Carrier

WeatherExpert® 48LC 04-06 Single Package Rooftop Gas Heating/Electric Cooling Unit with Puron® (R-410A) Refrigerant

Service and Maintenance Instructions

CONTENTS

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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

RISK OF FIRE OR EXPLOSION

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

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.

⚠ 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).

UNIT ARRANGEMENT AND ACCESS

General

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

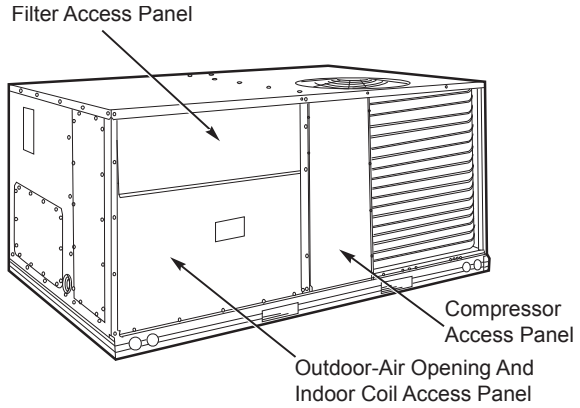

Fig. 1 — Typical Access Panel Locations

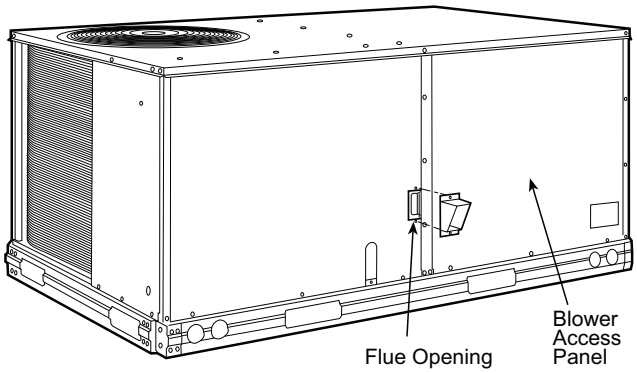

Fig. 2 — Blower Access Panel Location

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 small lift-out panel located on the rear side of the unit, above the evaporator/return air access panel. (See Fig. 1.)

To remove the filters:

1. Grasp the bottom flange of the upper panel.
2. Lift up and swing the bottom out until the panel disengages and pulls out.
3. Reach inside and extract the filters from the filter rack.
4. Replace these filters as required with similar replacement filters of same size.

To re-install the access panel:

1. Slide the top of the panel up under the unit top panel.
2. Slide the bottom into the side channels.
3. Push the bottom flange down until it contacts the top of the lower panel (or economizer top).

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, open the spring clips. Re-install the filter by placing the frame in its track, then closing the spring clips.

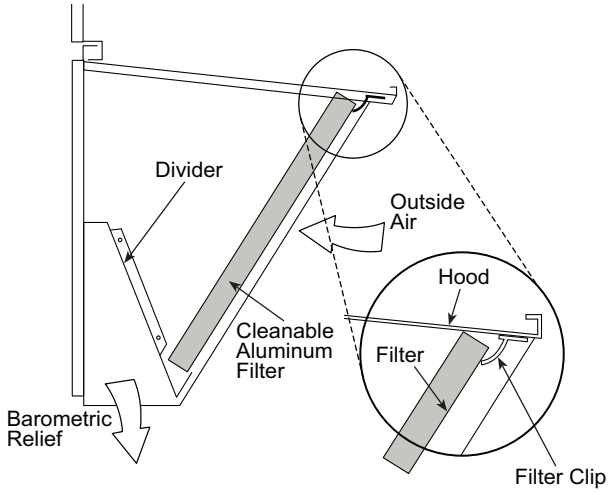

Fig. 3 — Filter Installation

MANUAL OUTSIDE AIR HOOD SCREEN

This inlet screen is secured by a retainer angle across the top edge of the hood. (See Fig. 4.)

To remove the screen, loosen the screws in the top retainer and slip the retainer up until the filter can be removed. Re-install by placing the frame in its track, rotating the retainer back down and tighten all screws.

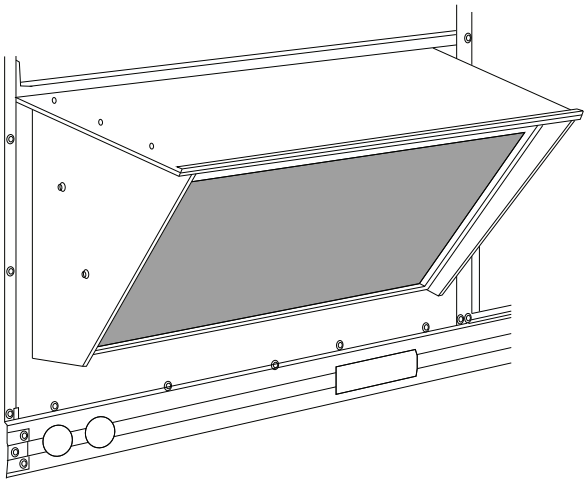

Fig. 4 — Screens Installed on Outdoor-Air Hood

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. 5.)

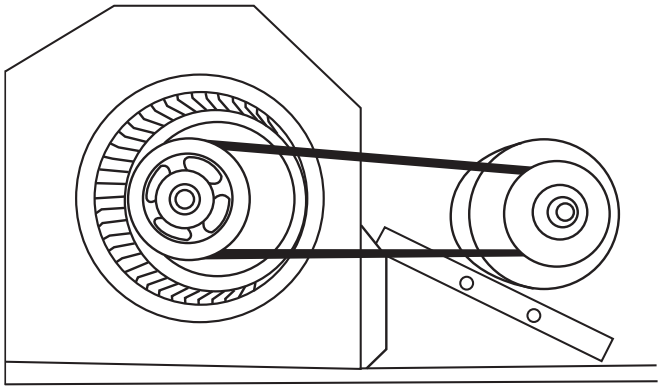

Fig. 5 — Belt Drive Motor Mounting

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 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 1/2 in. deflection.

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

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, 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.
2. Loosen belt by loosening fan motor mounting nuts. (See Fig. 5.)
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.

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.

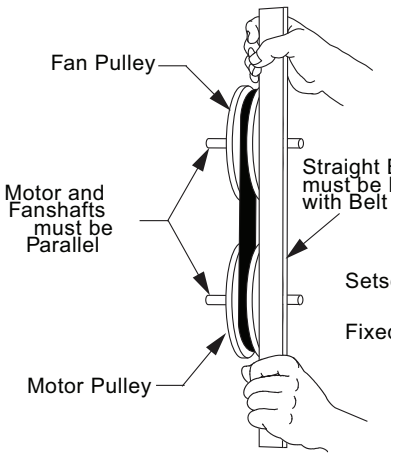

Fig. 6 — Supply-Fan Pulley Adjustment

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.

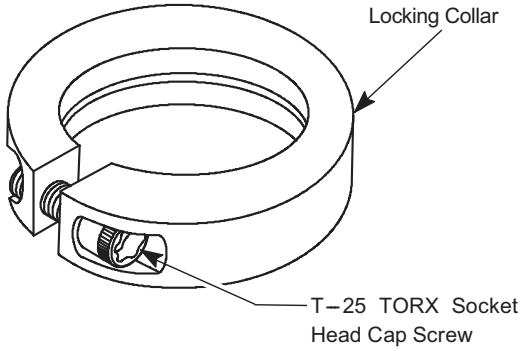

Fig. 7 — Tightening Locking Collar

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

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. Gauge set, hoses, and recovery system must be designed to handle R-410A refrigerant. If unsure about equipment, consult the equipment manufacturer.

Condenser Coil

The condenser coil is fabricated with round tube copper hairpins and plate fins of various materials and/or coatings (see Appendix A to identify the materials provided in this unit). The coil may be one-row or composite-type two-row. Composite two-row coils are two single-row coils fabricated with a single return bend end tubesheet.

Condenser 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 a very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

ROUTINE CLEANING OF COIL SURFACES

Periodic cleaning with Totaline® environmentally sound coil cleaner is essential to extend the life of coils. This cleaner is available from Carrier Replacement Components Division as part number P902-0301 for a one gallon container, and part number P902-0305 for a 5 gallon container. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or E-coated coils be cleaned with the Totaline environmentally sound 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 use of:

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

Totaline environmentally sound coil cleaner is nonflammable, hypo allergenic, non bacterial, and a USDA accepted biodegradable agent that will not harm the 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.

One-Row Coil

Wash coil with commercial coil cleaner. It is not necessary to remove top panel.

Two-Row Coils

Clean coil as follows:

1. Turn off unit power, tag disconnect.
2. Remove top panel screws on condenser end of unit.
3. Remove condenser coil corner post. See Fig. 8. To hold top panel open, place coil corner post between top panel and center post. See Fig. 9.
4. Remove screws securing coil to compressor plate and compressor access panel.
5. Remove fastener holding coil sections together at return end of condenser coil. Carefully separate the outer coil section 3 to 4 in. from the inner coil section. See Fig. 10.
6. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. Clean the outer surfaces with a stiff brush in the normal manner.
7. Secure inner and outer coil rows together with a field-supplied fastener.
8. Reposition the outer coil section and remove the coil corner post from between the top panel and center post. Reinstall the coil corner post and replace all screws.

