the same pre-set factory Low Ambient Speed.



**Fig. 62 — Outdoor Fan Speed Select Switch**



**Fig. 63 — Schematic of SPST Low Ambient Switch**

Table 40 shows the operation of the outdoor fans for each unit.

**Table 40 — Low Ambient Temperature Outdoor Fan Control**

48LC**	NO. OF FANS ON	NO. OF FANS OFF	SWITCH	LAS Fig. No.	OF SELECT SWITCH	RPM
14	3	0	(1) SPST	63	Up	250
17	4	0	(1) SPST	63	Up	250
20	4	0	(1) SPST	63	Up	250
24	6	0	(1) SPST	63	Up	250
26	6	0	(1) SPST	63	Up	250

## Heating

In the Heating Mode (W1 on the thermostat), the ISC board sends power to W on the IGC board. The ISC board sees W1=ON and also expects IFO=ON. However, the IFO is not ON immediately as the Integrated Gas Controller (IGC) board has to work thru its operating sequence. Thus, the ISC board will turn on a momentary LED (light-emitting diode). The indoor fan is not turned on by the ISC board.

The IGC board starts its gas ignition process. An LED on the IGC board turns on and remains on during normal operation. 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 "hall effect" sensor, 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 "hall effect" sensor, as well as the flame sensor. Once gas ignition is confirmed, the IGC board has a 45 second built in delay before it sends an IFO=ON signal to the ISC 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 delay will allow for the gas section to come to temperature before turning on the indoor fan. This will prevent the unit from blowing cold air into the space. Once the ISC board sees IFO=ON, the VFD controlled indoor fan is set to

high speed and the LED error is cleared. If, for some reason the over temperature limit opens prior to the start of the indoor fan blower, the unit will shorten the 45 second delay to 5 seconds less than the time from initiation of heat to when the limit tripped. Gas will not be interrupted to the burners and heating will continue. Once the fan ON delay has been modified, it will not change back to 45 seconds until power is reset to the control.

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. 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.

## APPENDIX A — MODEL NUMBER NOMENCLATURE

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	2	4	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

14 - 12.5 ton  
 17 - 15 ton  
 20 - 17.5 ton  
 24 - 20 ton  
 26 - 23 ton

### Sensor Options

A = None  
 B = RA Smoke Detector  
 C = SA Smoke Detector  
 D = RA + SA Smoke Detector  
 E = CO<sub>2</sub>  
 F = RA Smoke Detector and CO<sub>2</sub>  
 G = SA Smoke Detector and CO<sub>2</sub>  
 H = RA + SA Smoke Detector and CO<sub>2</sub>

### Indoor Fan Motor Options

1 = Standard Static / Vertical Supply, Return Air Flow  
 2 = Medium Static / Vertical Supply, Return Air Flow  
 3 = High Static / Vertical Supply, Return Air Flow  
 4 = Ultra High Static / Vertical Supply, Return Air Flow  
 5 = Standard Static / Horizontal Supply, Return Air Flow  
 6 = Medium Static / Horizontal Supply, Return Air Flow  
 7 = High Static / Horizontal Supply, Return Air Flow  
 8 = Ultra High Static / Horizontal Supply, Return Air Flow

### 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

### Packaging

0 = Standard  
 1 = LTL

### Electrical Options

A = None  
 B = HACR Circuit Breaker  
 C = Non-Fused Disconnect

### 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

### Intake / Exhaust Options

A = None  
 B = Temperature Low Leak Economizer with Barometric Relief  
 C = Temperature Low Leak Economizer with Centrifugal Power Exhaust - Vertical Only  
 E = Enthalpy Low Leak Economizer with Barometric Relief  
 F = Enthalpy Low Leak Economizer with Centrifugal Power Exhaust - Vertical Only  
 N = Temperature Ultra Low Leak Economizer with Barometric Relief  
 P = Temperature Ultra Low Leak Economizer with Centrifugal Power Exhaust - Vertical Only  
 R = Enthalpy Ultra Low Leak Economizer with Barometric Relief  
 S = Enthalpy Ultra Low Leak Economizer with Centrifugal Power Exhaust - Vertical Only

### Base Unit Controls

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

### Design Revision

- = Factory Design Revision

### Voltage

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

**Fig. A — 48LC\*14-26 Model Number Nomenclature**

## APPENDIX B — PHYSICAL DATA

**Table A — Physical Data (Cooling) 12.5 to 23 Tons**

		48LC*14	48LC*17	48LC*20	48LC*24	48LC*26
<b>REFRIGERATION SYSTEM</b>						
	# Circuits / # Comp. / Type	1 / 2 / Scroll	1 / 2 / Scroll	1 / 2 / Scroll	1 / 2 / Scroll	1 / 2 / Scroll
	R-410A charge (lbs-oz)	32-0	33-6	35-6	40-10	43-4
	Alternate (Humidi-Mizer®) R-410A charge A/B (lb-oz)	40-0	50-7	49-0	57-7	54-0
	oil A/B (oz)	118	56/60	60/60	85/110	110 / 110
	Metering device	TXV	TXV	TXV	TXV	TXV
	High-press. Trip / Reset (psig)	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505
	Low-press. Trip / Reset (psig)	54 / 117	54 / 117	54/117	54 / 117	54 / 117
<b>EVAP. COIL</b>						
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil Type	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF
	Coil Length (in.)	72	72	72	72	72
	Coil Height (in.)	44	52	52	52	52
	Rows / FPI	4 / 15	4 / 15	4 / 15	4 / 15	4 / 15
	Total face area (ft²)	22.0	26.0	26.0	26.0	26.0
	Condensate drain conn. size (in.)	3/4-in.	3/4-in.	3/4-in.	3/4-in.	3/4-in.
<b>HUMIDI-MIZER® COIL</b>						
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil Type	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF
	Coil Length (in.)	72	72	72	72	72
	Coil Height (in.)	44	52	52	52	52
	Rows / FPI	1 / 18	1 / 18	2 / 18	3 / 18	4 / 18
	Total face area (ft²)	22	26	26	26	26
<b>EVAPORATOR FAN AND MOTOR</b>						
<b>VERTICAL</b>						
<b>STANDARD STATIC</b>	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt
	Max BHP	2.9	2.9	2.9	7.4	7.4
	RPM range	498-676	555-753	676-854	707-888	707-888
	Motor frame size	56	56	56HZ	184T	184T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
<b>MEDIUM STATIC</b>	Fan Diameter (in.)	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15
	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt
	Max BHP	4.9	7.4	7.4	9.9	9.9
	RPM range	682-861	707-888	782-963	872-1053	872-1053
	Motor frame size	145TZ	184T	184T	213T	213T
<b>HIGH STATIC</b>	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15
	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 2 / Belt	1 / 2 / Belt
	Max BHP	7.4	9.9	9.9	13.6	13.6
	RPM range	782-963	872-1053	933-1113	1049-1291	1049-1291
<b>ULTRA HIGH STATIC</b>	Motor frame size	184T	213T	213T	215T	215T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15
	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 2 / Belt	1 / 2 / Belt	N/A	N/A
	Max BHP (208/230/460/575v)	9.9	13.6	13.6	N/A	N/A
<b>ULTRA HIGH STATIC</b>	RPM range	933-1113	1049-1291	1049-1291	N/A	N/A
	Motor frame size	213T	215T	215T	N/A	N/A
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A
	Fan Diameter (in.)	15 x 15 / 15 x 15	15 x 15 / 15 x 15	15 x 15 / 15 x 15	N/A	N/A



## APPENDIX B — PHYSICAL DATA

**Table A — Physical Data (Cooling) 12.5 to 23 Tons (cont)**

		48LC*14	48LC*17	48LC*20	48LC*24	48LC*26
<b>HORIZONTAL</b>						
<b>STANDARD STATIC</b>	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt
	Max BHP	2.9	2.9	2.9	7.4	7.4
	RPM range	498-676	525-713	555-753	707-888	707-888
	Motor frame size	56	56	56HZ	184T	184T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11
<b>MEDIUM STATIC</b>	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt
	Max BHP	4.9	7.4	7.4	9.9	9.9
	RPM range	644-808	707-888	707-888	859-1026	859-1026
	Motor frame size	145TZ	184T	184T	213T	213T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11
<b>HIGH STATIC</b>	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 1 / Belt	1 / 1 / Belt	1 / 2 / Belt	1 / 2 / Belt
	Max BHP	7.4	9.9	9.9	13.6	13.6
	RPM range	782-963	872-1053	872-1053	948-1190	948-1190
	Motor frame size	184T	213T	213T	215T	215T
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal
	Fan Diameter (in.)	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11
<b>ULTRA HIGH STATIC</b>	Motor Qty. / Drive Type	1 / 1 / Belt	1 / 2 / Belt	1 / 2 / Belt	N/A	N/A
	Max BHP (208/230/460/575v)	9.9	13.6	13.6	N/A	N/A
	RPM range	933-1113	948-1190	948-1190	N/A	N/A
	Motor frame size	213T	215T	215T	N/A	N/A
	Fan Qty. / Type	2 / Centrifugal	2 / Centrifugal	2 / Centrifugal	N/A	N/A
	Fan Diameter (in.)	18 x 15 / 15 x 11	18 x 15 / 15 x 11	18 x 15 / 15 x 11	N/A	N/A
<b>COND. COIL 1</b>						
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil Type	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF
	Coil Length (in.)	68	82	82	98	98
	Coil Height (in.)	44	52	52	52	52
	Rows / FPI	2/18	2 / 18	2/18	2 / 18	2 / 18
	Total face area (ft²)	20.8	29.6	29.6	35.4	35.4
<b>COND. COIL 2</b>						
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil Type	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF	5/16-in. RTPF
	Coil Length (in.)	68	82	82	98	98
	Coil Height (in.)	44	52	52	52	52
	Rows / FPI	2/18	2 / 18	2/18	2 / 18	2 / 18
	Total face area (ft²)	20.8	29.6	29.6	35.4	35.4
<b>COND. FAN / MOTOR</b>						
	Qty. / Motor Drive Type	3 / direct	4 / direct	4 / direct	6 / direct	6 / Direct
	Motor HP / RPM	1/3 / 1000	1/3 / 1000	1/3 / 1000	1/3 / 1000	1/3 / 1000
	Fan Diameter (in.)	22	22	22	22	22
<b>FILTERS</b>						
	RA Filter # / size (in.)	6 / 20 x 25 x 2	9/16x25x2	9/16x25x2	9/16x25x2	9 / 16x25x2
	OA inlet screen # / size (in.)	4 / 16 x 25 x 1	4/16x25x1	4/16x25x1	4/16x25x1	4 / 16x25x1

## APPENDIX B — PHYSICAL DATA

**Table B — Physical Data (Heating) 12.5 TO 23 Tons**

		48LC*14	48LC*17	48LC*20	48LC*24	48LC*26
<b>GAS CONNECTION</b>						
	# of gas valves	1	1	1	1	1
	Natural gas supply line pressure (in. wg) / (psig)	4-13 / 0.18 - 0.47	4-13 / 0.18 - 0.47	4-13 / 0.18 - 0.47	4-13 / 0.18 - 0.47	4-13 / 0.18 - 0.47
	Liquid propane supply line pressure (in. wg) / (psig)	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47	11-13 / 0.40-0.47
<b>HEAT ANTICIPATOR SETTING (AMPS)</b>						
	First stage	0.14	0.14	0.14	0.14	0.14
	Second stage	0.14	0.14	0.14	0.14	0.14
<b>NATURAL GAS HEAT</b>						
<b>LOW</b>	# of stages / # of burners (total)	1 or 2 / 4	1 or 2 / 5	1 or 2 / 5	1 or 2 / 5	1 or 2 / 5
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	20 - 50	20 - 55	20 - 55	20 - 55	20 - 55
<b>MED</b>	# of stages / # of burners (total)	1 or 2 / 5	1 or 2 / 7	1 or 2 / 7	1 or 2 / 7	1 or 2 / 7
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	20 - 55	30 - 60	30 - 60	30 - 60	30 - 60
<b>HIGH</b>	# of stages / # of burners (total)	1 or 2 / 7	1 or 2 / 9	1 or 2 / 9	1 or 2 / 9	1 or 2 / 9
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	30 - 60	35 - 65	35 - 65	35 - 65	35 - 65
<b>LIQUID PROPANE HEAT</b>						
<b>LOW</b>	# of stages / # of burners (total)	1 or 2 / 4	1 or 2 / 5	1 or 2 / 5	1 or 2 / 5	1 or 2 / 5
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	20 - 50	20 - 55	20 - 55	20 - 55	20 - 55
<b>MED</b>	# of stages / # of burners (total)	1 or 2 / 5	1 or 2 / 7	1 or 2 / 7	1 or 2 / 7	1 or 2 / 7
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	20 - 55	30 - 60	30 - 60	30 - 60	30 - 60
<b>HIGH</b>	# of stages / # of burners (total)	1 or 2 / 7	1 or 2 / 9	1 or 2 / 9	1 or 2 / 9	1 or 2 / 9
	Connection size	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT	3/4-in. NPT
	Rollout switch opens / closes (°F)	195 / 115	195 / 115	195 / 115	195 / 115	195 / 115
	Temperature rise (°F)	30 - 60	35 - 65	35 - 65	35 - 65	35 - 65

## APPENDIX C — FAN PERFORMANCE

### General Fan Performance Notes:

1. Interpolation is permissible. Do not extrapolate.
2. External static pressure is the static pressure difference between the return duct and the supply duct plus the static pressure caused by any FIOPs or accessories.
3. Tabular data accounts for pressure loss due to clean filters, unit casing, and wet coils. Factory options and accessories may add static pressure losses. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
4. The Fan Performance tables offer motor/drive recommendations. In cases when two motor/drive combinations would work, Carrier recommends the lower horsepower option.
5. For information on the electrical properties of Carrier motors, please see the electrical information section of this book.
6. For more information on the performance limits of Carrier motors, see the application data section of this book.
7. The EPACT (Energy Policy Act) regulates energy requirements for specific types of indoor fan motors. Motors regulated by EPACT include any general purpose, T-frame (three-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT compliant energy-efficient motor. Variable-speed motors are exempt from EPACT compliance requirements.