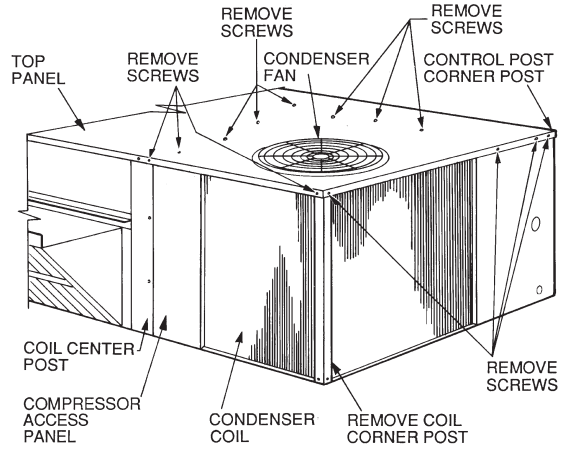

Fig. 8 — Cleaning Condenser Coil

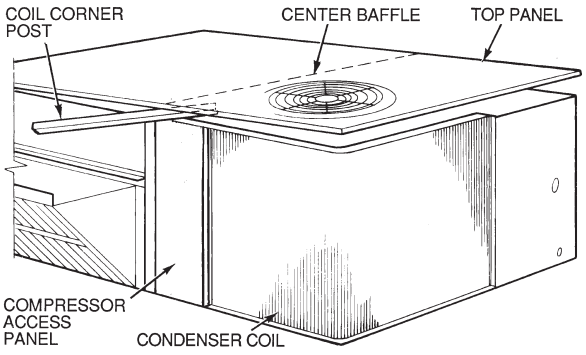

Fig. 9 — Propping Up Top Panel

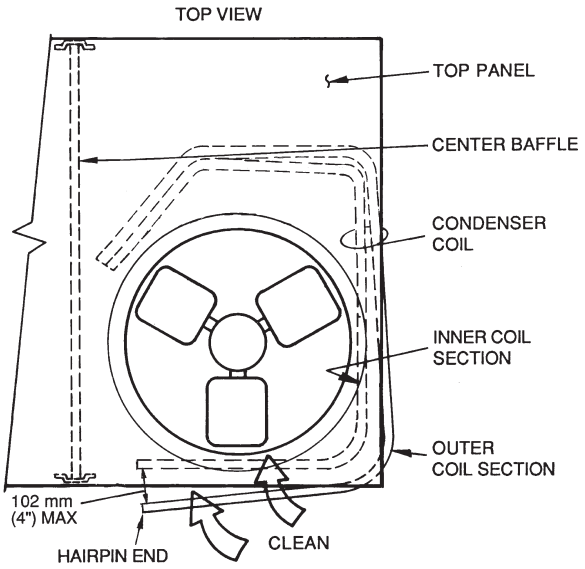

Fig. 10 — Separating Coil Sections

Totaline Environmentally Sound Coil Cleaner Application Equipment

- 2-1/2 gallon garden sprayer
- Water rinse with low velocity spray nozzle

⚠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 airside pressure drop.

⚠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.

Totaline Environmentally Sound 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 sound coil cleaner in a 2-1/2 gallon garden sprayer according to the instructions included with the cleaner. The optimum solution temperature is 100°F.

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

5. Thoroughly apply Totaline environmentally sound coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
6. 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.
7. Ensure cleaner thoroughly penetrates deep into finned areas.
8. Interior and exterior finned areas must be thoroughly cleaned.
9. Finned surfaces should remain wet with cleaning solution for 10 minutes.
10. Ensure surfaces are not allowed to dry before rinsing. Reapplying cleaner as needed to ensure 10 minute saturation is achieved.
11. 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.

Evaporator Coil

CLEANING THE EVAPORATOR COIL

1. Turn unit power off. Install lockout tag. Remove evaporator coil access panel.
2. If economizer or two-position damper is installed, remove economizer by disconnecting Molex plug and removing mounting screws.
3. Slide filters out of unit.
4. Clean coil using a commercial coil cleaner or dishwasher detergent in a pressurized spray canister. Wash both sides of coil and flush with clean water. For best results, back-flush toward return-air section to remove foreign material. Flush condensate pan after completion.
5. Reinstall economizer and filters.
6. Reconnect wiring.
7. Replace access panels.

EVAPORATOR COIL METERING DEVICES

The metering devices are multiple fixed-bore devices (Acutrol™) swedged into the horizontal outlet tubes from the liquid header, located at the entrance to each evaporator coil circuit path. These are non-adjustable. Service requires replacing the entire liquid header assembly.

To check for possible blockage of one or more of these metering devices, disconnect the supply fan contactor (IFC) coil, then start the compressor and observe the frosting pattern on the face of the evaporator coil. A frost pattern should develop uniformly across the face of the coil starting at each horizontal header tube. Failure to develop frost at an outlet tube can indicate a plugged or a missing orifice.

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 1/4 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. 11.) 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.

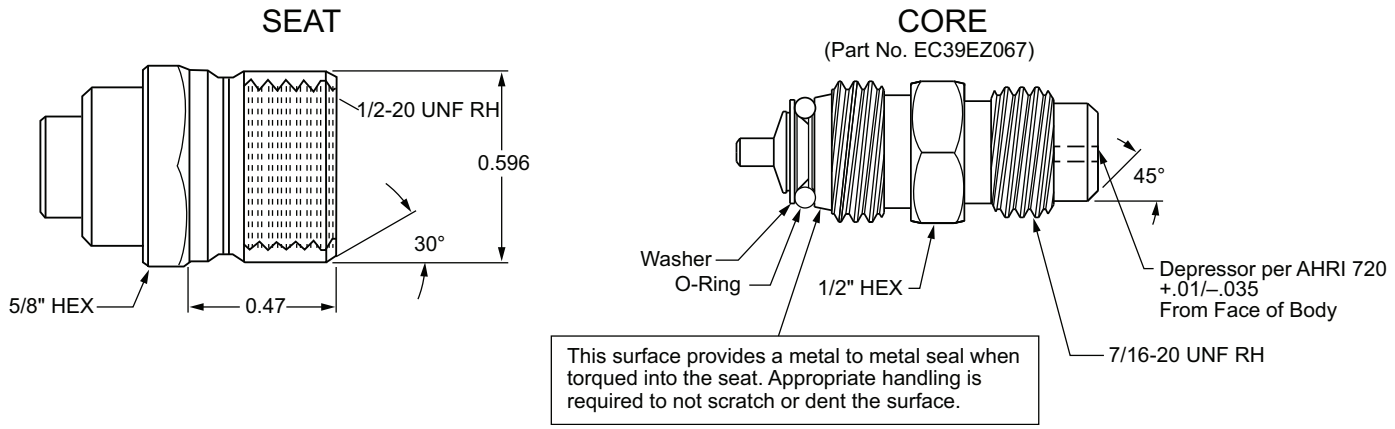

Fig. 11 — CoreMax[1] Access Port Assembly

Compressor

LUBRICATION

The compressor is 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.

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.

Compressor mounting bolt torque is 65 to 75 ft-lb.

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:

Note that the evaporator fan is probably also rotating in the wrong direction.

1. Turn off power to the unit.
2. Reverse any two of the unit power leads.
3. 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 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. 12.
5. Tighten setscrews.
6. Replace condenser-fan assembly.

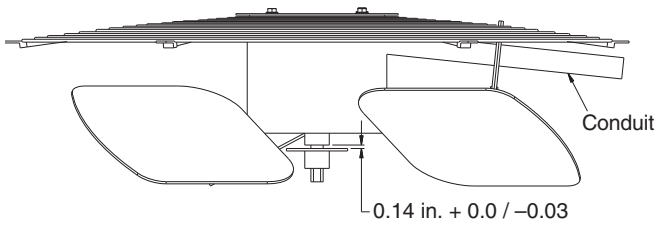

Fig. 12 — Condenser Fan Adjustment

Troubleshooting Cooling System

Refer to Table 1 for additional troubleshooting topics.

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Table 1 — Cooling Service Analysis

PROBLEM	CAUSE	REMEDY
Compressor and Condenser Fan Will Not Start	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.
Compressor Will Not Start But Condenser Fan Runs	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.
Compressor Cycles (other than normally satisfying thermostat)	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 replace.
	Defective thermostat.	Replace thermostat.
	Faulty condenser- fan motor or capacitor.	Replace.
	Restriction in refrigerant system.	Locate restriction and remove.
Compressor Operates Continuously	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.
Excessive Head Pressure	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.
Head Pressure Too Low	Low refrigerant charge.	Check for leaks; repair and recharge.
	Compressor valves leaking.	Replace compressor.
	Restriction in liquid tube.	Remove restriction.
Excessive Suction Pressure	High head load.	Check for source and eliminate.
	Compressor valves leaking.	Replace compressor.
	Refrigerant overcharged.	Recover excess refrigerant.
Suction Pressure Too Low	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.
Evaporator Fan Will Not Shut Off	Time off delay not finished.	Wait for 30 second off delay.
Compressor Makes Excessive Noise	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.

NO CHARGE

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

LOW-CHARGE COOLING

Using cooling charging charts (see Fig. 13-15), vary refrigerant until the conditions of the appropriate chart are met. Note the charging charts are different from 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 liquid line. Mount the temperature sensing device on the liquid line 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

Take the outdoor ambient temperature and read the liquid pressure gage. Refer to chart to determine what liquid temperature should be. If liquid temperature is low, add refrigerant. If liquid temperature is high, carefully recover some of the charge. Recheck the liquid pressure as charge is adjusted.

EXAMPLE:

Model 48LC*004

Outdoor Temperature 85°F (29°C)

Suction Pressure 140 psig (965 kPa)

Suction Temperature should be 60°F (16°C)