**Table C — 48LC\*\*14 — 12.5 Ton Horizontal Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3750	461	0.76	541	1.16	609	1.61	669	2.08	724	2.59
4063	485	0.90	562	1.32	628	1.79	687	2.28	741	2.81
4375	510	1.05	584	1.50	648	1.98	706	2.50	759	3.05
4688	535	1.23	606	1.70	669	2.20	725	2.75	777	3.32
5000	561	1.42	629	1.92	690	2.45	745	3.01	796	3.60
5313	587	1.64	652	2.16	711	2.71	765	3.30	815	3.91
5625	614	1.89	677	2.42	734	3.00	786	3.61	835	4.24
5938	641	2.16	701	2.72	756	3.32	808	3.95	855	4.60
6250	668	2.45	726	3.04	780	3.66	830	4.31	876	4.99

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3750	774	3.12	820	3.68	864	4.26	905	4.86	944	5.49
4063	790	3.37	836	3.94	880	4.55	921	5.17	959	5.81
4375	807	3.63	853	4.23	896	4.85	936	5.50	975	6.16
4688	825	3.91	870	4.53	912	5.18	953	5.84	991	6.53
5000	843	4.22	888	4.86	930	5.53	969	6.21	1007	6.92
5313	862	4.55	906	5.21	947	5.90	986	6.61	1024	7.33
5625	881	4.91	924	5.59	965	6.30	1004	7.03	1041	7.78
5938	900	5.29	943	6.00	983	6.72	1022	7.47	1059	8.24
6250	920	5.70	962	6.43	1002	7.18	1040	7.95	1077	8.74

**Boldface** indicates field-supplied drive is required (Standard motor, motor pulley P/N KR11HY163, blower pulley P/N KR51BM415, belt P/N KR29AF049) 368-509 rpm range.

	STD Static (498-676 rpm) 2.9 Max BHP
	MID Static (644-808 rpm) 4.9 Max BHP
	HIGH Static (782-963 rpm) 7.4 Max BHP
	ULTRA HIGH Static (933-1113 rpm) 9.9 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table D — 48LC\*\*14 — 12.5 Ton Vertical Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3750	453	0.48	547	0.69	630	0.91	704	1.13	771	1.36
4063	474	0.58	564	0.80	644	1.03	716	1.27	782	1.52
4375	497	0.69	582	0.92	659	1.16	730	1.42	794	1.68
4688	520	0.81	601	1.05	675	1.31	744	1.58	807	1.86
5000	544	0.95	620	1.21	692	1.48	759	1.76	821	2.05
5313	568	1.11	641	1.38	710	1.66	774	1.95	835	2.26
5625	593	1.29	662	1.56	728	1.86	791	2.17	850	2.48
5938	619	1.48	685	1.77	748	2.08	808	2.40	866	2.73
6250	644	1.70	707	2.00	768	2.32	826	2.65	882	2.99

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
3750	832	1.60	889	1.85	942	2.09	992	2.35	1040	2.60
4063	843	1.77	899	2.03	952	2.29	1002	2.56	1049	2.83
4375	854	1.95	910	2.22	962	2.50	1012	2.78	1059	3.07
4688	866	2.14	921	2.43	973	2.72	1022	3.02	1069	3.32
5000	878	2.35	933	2.65	984	2.96	1033	3.27	1080	3.59
5313	892	2.57	945	2.89	996	3.21	1044	3.54	1090	3.87
5625	905	2.81	958	3.14	1008	3.48	1056	3.82	1102	4.17
5938	920	3.07	972	3.41	1021	3.77	1068	4.12	1114	4.48
6250	935	3.35	986	3.71	1035	4.07	1081	4.44	1126	4.82

**Boldface** indicates field-supplied drive is required (Standard motor, motor pulley P/N KR11HY163, blower pulley P/N KR51BM415, belt P/N KR29AF049) 368-509 rpm range.

*Italics* indicate field-supplied drive is required (super static motor, motor pulley P/N KR12HY167, blower pulley P/N KR52BH615, belts P/N BX41) 948-1190 rpm range.

	STD Static (498-676 rpm) 2.9 Max BHP
	MID Static (682-861 rpm) 4.9 Max BHP
	HIGH Static (782-963 rpm) 7.4 Max BHP
	ULTRA HIGH Static (933-1113 rpm) 9.9 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table E — 48LC\*\*17 — 15 Ton Horizontal Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	526	1.35	601	1.89	667	2.50	726	3.14	779	3.81
4875	557	1.62	628	2.19	692	2.83	749	3.50	802	4.20
5250	589	1.93	656	2.53	717	3.20	774	3.90	825	4.64
5625	621	2.28	<b>685</b>	<b>2.91</b>	744	3.61	798	4.34	849	5.12
6000	654	2.68	714	3.34	771	4.07	824	4.83	873	5.64
6375	<b>687</b>	<b>3.13</b>	745	3.82	799	4.57	850	5.37	899	6.21
6750	721	3.63	775	4.35	828	5.13	877	5.96	924	6.83
7125	755	4.19	807	4.94	857	5.75	905	6.60	951	7.50
7500	789	4.80	839	5.58	887	6.42	933	7.31	977	8.23

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	828	4.50	873	5.22	915	5.95	954	6.71	992	7.48
4875	850	4.93	895	5.69	937	6.46	976	7.26	1013	8.06
5250	873	5.41	917	6.20	959	7.01	998	7.84	1035	8.68
5625	896	5.92	940	6.74	981	7.59	1020	8.46	1058	9.34
6000	920	6.47	963	7.33	1004	8.22	1043	9.12	1080	10.04
6375	944	7.08	987	7.97	1027	8.89	1066	9.83	—	—
6750	969	7.73	1011	8.65	1051	9.61	1089	10.58	—	—
7125	994	8.43	1035	9.39	1075	10.38	—	—	—	—
7500	1020	9.19	1060	10.19	1099	11.21	—	—	—	—

**Boldface** indicates field-supplied drive is required (Mid static motor, motor pulley P/N KR11HY232, blower pulley P/N KR51BQ415, belt P/N KR29BF059) 583-717 rpm range.