COOLING CHARGING CHARTS

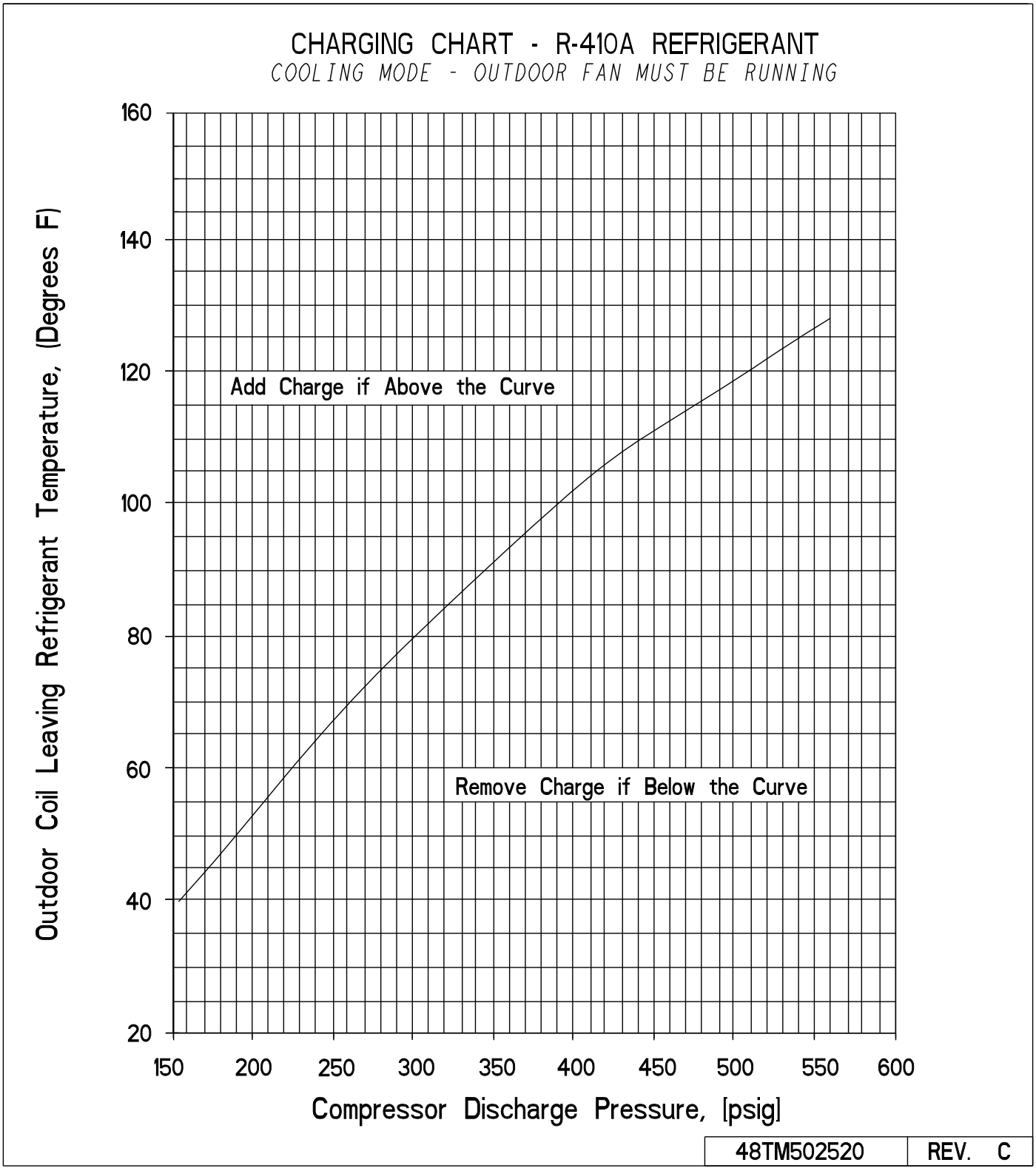


Fig. 13 — 48LC04 Cooling Charging Chart**

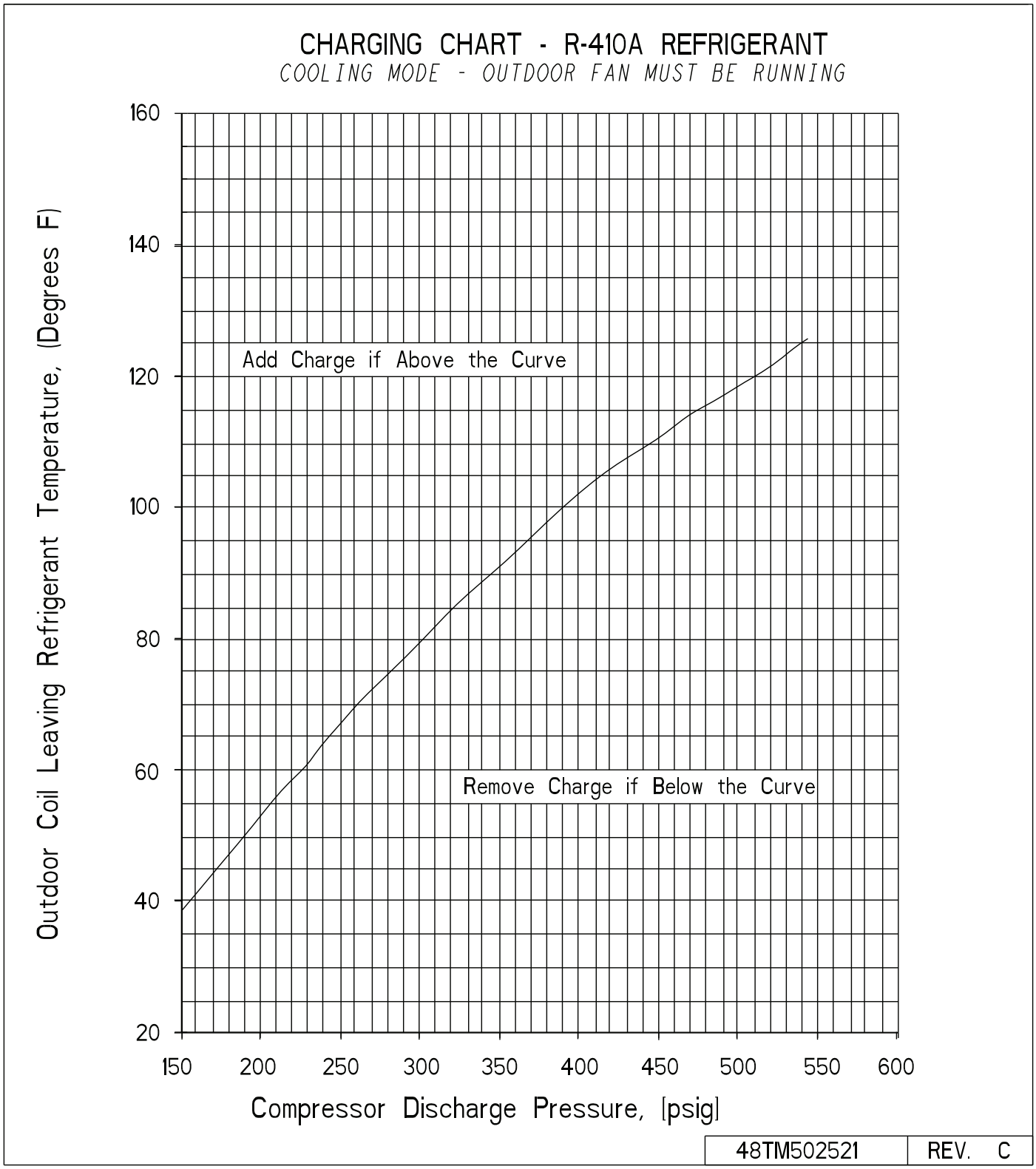


Fig. 14 — 48LC05 Cooling Charging Chart**

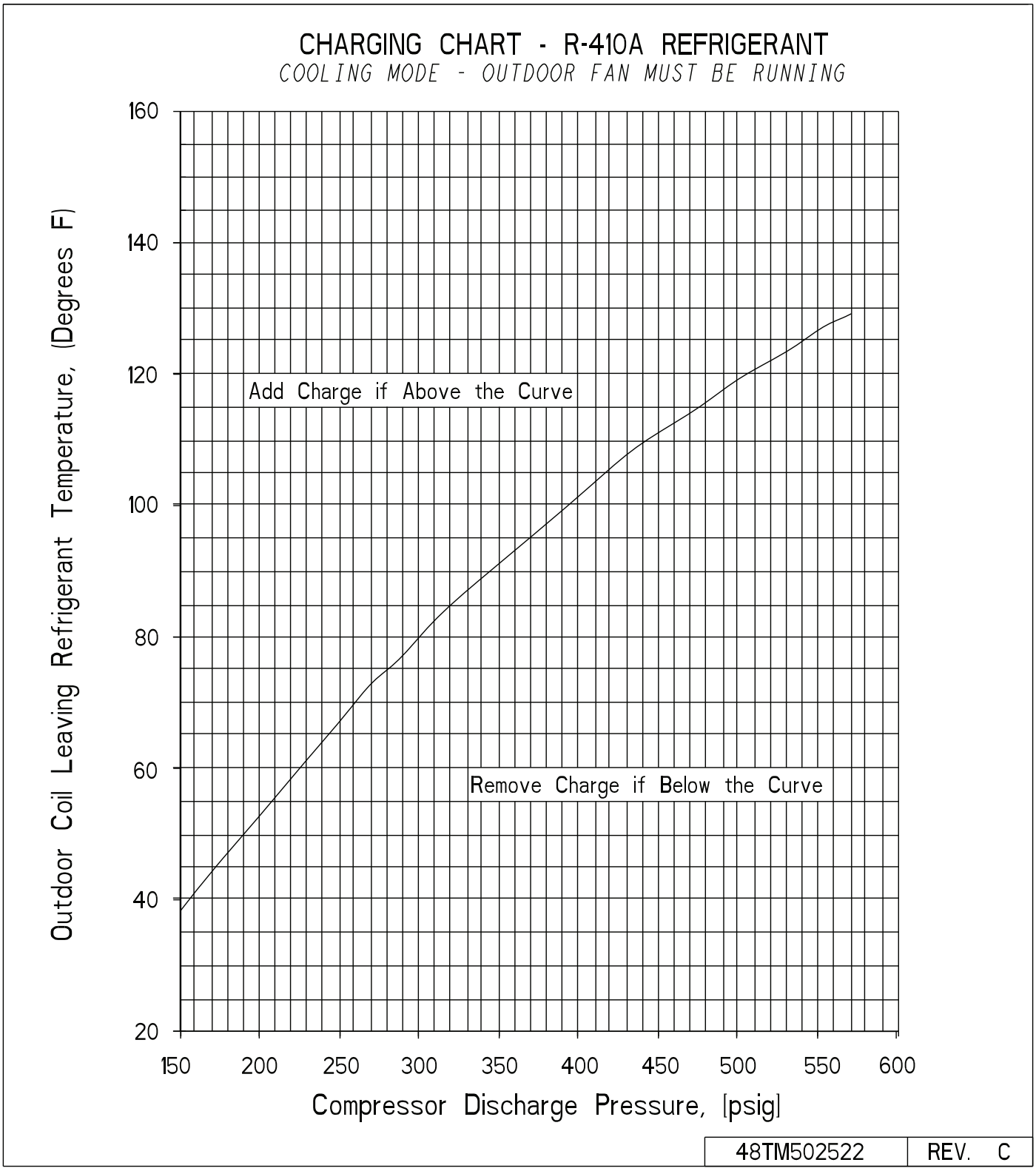


Fig. 15 — 48LC06 Cooling Charging Chart**

THERMOSTATIC EXPANSION VALVE (TXV)

All 48LC units have a factory-installed nonadjustable thermostatic expansion valve (TXV). The TXV will be a bi-flow, bleed port expansion valve with an external equalizer. TXVs are specifically designed to operate with Puron or R-22 refrigerant, use only factory authorized TXVs. Do not interchange Puron and R-22 TXVs.