	STD Static (575-713 rpm) 2.9 Max BHP
	MID Static (707-888 rpm) 7.4 Max BHP
	HIGH Static (872-1053 rpm) 9.9 Max BHP
	ULTRA HIGH Static (948-1190 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table F — 48LC\*\*17 — 15 Ton Vertical Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	508	0.79	603	1.12	679	1.44	745	1.76	806	2.09
4875	532	0.94	626	1.31	701	1.65	765	1.99	825	2.34
5250	556	1.11	649	1.51	723	1.89	787	2.25	845	2.62
5625	581	1.30	672	1.73	746	2.14	809	2.54	866	2.93
6000	607	1.51	695	1.98	768	2.42	831	2.85	887	3.27
6375	634	1.75	719	2.24	791	2.73	854	3.19	909	3.63
6750	662	2.02	743	2.54	815	3.05	876	3.55	932	4.03
7125	690	2.33	767	2.86	838	3.41	899	3.94	954	4.45
7500	719	2.66	791	3.20	861	3.79	922	4.35	977	4.90

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
4500	863	2.43	918	2.79	971	3.16	1022	3.55	1071	3.96
4875	880	2.70	933	3.07	984	3.46	1033	3.86	1081	4.28
5250	899	3.00	950	3.39	999	3.79	1047	4.20	1093	4.63
5625	918	3.33	968	3.73	1016	4.15	1062	4.58	1107	5.02
6000	939	3.69	988	4.11	1035	4.55	1079	4.99	1123	5.45
6375	960	4.08	1008	4.53	1054	4.98	1098	5.44	1140	5.91
6750	982	4.50	1029	4.97	1074	5.45	1117	5.93	1159	6.41
7125	1004	4.95	1051	5.45	1095	5.95	1138	6.45	—	—
7500	1027	5.43	1073	5.96	1117	6.48	1159	7.01	—	—

**Boldface** indicates field-supplied drive is required (Standard motor, motor pulley P/N KR11HY216, blower pulley P/N KR51BM415, belt P/N KR30BE050) 435-570 rpm range.

- STD Static (555-753 rpm) 2.9 Max BHP
- MID Static (707-888 rpm) 7.4 Max BHP
- HIGH Static (872-1053 rpm) 9.9 Max BHP
- ULTRA HIGH Static (1049-1291 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table G — 48LC\*\*20 — 17.5 Ton Horizontal Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5250	589	1.93	656	2.53	717	3.20	774	3.90	825	4.64
5688	626	2.34	<b>690</b>	<b>2.98</b>	748	3.68	803	4.42	853	5.20
6125	665	2.82	724	3.50	780	4.23	833	5.01	882	5.82
6563	<b>704</b>	<b>3.37</b>	760	4.08	813	4.84	864	5.66	911	6.51
7000	743	4.00	796	4.74	847	5.53	896	6.38	942	7.27
7438	783	4.70	833	5.47	882	6.30	928	7.18	973	8.11
7875	823	5.48	871	6.29	917	7.15	962	8.07	1005	9.03
8313	864	6.35	909	7.19	953	8.09	996	9.04	1038	10.03
8750	905	7.31	948	8.19	990	9.13	1031	10.11	1071	11.13

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5250	873	5.41	917	6.20	959	7.01	998	7.84	1035	8.68
5688	900	6.01	944	6.84	985	7.69	1024	8.57	1061	9.46
6125	928	6.67	971	7.54	1012	8.43	1050	9.35	1087	10.29
6563	956	7.39	999	8.31	1039	9.24	1077	10.20	—	—
7000	985	8.19	1027	9.14	1067	10.12	—	—	—	—
7438	1015	9.06	1056	10.05	1095	11.06	—	—	—	—
7875	1046	10.02	1086	11.04	—	—	—	—	—	—
8313	1078	11.06	—	—	—	—	—	—	—	—
8750	—	—	—	—	—	—	—	—	—	—

**Boldface** indicates field-supplied drive is required (Mid static motor (HD60FK657), motor pulley P/N KR11HY232, blower pulley P/N KR51BQ415, belt P/N KR29BF059) 583-717 rpm range.

	STD Static (555-753 rpm) 2.9 Max BHP
	MID Static (707-888 rpm) 7.4 Max BHP
	HIGH Static (872-1053 rpm) 9.9 Max BHP
	ULTRA HIGH Static (948-1190 rpm) 13.6 Max BHP



## APPENDIX C — FAN PERFORMANCE

**Table H — 48LC\*\*20 — 17.5 Ton Vertical Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5250	556	1.11	649	1.51	723	1.89	787	2.25	845	2.62
5688	586	1.33	676	1.77	749	2.19	812	2.59	869	2.99
6125	616	1.59	703	2.06	776	2.52	838	2.96	894	3.39
6563	648	1.89	731	2.39	803	2.89	865	3.36	920	3.83
7000	681	2.22	759	2.75	830	3.29	892	3.80	947	4.30
7438	714	2.60	787	3.14	857	3.72	918	4.28	973	4.82
7875	748	3.03	817	3.58	884	4.20	945	4.80	1000	5.38
8313	783	3.50	847	4.07	912	4.72	972	5.36	1027	5.98
8750	819	4.03	878	4.61	941	5.28	1000	5.96	1054	6.63

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
5250	899	3.00	950	3.39	999	3.79	1047	4.20	1093	4.63
5688	922	3.39	972	3.80	1019	4.21	1065	4.64	1109	5.09
6125	946	3.81	995	4.25	1041	4.69	1085	5.14	1128	5.60
6563	971	4.28	1019	4.74	1064	5.21	1107	5.68	1149	6.16
7000	997	4.80	1044	5.28	1088	5.78	1131	6.27	1172	6.77
7438	1023	5.35	1069	5.87	1113	6.39	1155	6.91	—	—
7875	1049	5.95	1095	6.50	1139	7.05	—	—	—	—
8313	1076	6.59	1122	7.18	1165	7.76	—	—	—	—
8750	1103	7.27	1148	7.90	—	—	—	—	—	—

**Boldface** indicates field-supplied drive is required (Standard motor (HD60FE656), motor pulley P/N KR11HY163, blower pulley P/N KR51BM615, belt P/N KR29BF042) 555-753 rpm range.

*Italics* indicate field-supplied drive is required (medium static motor P/N HD60FK657, motor pulley P/N KR11HY194, blower pulley P/N KR51BM419, belt P/N KR28BF051) 651-818 rpm range.

- STD Static (676-854 rpm) 2.9 Max BHP
- MID Static (782-963 rpm) 7.4 Max BHP
- HIGH Static (933-1113 rpm) 9.9 Max BHP
- ULTRA HIGH Static (1049-1291 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table I — 48LC\*\*24 — 20 Ton Horizontal Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,000	<b>654</b>	<b>2.68</b>	714	3.34	771	4.07	824	4.83	873	5.64
6,500	<b>698</b>	<b>3.29</b>	755	3.99	809	4.75	859	5.56	907	6.41
7,000	743	4.00	796	4.74	847	5.53	896	6.38	942	7.27
7,500	789	4.80	839	5.58	887	6.42	933	7.31	977	8.23
8,000	835	5.72	882	6.54	928	7.41	972	8.34	1014	9.31
8,500	881	6.75	926	7.61	969	8.53	1011	9.49	1052	10.49
9,000	928	7.91	970	8.81	1011	9.76	1052	10.76	1091	11.81
9,500	975	9.20	1015	10.14	1054	11.13	1093	12.17	1130	13.25
10,000	1022	10.62	1060	11.60	1098	12.64	—	—	—	—

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,000	920	6.47	963	7.33	1004	8.22	1043	9.12	1080	10.04
6,500	952	7.29	995	8.19	1035	9.12	1073	10.07	1110	11.04
7,000	985	8.19	1027	9.14	1067	10.12	1104	11.11	1140	12.13
7,500	1020	9.19	1060	10.19	1099	11.21	1136	12.25	1172	13.31
8,000	1055	10.31	1094	11.34	1132	12.40	1169	13.49	—	—
8,500	1092	11.53	1130	12.61	—	—	—	—	—	—
9,000	1129	12.89	—	—	—	—	—	—	—	—
9,500	—	—	—	—	—	—	—	—	—	—
10,000	—	—	—	—	—	—	—	—	—	—

**Boldface** indicates field-supplied drive is required (Standard motor (HD60FK657), motor pulley P/N KR11HY232, blower pulley P/N KR51BQ415, belt P/N KR29BF059) 583-717 rpm range.