TXV Operation

The TXV is a metering device that is used in air conditioning and heat pump systems to adjust to changing load conditions by maintaining a preset superheat temperature at the outlet of the evaporator coil.

REPLACING TXV

1. Recover refrigerant.
2. Remove TXV support clamp using a 5/16 in. nut driver.
3. Remove TXV using a backup wrench on connections to prevent damage to tubing.
4. Remove equalizer tube from suction line of coil. Use file or tubing cutter to cut brazed equalizer line approximately 2 in. above suction tube.
5. Remove bulb from vapor tube inside cabinet.
6. Install the new TXV using a wrench and backup wrench to avoid damage to tubing or valve to attach TXV to distributor.
7. Attach equalizer tube to suction line. If coil has mechanical connection, then use wrench and back up wrench to attach. If coil has brazed connection, use file or tubing cutters to remove mechanical flare nut from equalizer line. Then use coupling to braze the equalizer line to stub (previous equalizer line) in suction line.
8. Attach TXV bulb in the same location as original (in the sensing bulb indent) was when removed, using supplied bulb clamps. See Fig. 16.
9. Route equalizer tube through suction connection opening (large hole) in fitting panel and install fitting panel in place.
10. Sweat inlet of TXV marked "IN" to liquid line. Avoid excessive heat which could damage valve.

Fig. 16 — Sensing Bulb Indent

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-v GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 17.

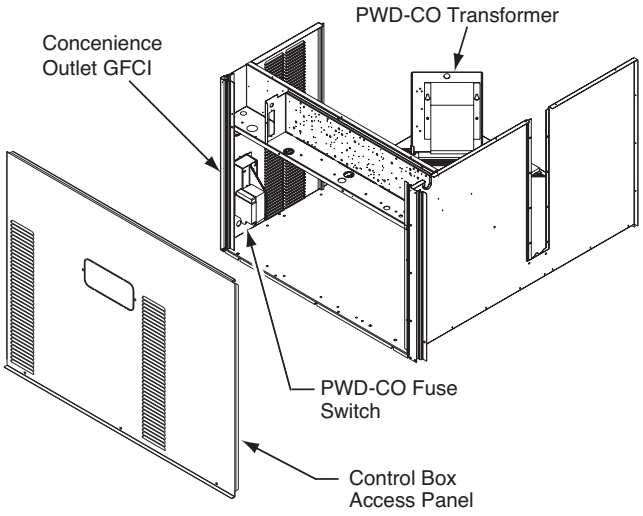


Fig. 17 — Convenience Outlet Location

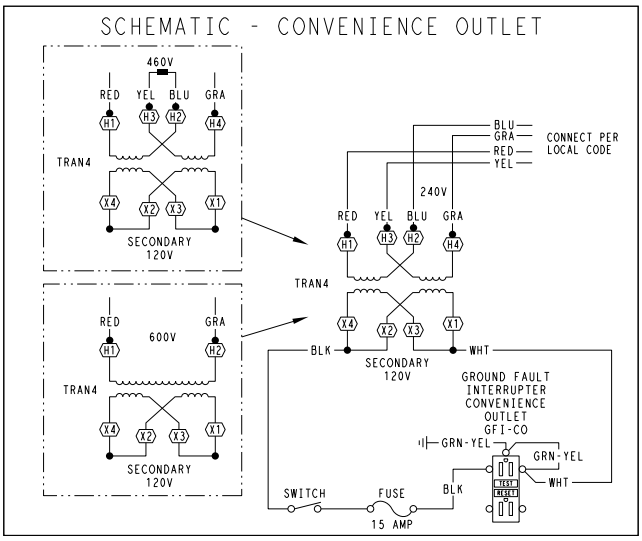
Non-Powered Type

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. 17.

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 nonfused disconnect or HACR breaker switch; this will provide service power to the unit when the unit disconnect switch or HACR switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect or HACR switch is open. See Fig. 18.



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. 18 — 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[1] "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. 19) 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).

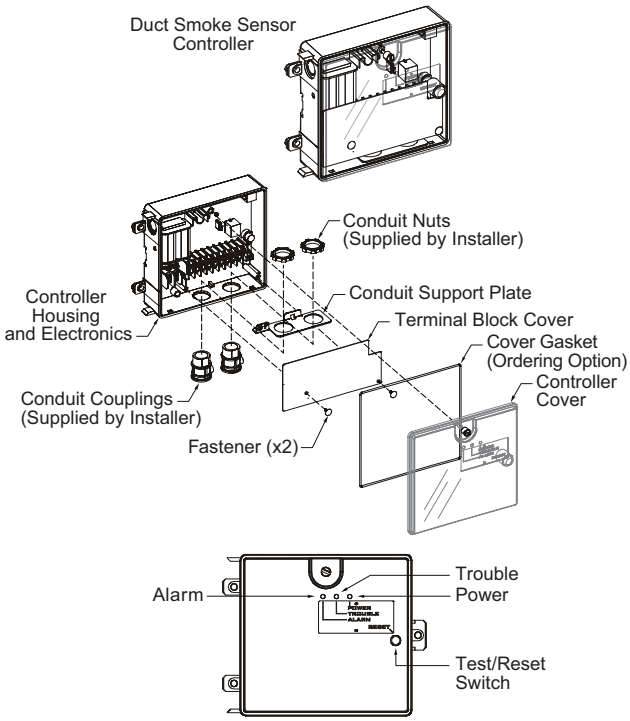


Fig. 19 — Controller Assembly

Sensor

The sensor (see Fig. 20) 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

1. Third-party trademarks and logos are the property of their respective owners.

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.

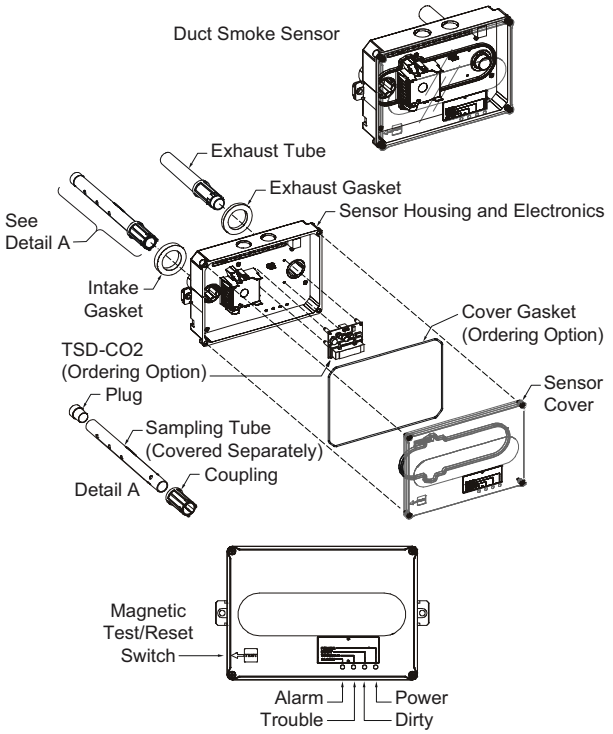


Fig. 20 — Smoke Detector Sensor

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. 21. 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.

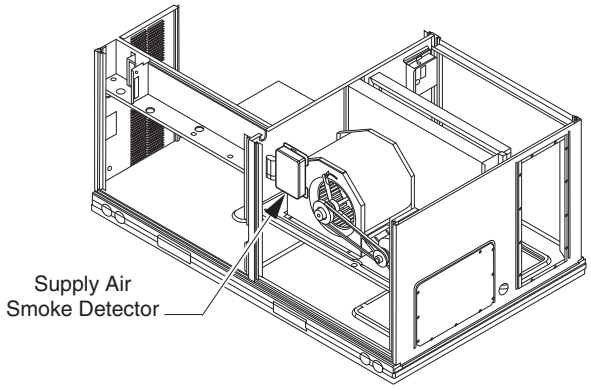
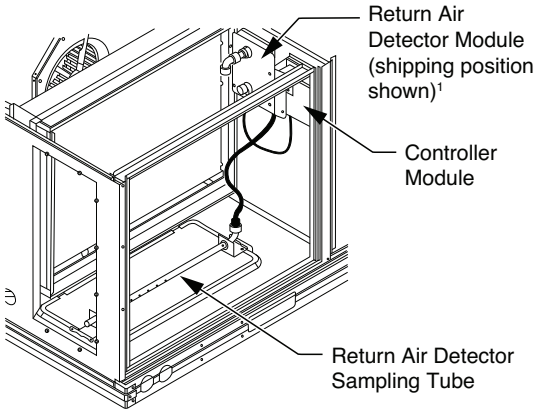


Fig. 21 — Typical Supply Air Smoke Detector Sensor Location

RETURN AIR WITHOUT ECONOMIZER

The sampling tube is located across the return air opening on the unit basepan. See Fig. 22. 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.)



[1]RA detector must be moved from shipping position to operating position by installer.

Fig. 22 — Typical Return Air Detector Location

RETURN AIR WITH ECONOMIZER

The sampling tube is inserted through the side plates of the economizer housing, placing it across the return air opening on the unit basepan. See Fig. 23. 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.)

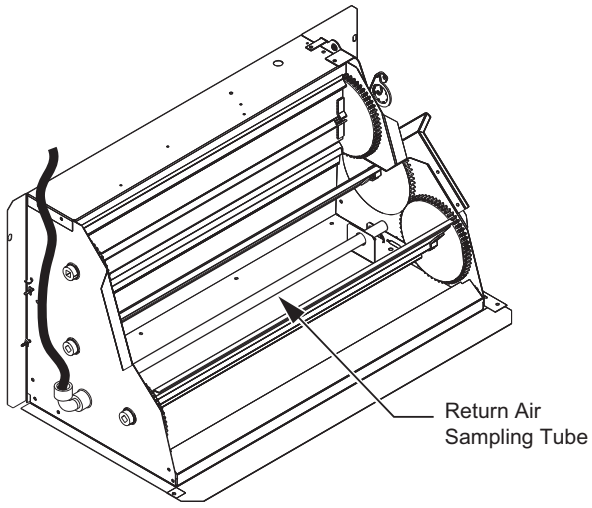


Fig. 23 — Return Air Sampling Tube Location

Completing Installation of Return Air Smoke Sensor

1. Unscrew the two screws holding the return air sensor detector plate. See Fig. 24. Save the screws.
2. Remove the return air sensor and its detector plate.
3. Rotate the detector plate so the sensor is facing outwards and the sampling tube connection is on the bottom. See Fig. 25.