	STD Static (707-888 rpm) 7.4 Max BHP
	MID Static (859-1026 rpm) 9.9 Max BHP
	HIGH Static (948-1190 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table J — 48LC\*\*24 — 20 Ton Vertical Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,000	607	1.51	695	1.98	768	2.42	831	2.85	887	3.27
6,500	643	1.84	727	2.34	799	2.83	861	3.30	917	3.76
7,000	681	2.22	759	2.75	830	3.29	892	3.81	947	4.30
7,500	719	2.66	791	3.20	861	3.79	922	4.35	977	4.90
8,000	758	3.16	825	3.72	893	4.34	953	4.96	1008	5.55
8,500	798	3.72	860	4.30	924	4.95	984	5.61	1038	6.25
9,000	839	4.35	896	4.94	957	5.62	1016	6.33	1069	7.01
9,500	880	5.06	933	5.66	990	6.36	1047	7.10	1100	7.84
10,000	922	5.84	970	6.45	1025	7.17	1079	7.94	1131	8.72

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,000	939	3.69	988	4.11	1034	4.55	1079	4.99	1123	5.45
6,500	968	4.22	1015	4.67	1061	5.13	1104	5.60	1146	6.07
7,000	997	4.80	1044	5.28	1088	5.78	1131	6.27	1172	6.77
7,500	1027	5.43	1073	5.96	1117	6.48	1159	7.01	1199	7.54
8,000	1057	6.13	1103	6.69	1146	7.25	1187	7.81	1227	8.37
8,500	1088	6.88	1133	7.48	1176	8.08	1217	8.68	1255	9.27
9,000	1118	7.68	1164	8.34	1206	8.98	1246	9.61	1285	10.24
9,500	1149	8.56	1194	9.26	1237	9.94	1277	10.62	—	—
10,000	1180	9.49	1225	10.24	1267	10.97	—	—	—	—

**Boldface** indicates field-supplied drive is required (Standard motor (HD60FK657), motor pulley P/N KR11HY232, blower pulley P/N KR51BQ415, belt P/N KR29BF059) 583-717 rpm range.

	STD Static (707-888 rpm) 7.4 Max BHP
	MID Static (872-1053 rpm) 9.9 Max BHP
	HIGH Static (1049-1291 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table K — 48LC\*\*26 — 23 Ton Horizontal Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,750	719	3.61	774	4.33	826	5.10	876	5.93	923	6.79
7,313	770	4.46	821	5.22	870	6.04	918	6.91	963	7.82
7,875	822	5.45	870	6.25	916	7.12	960	8.03	1003	8.98
8,438	874	6.58	919	7.43	962	8.33	1005	9.29	1046	10.28
9,000	926	7.87	968	8.76	1010	9.71	1050	10.70	1089	11.74
9,563	979	9.31	1019	10.25	1058	11.25	1096	12.29	1133	13.37
10,125	1032	10.94	1070	11.93	1107	12.96	—	—	—	—
10,688	1085	12.75	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
6,750	967	7.69	1009	8.62	1049	9.57	1087	10.53	1124	11.52
7,313	1005	8.76	1046	9.74	1085	10.73	1123	11.76	1158	12.80
7,875	1045	9.97	1084	10.99	1122	12.03	1159	13.11	—	—
8,438	1085	11.32	1124	12.38	1160	13.48	—	—	—	—
9,000	1127	12.82	—	—	—	—	—	—	—	—
9,563	—	—	—	—	—	—	—	—	—	—
10,125	—	—	—	—	—	—	—	—	—	—
10,688	—	—	—	—	—	—	—	—	—	—
11,250	—	—	—	—	—	—	—	—	—	—

	STD Static (707-888 rpm) 7.4 Max BHP
	MID Static (859-1026 rpm) 9.9 Max BHP
	HIGH Static (948-1190 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table L — 48LC\*\*26 — 23 Ton Vertical Supply**

CFM	Available External Static Pressure (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
<b>6,750</b>	<b>662</b>	<b>2.02</b>	743	2.54	815	3.05	876	3.55	932	4.03
<b>7,313</b>	<b>705</b>	<b>2.49</b>	779	3.03	849	3.60	911	4.14	966	4.67
<b>7,875</b>	749	3.03	817	3.59	885	4.20	945	4.80	1000	5.38
<b>8,438</b>	793	3.65	856	4.22	920	4.87	980	5.53	1034	6.16
<b>9,000</b>	839	4.35	896	4.94	957	5.62	1016	6.33	1069	7.01
<b>9,563</b>	885	5.15	937	5.75	995	6.46	1051	7.20	1104	7.95
<b>10,125</b>	932	6.05	980	6.66	1033	7.38	1088	8.17	1139	8.96
<b>10,688</b>	979	7.05	1023	7.67	1073	8.41	1125	9.22	1175	10.06
<b>11,250</b>	1026	8.16	1067	8.79	1114	9.55	1163	10.38	1211	11.26

CFM	Available External Static Pressure (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP
<b>6,750</b>	982	4.50	1029	4.97	1074	5.45	1117	5.93	1159	6.41
<b>7,313</b>	1016	5.19	1062	5.70	1106	6.21	1148	6.72	1188	7.24
<b>7,875</b>	1050	5.95	1096	6.50	1139	7.05	1180	7.60	1219	8.15
<b>8,438</b>	1084	6.78	1129	7.38	1172	7.97	1213	8.57	1252	9.16
<b>9,000</b>	1118	7.68	1164	8.34	1206	8.98	1246	9.61	1285	10.24
<b>9,563</b>	1153	8.67	1198	9.38	1240	10.07	1280	10.75	—	—
<b>10,125</b>	1188	9.74	1233	10.50	1275	11.24	—	—	—	—
<b>10,688</b>	1223	10.89	1267	11.71	—	—	—	—	—	—
<b>11,250</b>	1258	12.14	—	—	—	—	—	—	—	—

**Boldface** indicates field-supplied drive is required (Standard motor (HD60FK657), motor pulley P/N KR11HY232, blower pulley P/N KR51BQ415, belt P/N KR29BF059) 583-717 rpm range.