4. Screw the sensor and detector plate into its operating position using screws from Step 1. Make sure the sampling tube connection is on the bottom and the exhaust tube is on the top. See Fig. 26.
5. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.
6. For units with an economizer, the sampling tube is integrated into the economizer housing but the connection of the flexible tubing to the sampling tube is the same.

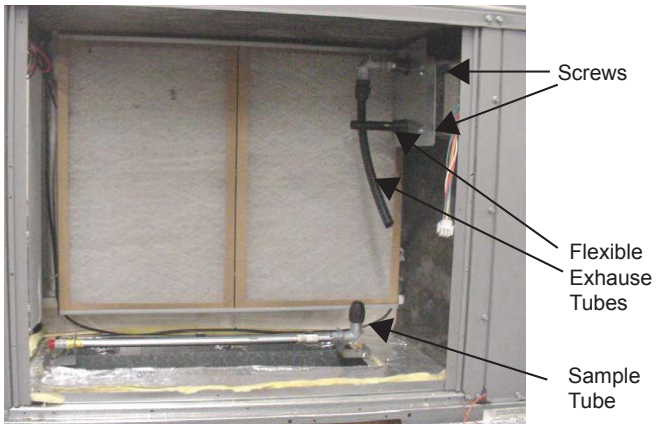


Fig. 24 — Return Air Detector Shipping Position

Fig. 25 — Return Air Sensor Operating Position

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. 26 for smoke detector wiring.

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 CTB; all unit operations cease immediately.

RTU OPEN CONTROLS

Unit operating functions (fan, cooling and heating) are terminated as described above. In addition, see below.

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 CTB provides 24-v signal to FIOP DDC control.

RTU OPEN

The 24-v signal is conveyed to RTU-Open's J1-10 input terminal. This signal initiates the FSD sequence by the RTU Open control. FSD status is reported to connected BAS network.

USING REMOTE LOGIC

Five conductors are provided for field use (see Highlight F in Fig. 26) for additional annunciation functions.

ADDITIONAL APPLICATION DATA

Refer to the application data document "Factory Installed Smoke Detectors for Small and Medium Rooftop Units 2 to 25 Tons" for discussions on additional control features of these smoke detectors including multiple unit coordination. See Fig. 26.

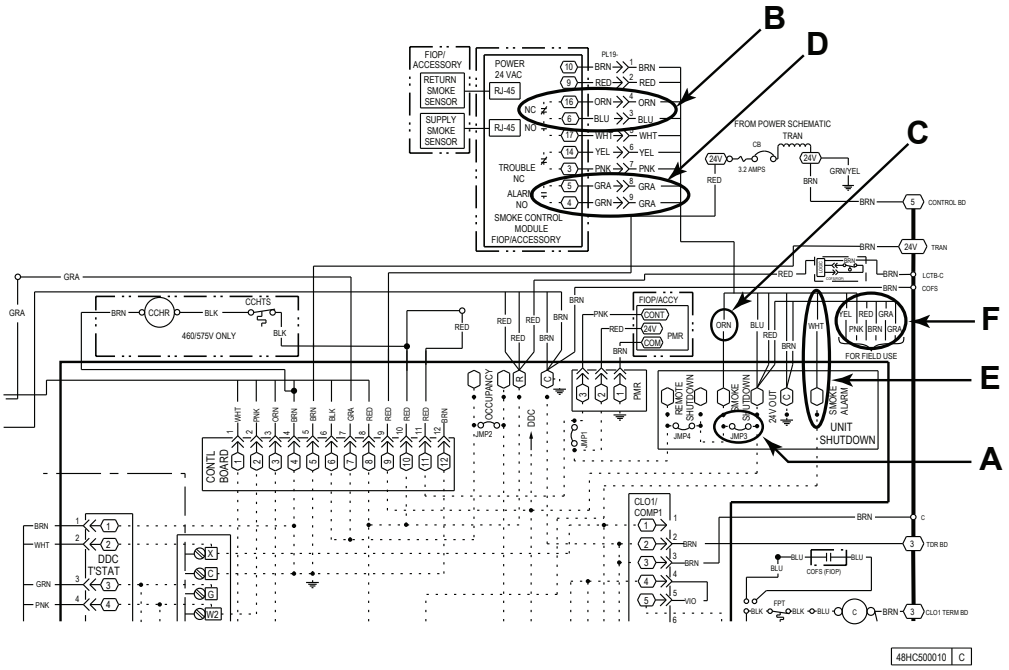


Fig. 26 — Typical Smoke Detector System Wiring

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 caution 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 caution 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 caution 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

1. Press the controller's test/reset switch for two seconds.
2. 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. Use a field provided SD-MAG test magnet 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 caution 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 caution 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 2 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 caution 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. 27 and configured to operate the controller's supervision relay. For more information, see "Changing the Dirty Sensor Test."

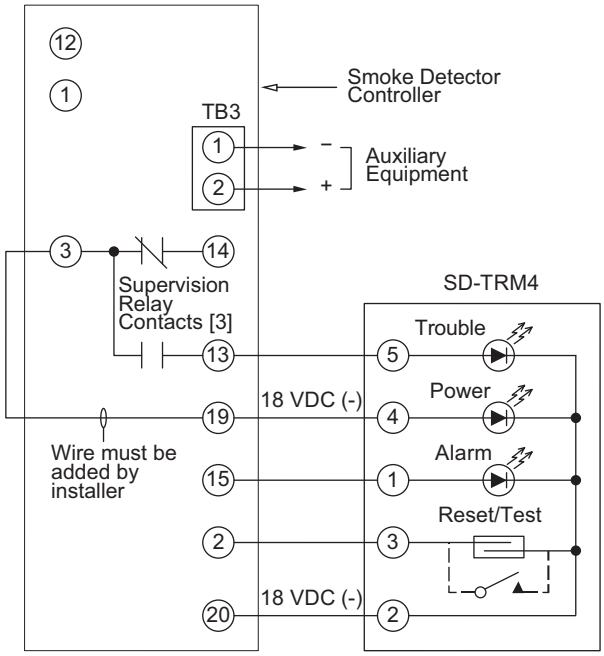


Fig. 27 — Remote Test/Reset Station Connections

IMPORTANT: Failure to follow this caution 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 caution 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 caution 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. 28.)
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.

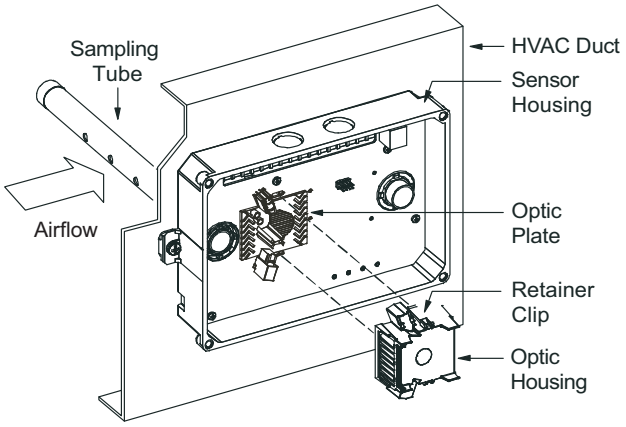


Fig. 28 — Sensor Cleaning Diagram

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. 29.)
- If there is a sensor fault, the sensor's trouble LED and the controller trouble LED will 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.

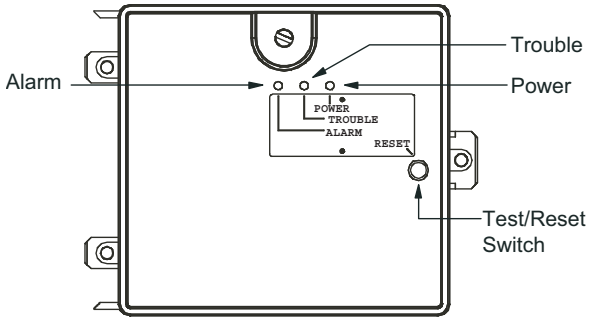


Fig. 29 — Controller Assembly

Table 3 — Detector Indicators

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

Resetting Alarm and Trouble Condition Trips

Manual reset is required to restore smoke detector systems to Normal operation. For installations using two sensors, the duct smoke detector does not differentiate which sensor signals an alarm or trouble condition. Check each sensor for Alarm or Trouble status (indicated by LED). Clear the condition that has generated the trip at this sensor. Then reset the sensor by pressing and holding the reset button (on the side) for 2 seconds. Verify that the sensor's Alarm and Trouble LEDs are now off. At the controller, clear its Alarm or Trouble state by pressing and holding the manual reset button (on the front cover) for 2 seconds. Verify that the controller's Alarm and Trouble LEDs are now off. Replace all panels.

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. 27. 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 ± 10 psig (4344 ± 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 ± 5 psig (372 ± 34 kPa). Reset is automatic at 117 ± 5 psig (807 ± 34 kPa).

EVAPORATOR FREEZE PROTECTION

The system is protected against evaporator coil frosting and low temperature conditions by a temperature switch mounted on the evaporator coil hairpin. Trip setting is 30°F ± 5°F (–1°C ± 3°C). Reset is automatic at 45°F (7°C).

Supply (Indoor) Fan Motor Protection

Disconnect and lockout power when servicing fan motor.

The standard supply fan motor is equipped with internal overcurrent and overtemperature protection. Protection devices reset automatically.

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.

CONDENSER FAN MOTOR PROTECTION

The condenser fan motor is internally protected against overtemperature.

Relief Device

A soft solder joint at the suction service access port provides pressure relief under abnormal temperature and pressure conditions (i.e., fire in building). Protect this joint during brazing operations near this joint.

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. 30 and 31.)

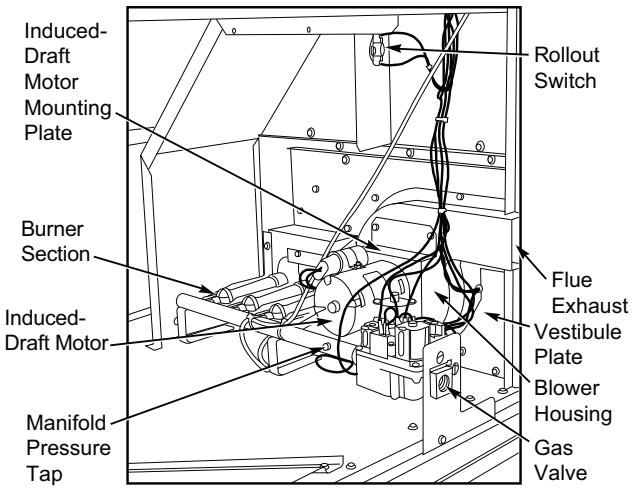


Fig. 30 — Burner Section Details

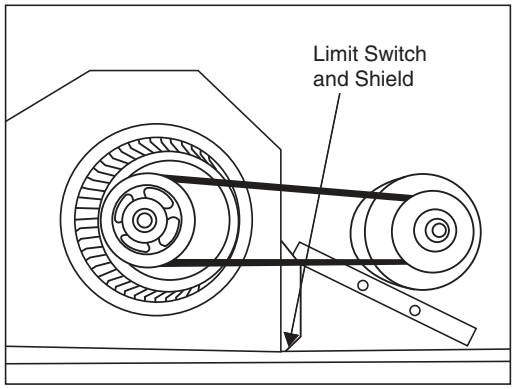


Fig. 31 — Limit Switch Location

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 Orifice Replacement section 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 4). 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 5).

LIQUID PROPANE

Accessory packages are available for field-installation that will convert the 48LC unit (except low NOx models) 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.

Low NOx models include specially-sized orifices and use of different flue flow limits and tube baffles. Because of these extra features, conversion of these models to LP is not recommended.

Fuel line pressure entering unit gas valve must remain within specified range (see Table 6).

Manifold pressure for LP fuel use must be adjusted to specified range (see Table 7). Follow instructions in the accessory kit to make initial readjustment.

Table 4 — Natural Gas Supply Line Pressure Ranges

UNIT MODEL	UNIT SIZE	MIN	MAX
48LCD/E/L/M/S/R	04, 05, 06	4.0 in. wg (996 Pa)	13.0 in. wg (3240 Pa)
48LCF/N/T (High Heat units only)	05, 06	5.0 in. wg (1245 Pa)	13.0 in. wg (3240 Pa)

Table 5 — Natural Gas Manifold Pressure Ranges

UNIT MODEL	UNIT SIZE	MIN	MAX
48LCD/E/L/M/S/R	04, 05, 06	3.5 in. wg (872 Pa)	1.7 in. wg (423 Pa)
48LCF/N/T (High Heat units only)	05, 06	3.5 in. wg (872 Pa)	1.7 in. wg (423 Pa)

Table 6 — Liquid Propane Supply Line Pressure Ranges

UNIT MODEL	UNIT SIZE	MIN	MAX
48LCD/E/L/M/S/R	04, 05, 06	11.0 in. wg (2740 Pa)	13.0 in. wg (3240 Pa)
48LCF/N/T (High Heat units only)	05, 06	11.0 in. wg (2740 Pa)	13.0 in. wg (3240 Pa)

Table 7 — Liquid Propane Manifold Pressure Ranges

UNIT MODEL	UNIT SIZE	MIN	MAX
48LCD/E/L/M/S/R	04, 05, 06	10.0 in. wg (2490 Pa)	5.0 in. wg (1245 Pa)
48LCF/N/T (High Heat units only)	05, 06	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. 32 and 33. 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.

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.

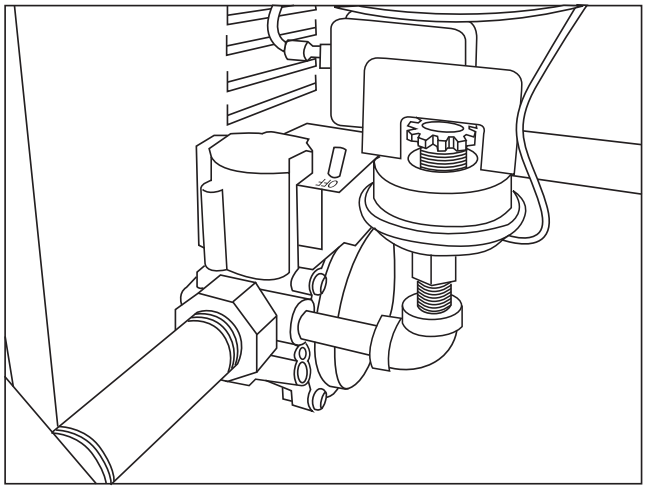


Fig. 32 — LP Low Pressure Switch (Installed)

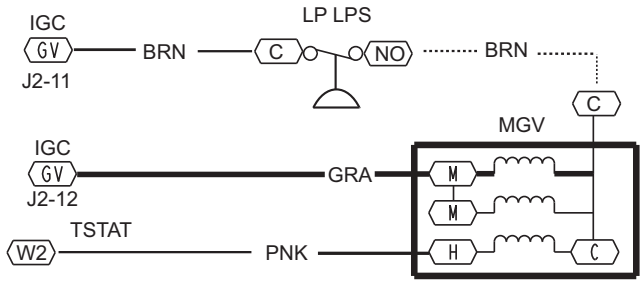


Fig. 33 — LP Supply Line Low Pressure Switch Wiring

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. 34.
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. Slide burner access panel out.
2. Remove the 7 screws that attach induced-draft motor housing to vestibule plate. (See Fig. 34.)
3. The blower wheel can be cleaned at this point. If additional cleaning is required, continue with Steps 4 and 5.
4. To remove blower from the motor shaft, remove 2 setscrews.
5. 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.
6. To reinstall, reverse the procedure outlined above.

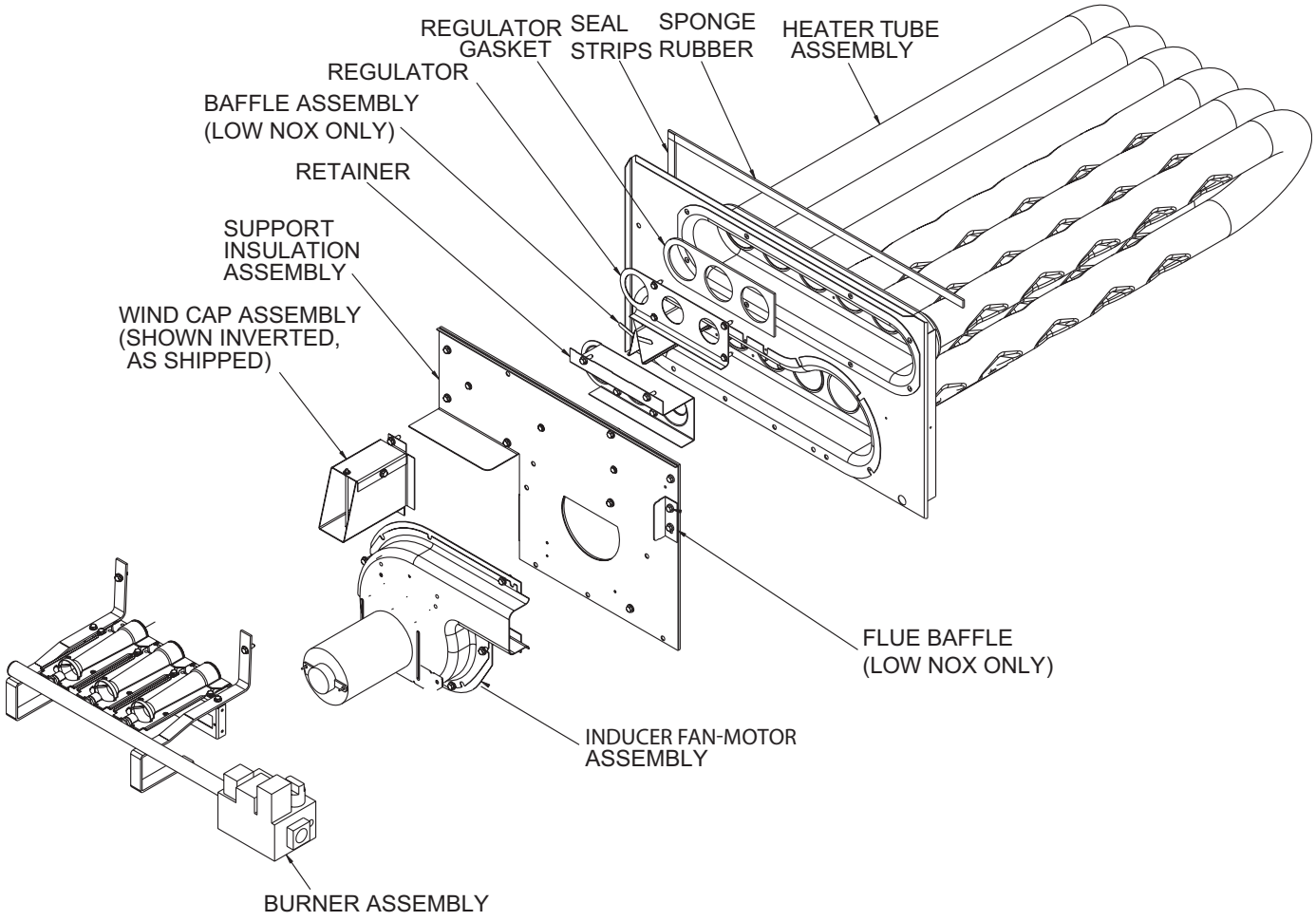


Fig. 34 — Heat Exchanger Assembly

Burners and Igniters

⚠ 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. 35 for maximum projection dimension for orifice face to manifold tube.

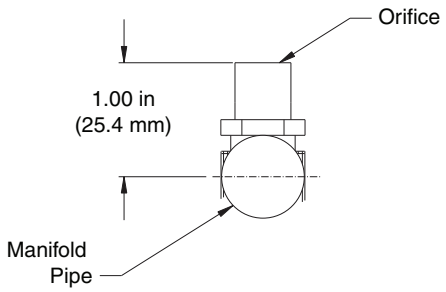


Fig. 35 — Orifice Projection

Removal and Replacement of Gas Train

See Fig. 30, 34 and 36.