	STD Static (707-888 rpm) 7.4 Max BHP
	MID Static (872-1053 rpm) 9.9 Max BHP
	HIGH Static (1049-1291 rpm) 13.6 Max BHP

## APPENDIX C — FAN PERFORMANCE

**Table M — Pulley Adjustment - Vertical Units**

48LC UNIT		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN												
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
14	3 phase	Standard static	N/A	N/A	676	658	640	623	605	587	569	551	534	516	498
		Medium static	N/A	N/A	861	843	825	807	789	772	754	736	718	700	682
		High static	963	948	933	918	903	888	873	857	842	827	812	797	782
		Ultra static	1113	1098	1083	1068	1053	1038	1023	1008	993	978	963	948	933
17	3 phase	Standard static	N/A	N/A	753	733	713	694	674	654	634	614	595	575	555
		Medium static	888	873	858	843	828	813	798	782	767	752	737	722	707
		High static	1053	1038	1023	1008	993	978	963	947	932	917	902	887	872
		Ultra static	1291	1271	1251	1231	1210	1190	1170	1150	1130	1110	1089	1069	1049
20	3 phase	Standard static	N/A	N/A	854	836	818	801	783	765	747	729	712	694	676
		Medium static	963	948	933	918	903	888	873	857	842	827	812	797	782
		High static	1113	1098	1083	1068	1053	1038	1023	1008	993	978	963	948	933
		Ultra static	1291	1271	1251	1231	1210	1190	1170	1150	1130	1110	1089	1069	1049
24	3 phase	Standard static	888	873	858	843	828	813	798	782	767	752	737	722	707
		Medium static	1053	1038	1023	1008	993	978	963	947	932	917	902	887	872
		High static	1291	1271	1251	1231	1210	1190	1170	1150	1130	1110	1089	1069	1049
26	3 phase	Standard static	888	873	858	843	828	813	798	782	767	752	737	722	707
		Medium static	1053	1038	1023	1008	993	978	963	947	932	917	902	887	872
		High static	1291	1271	1251	1231	1210	1190	1170	1150	1130	1110	1089	1069	1049

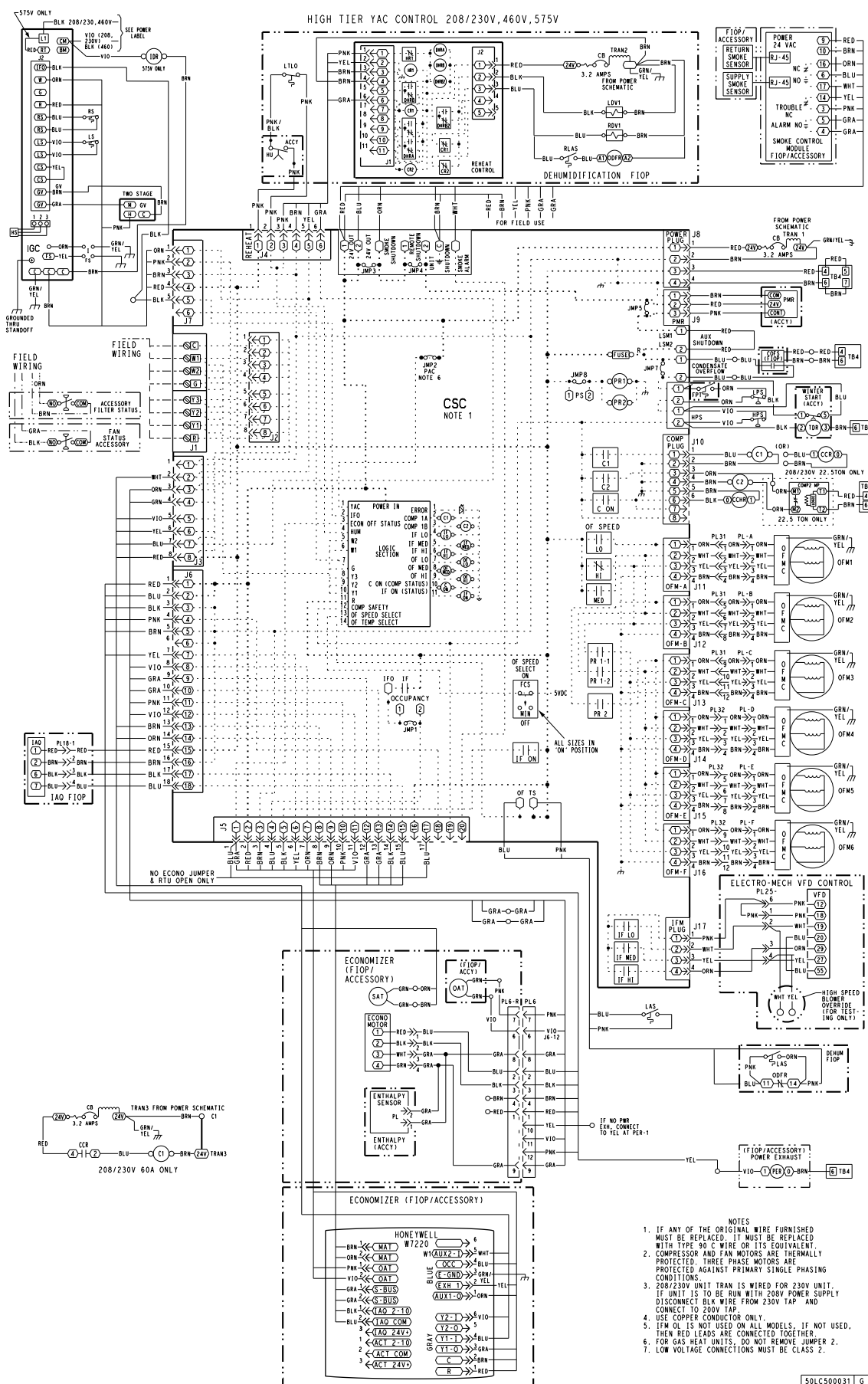
Factory setting

**Table N — Pulley Adjustment - Horizontal Units**

48LC UNIT		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN												
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
14	3 phase	Standard static	N/A	N/A	676	658	640	623	605	587	569	551	534	516	498
		Medium static	808	794	781	767	753	740	726	712	699	685	671	658	644
		High static	963	948	933	918	903	888	873	857	842	827	812	797	782
		Ultra static	1113	1098	1083	1068	1053	1038	1023	1008	993	978	963	948	933
17	3 phase	Standard static	N/A	N/A	713	694	675	657	638	619	600	581	563	544	525
		Medium static	888	873	858	843	828	813	798	782	767	752	737	722	707
		High static	1053	1038	1023	1008	993	978	963	947	932	917	902	887	872
		Ultra static	1190	1170	1150	1130	1109	1089	1069	1049	1029	1009	988	968	948
20	3 phase	Standard static	N/A	N/A	753	733	713	694	674	654	634	614	595	575	555
		Medium static	888	873	858	843	828	813	798	782	767	752	737	722	707
		High static	1053	1038	1023	1008	993	978	963	947	932	917	902	887	872
		Ultra static	1190	1170	1150	1130	1109	1089	1069	1049	1029	1009	988	968	948
24	3 phase	Standard static	888	873	858	843	828	813	798	782	767	752	737	722	707
		Medium static	1026	1012	998	984	970	956	943	929	915	901	887	873	859
		High static	1190	1170	1150	1130	1109	1089	1069	1049	1029	1009	988	968	948
26	3 phase	Standard static	888	873	858	843	828	813	798	782	767	752	737	722	707
		Medium static	1026	1012	998	984	970	956	943	929	915	901	887	873	859
		High static	1190	1170	1150	1130	1109	1089	1069	1049	1029	1009	988	968	948