1. Shut off manual gas valve.
2. Shut off power to unit.
3. Slide out burner partition.
4. Disconnect gas piping at unit gas valve.
5. Remove wires connected to gas valve. Mark each wire.
6. Remove igniter wires and sensor wires at the Integrated Gas Unit Controller (IGC). (See Fig. 37.)
7. Remove the 2 screws that attach the burner rack to the vestibule plate (Fig. 34).
8. Slide the burner tray out of the unit (Fig. 36).
9. To reinstall, reverse the procedure outlined above.

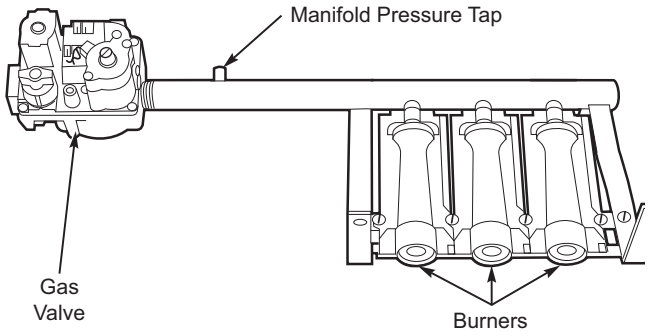


Fig. 36 — Burner Tray Details

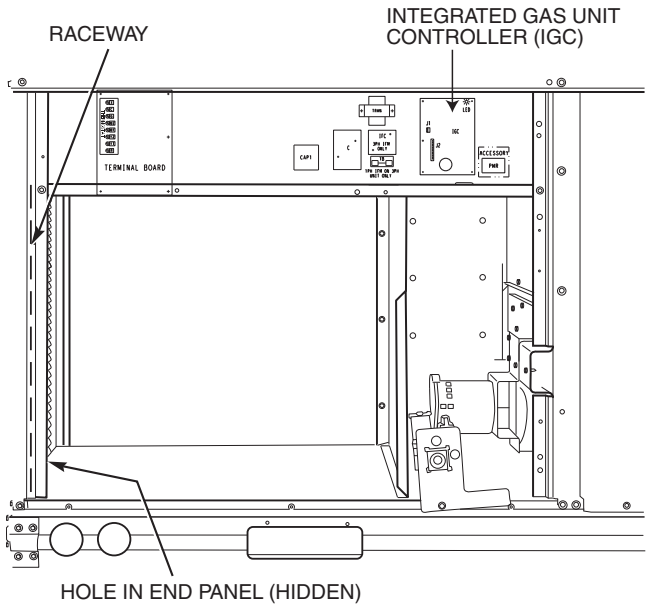


Fig. 37 — Unit Control Box/IGC Location

Cleaning and Adjustment

1. Remove burner rack from unit as described in Removal and Replacement of Gas Train section.
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. (See Fig. 38.)
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. 35.
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 crossovers 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.

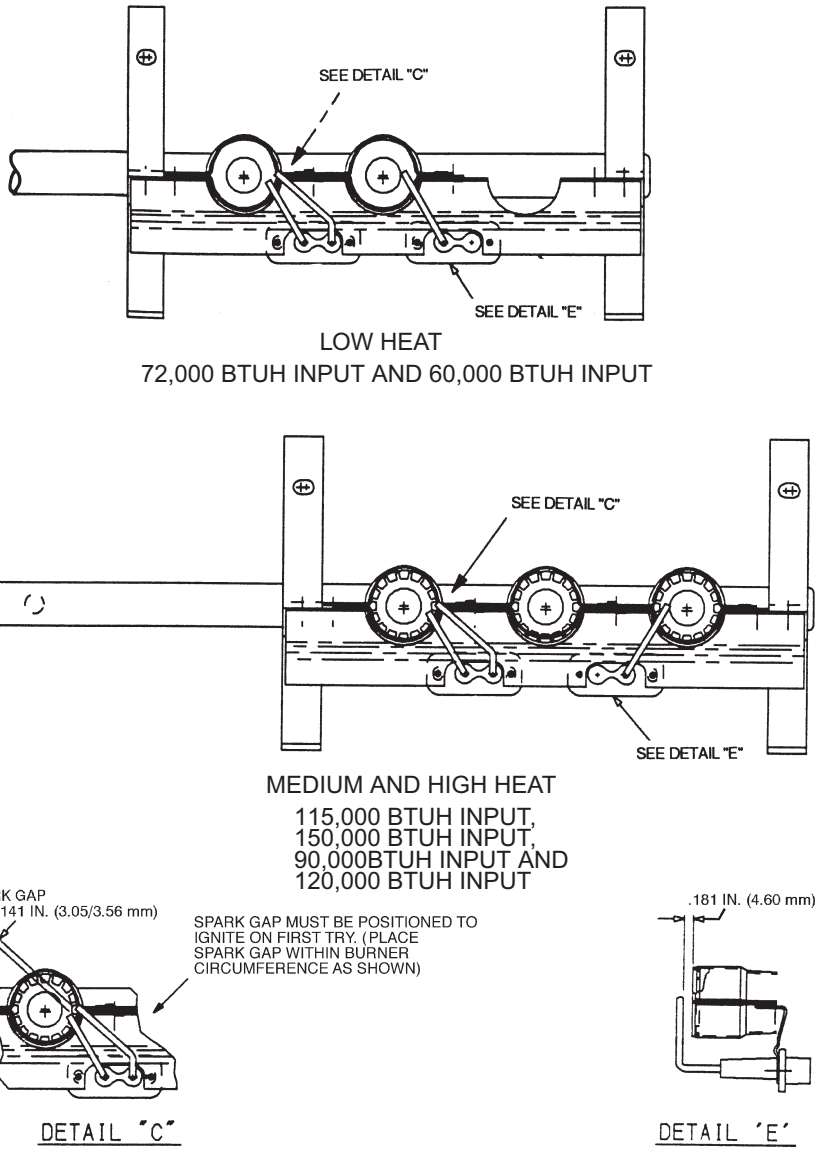


Fig. 38 — Spark Adjustment (04-06)

Gas Valve

All three-phase models (except Low NOx) are equipped with 2-stage gas valves. Single-phase models and all Low NOx models are equipped with single-stage gas valves. See Fig. 40 for locations of adjustment screws and features on the gas valves.

IMPORTANT: Leak check 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 4-7.

1. Remove manifold pressure tap plug from manifold and connect pressure gage or manometer. (See Fig. 36.)
2. Turn on electrical supply.
3. Turn on unit main gas valve.
4. Set room thermostat to call for heat. If unit has two-stage gas valve, verify high-stage heat operation before attempting to adjust manifold pressure.
5. When main burners ignite, check all fittings, manifold, and orifices for leaks.
6. Adjust high-stage pressure to specified setting by turning the plastic adjustment screw clockwise to increase pressure, counter-clockwise to decrease pressure.
7. For two-stage gas valves, set room thermostat to call for low-stage heat. Adjust low-stage pressure to specified setting.
8. Replace regulator cover screw(s) when finished.
9. With burner access panel removed, observe unit heating operation in both high stage and low stage operation if so equipped. Observe burner flames to see if they are blue in appearance, and that the flames are approximately the same for each burner.
10. Turn off unit, remove pressure manometer and replace the 1/8 in. pipe fitting on the gas manifold. (See Fig. 35.)

LIMIT SWITCH

Remove blower access panel. Limit switch is located on the fan deck. See Fig. 31.

Burner Ignition

Unit is equipped with a direct spark ignition 100% lockout system. Integrated Gas Unit Controller (IGC) is located in the control box. See Fig. 37. The IGC contains a self-diagnostic LED (light-emitting diode). A single LED (see Fig. 41 and Table 9) 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 8 for an explanation of LED error code descriptions.

If lockout occurs, unit may be reset by interrupting power supply to unit for at least 5 seconds.

Table 8 — LED Error Code Description[a]

LED INDICATION	ERROR CODE DESCRIPTION
On	Normal Operation
Off	Hardware Failure
1 Flash[b]	Evaporator Fan On/Off Delay Modified
2 Flashes	Limit Switch Fault
3 Flashes	Flame Sense Fault
4 Flashes	4 Consecutive Limit Switch Faults
5 Flashes	Ignition Lockout Fault
6 Flashes	Induced-Draft Motor Fault
7 Flashes	Rollout Switch Fault
8 Flashes	Internal Control Fault
9 Flashes	Software Lockout

NOTE(S):

a. 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.
b. Indicates a code that is not an error. The unit will continue to operate when this code is displayed.

LEGEND

LED — Light Emitting Diode

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 Tables 11 and 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. 35.

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 OAT (see Fig. 39) (part no. HH22AG106) in series with the second stage gas valve (See Fig. 41.) Set the outdoor-air thermostat at 35°F (2°C) 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.

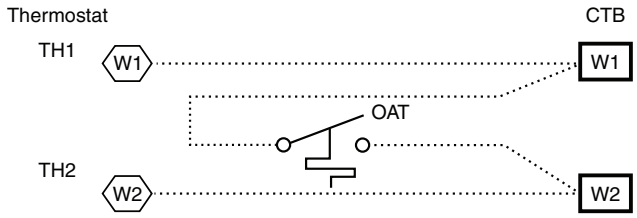


Fig. 39 — OAT Connections

Troubleshooting Heating System

Refer to Tables 13 and 14 for additional troubleshooting topics.

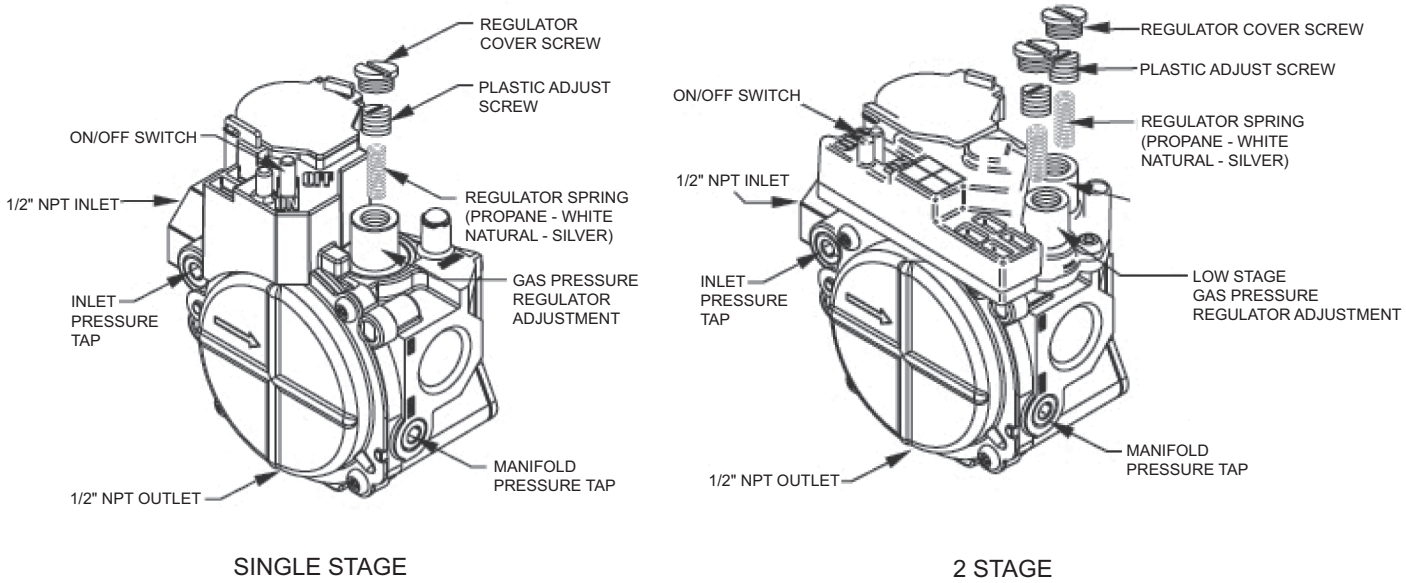


Fig. 40 — Gas Valves

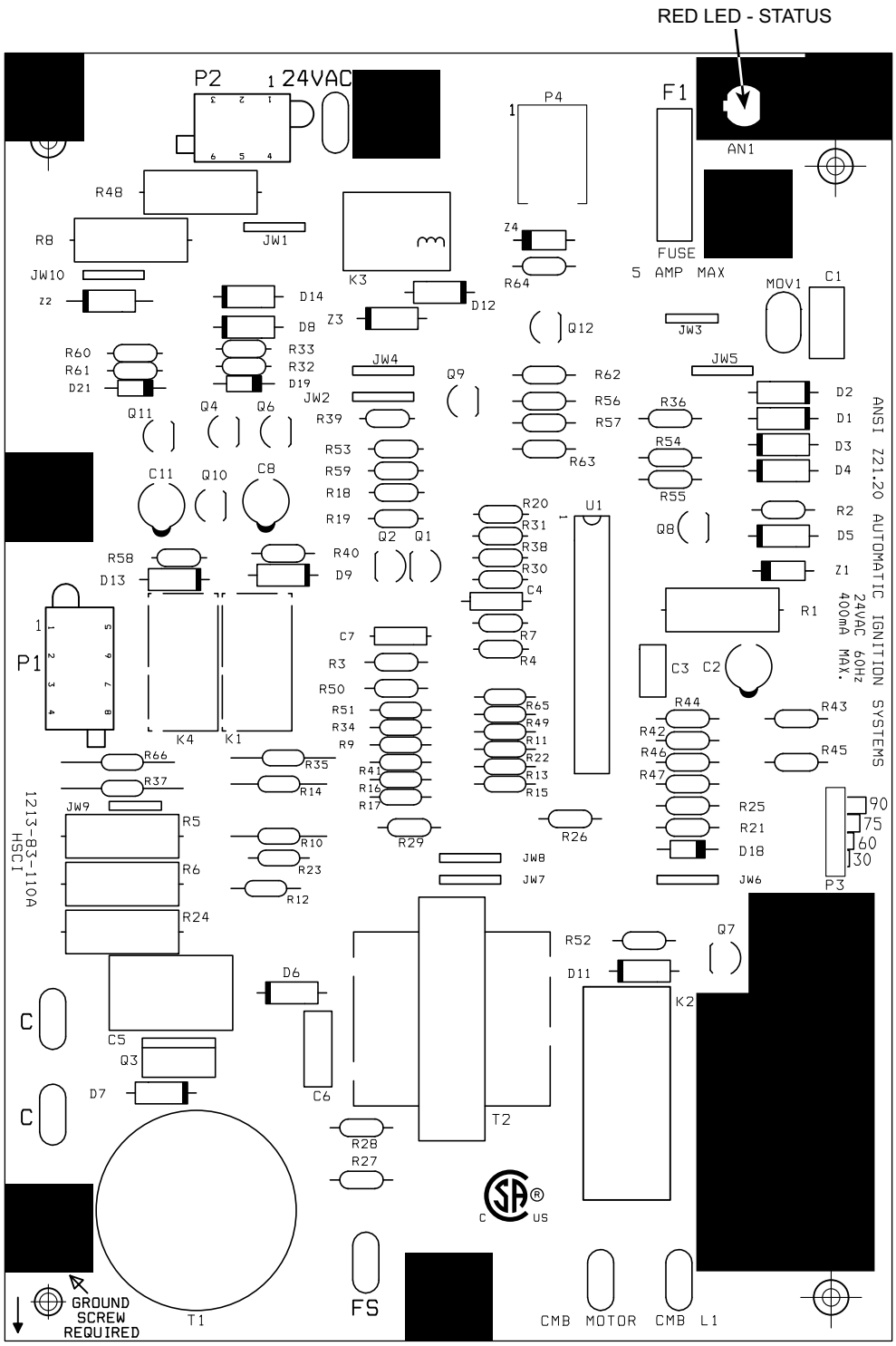


Fig. 41 — Integrated Gas Control (IGC) Board

Table 9 — IGC Connections

TERMINAL LABEL	POINT DESCRIPTION	SENSOR LOCATION	TYPE OF I/O	CONNECTION PIN NUMBER
INPUTS				
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
OUTPUTS				
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 10 — Orifice Sizes

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

Table 11 — Altitude Compensation[a] (48LCD/E/F/S/R/T*04-06)

ELEVATION ft (m)	72,000 BTUH NOMINAL		115,000 BTUH NOMINAL		150,000 BTUH Nominal	
	NG ORIFICE SIZE	LP ORIFICE SIZE	NG ORIFICE SIZE	LP ORIFICE SIZE	NG ORIFICE SIZE	LP ORIFICE SIZE
0-2000 (610)	33[1]	51[4]	33[1]	50[3]	30[b]	46[3]
2000 (610)	35[1]	51[4]	35[1]	51[4]	30[b]	47[3]
3000 (914)	35[1]	52[4]	35[1]	51[4]	31[1]	47[3]
4000 (1219)	36[1]	52[4]	36[1]	51[4]	31[1]	48[3]
5000 (1524)	36[1]	52[4]	36[1]	51[4]	31[1]	48[3]
6000 (1829)	37[2]	52[4]	37[2]	52[4]	31[1]	48[3]
7000 (2134)	38[2]	53[4]	38[2]	52[4]	32[1]	49[3]
8000 (2438)	39[2]	53[4]	39[2]	52[4]	33[1]	49[3]
9000 (2743)	40[b]	53[4]	40[b]	53[4]	34[1]	50[3]
10000 (3048)	41[b]	54[4]	41[b]	53[4]	35[1]	50[3]
11000 (3353)	42[b]	54[4]	42[b]	53[4]	36[1]	51[4]
12000 (3658)	43[b]	54[4]	43[b]	54[4]	37[2]	51[4]
13000 (3962)	43[b]	55[4]	43[b]	54[4]	38[2]	52[4]
14000 (4267)	44[2]	56[b]	44[2]	55[4]	40[b]	53[4]

NOTE(S):

a. 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.
b. Not included in kit. May be purchased separately through dealer.

LEGEND

NG — Natural Gas
LP — Liquid Propane

LEGEND

1 = CRLPELEV001A00
2 = CRLPELEV002A00
3 = CRLPELEV003A00
4 = CRLPELEV004A00

Table 12 — Altitude Compensation[a] (48LCL/M/N*04-06) - Low NOx Units

ELEVATION ft (m)	60,000, 90,000 BTUH NOMINAL	120,000 BTUH Nominal
	NG ORIFICE SIZE	NG ORIFICE SIZE
0-2000 (610)	38[2]	32[1]
2000 (610)	39[2]	33[1]
3000 (914)	40[b]	33[1]
4000 (1219)	41[b]	35[1]
5000 (1524)	41[b]	35[1]
6000 (1829)	42[b]	36[1]
7000 (2134)	42[b]	36[1]
8000 (2438)	43[b]	37[2]
9000 (2743)	43[b]	38[2]
10000 (3048)	44[2]	40[b]
11000 (3353)	44[2]	41[b]
12000 (3658)	45[2]	42[b]
13000 (3962)	47[3]	43[b]
14000 (4267)	48[3]	43[b]

NOTE(S):

a. 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.
b. Not included in kit. May be purchased separately through dealer.

LEGEND

NG — Natural Gas

1 = CRLPELEV001A00
2 = CRLPELEV002A00
3 = CRLPELEV003A00

Table 13 — Heating Service Analysis

PROBLEM	CAUSE	REMEDY
Burners Will Not Ignite	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.
Inadequate Heating	Dirty air filter.	Clean or replace filter as necessary.
	Gas input to unit too low.	Check gas pressure at manifold. Clock 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.
Poor Flame Characteristics	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.
Burners Will Not Turn Off	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
On	Normal Operation	—	—	—
Off	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.
2 Flashes	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.
3 Flashes	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.
4 Flashes	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.
5 Flashes	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. Check gas valve connections to IGC terminals. BRN lead must be on Pin 11.
6 Flashes	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.
7 Flashes	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.
8 Flashes	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.
9 Flashes	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 AND ENVIRONMENTAL HAZARD

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

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

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

⚠ WARNING

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:

1. Note that the evaporator fan is probably also rotating in the wrong direction.
2. Turn off power to the unit and install lockout tag.
3. Reverse any two of the unit power leads.
4. 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 Tables 11 and 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.

Electrical Connections

HACR

The amp rating of the HACR factory installed option is based on the size, voltage, indoor motor and other electrical options of the unit as shipped from the factory. If field-installed accessories are added or changed in the field (i.e. electric heat, power exhaust, ERV), the HACR may no longer be of the proper amp rating and therefore will need to be removed from the unit. See unit nameplate and label on factory installed HACR for the amp rating of the HACR that was shipped with the unit from the factory. See unit nameplates for the proper fuse, HACR or maximum over-current protection device required on the unit with field installed accessories. See Fig. 42.