Factory setting

## APPENDIX D — WIRING DIAGRAMS

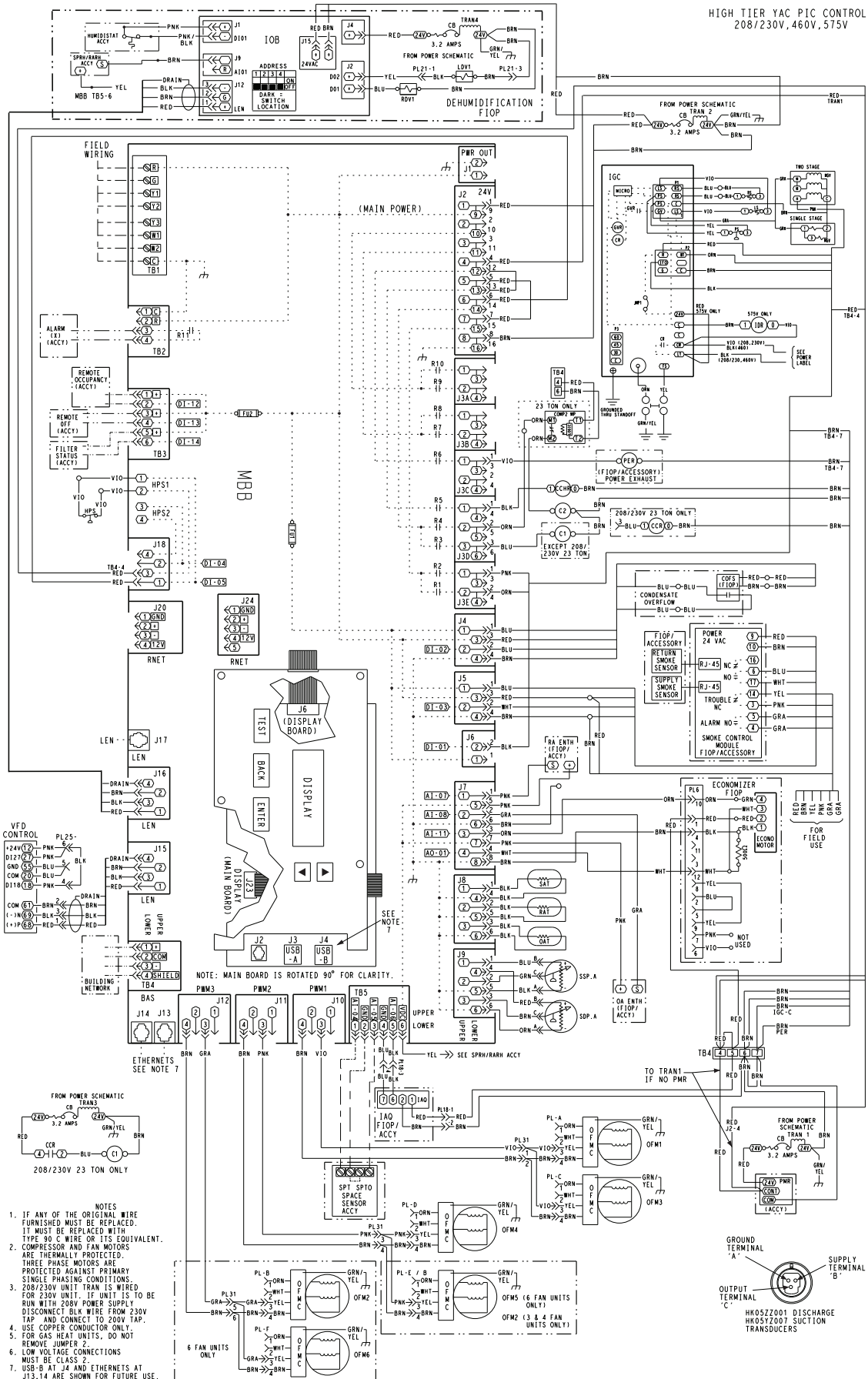


**Fig. B — Typical Electromechanical Control Wiring Diagram, 48LC 14-26**



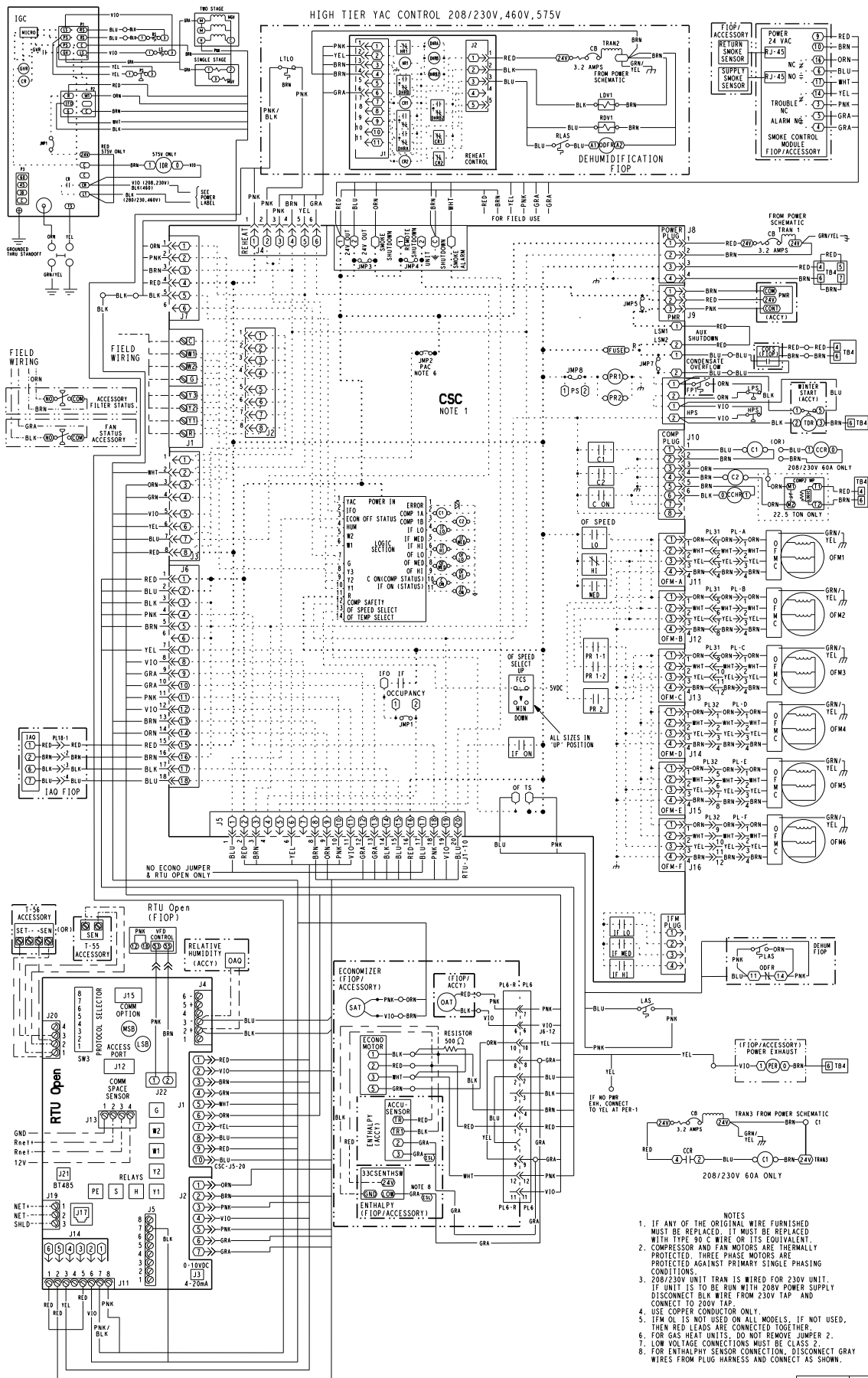
## APPENDIX D — WIRING DIAGRAMS

HIGH TIER YAC PIC CONTROL  
208/230V, 460V, 575V



**Fig. C — 48LC 14-26 Systemvu Control Schematic**

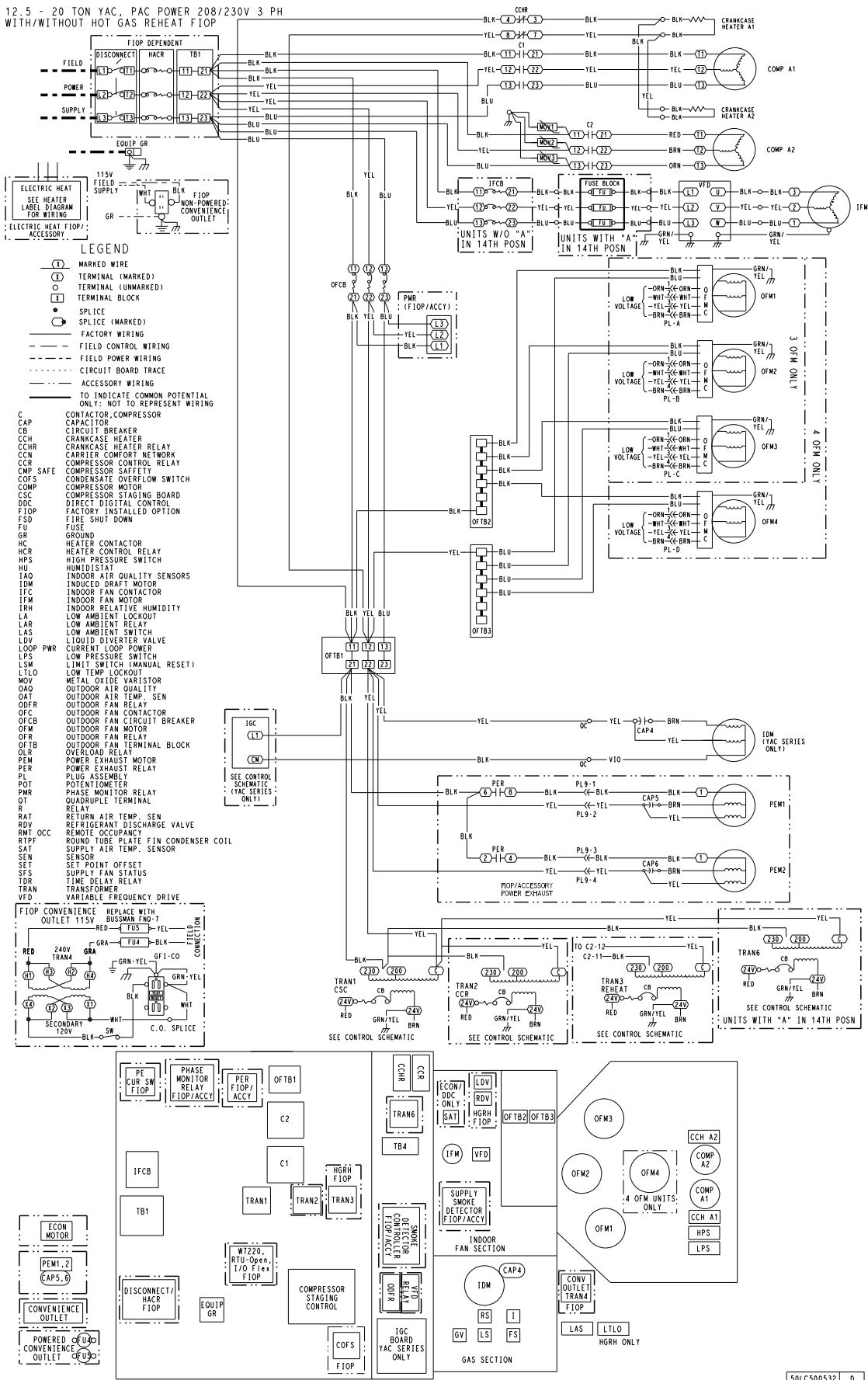
## APPENDIX D — WIRING DIAGRAMS



**Fig. D — 48LC 14-26 RTU-Open Control Wiring Diagram**

## APPENDIX D — WIRING DIAGRAMS

12.5 - 20 TON YAC, PAC POWER 208/230V 3 PH  
WITH/WITHOUT HOT GAS REHEAT FIOP



NOTE: This power wiring diagram is typical for electromechanical, SystemVu™ and RTU Open units.

**Fig. E — Typical Power Wiring Diagram (48LC 14-20, 208/230-v shown)**





**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 judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instruction document.**

**I. PRELIMINARY INFORMATION**

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

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

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

ADDRESS \_\_\_\_\_

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

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

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

**II. PRE-START-UP**

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

Verify installation of duct pressure transducer (Y/N) \_\_\_\_\_

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

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

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

Verify that all electrical connections and terminals are tight (Y/N) \_\_\_\_\_

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

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

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

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

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

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

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

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

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

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

**III. START-UP**

**ELECTRICAL**

Supply Voltage	L1-L2 _____	L2-L3 _____	L3-L1 _____
Compressor Amps 1	L1 _____	L2 _____	L3 _____
Compressor Amps 2	L1 _____	L2 _____	L3 _____
Supply Fan Amps	L1 _____	L2 _____	L3 _____

**TEMPERATURES**

Outdoor-Air Temperature	_____ °F DB (Dry Bulb)	
Return-Air Temperature	_____ °F DB	_____ °F WB (Wet Bulb)
Cooling Supply Air Temperature	_____ °F	
Gas Heat Supply Air Temperature	_____ °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 (Y/N) \_\_\_\_\_

## GENERAL

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

## IV. HUMIDI-MIZER® SYSTEM START-UP

### STEPS

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

### OBSERVE AND RECORD

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

### OBSERVE

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

### OBSERVE

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

## REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE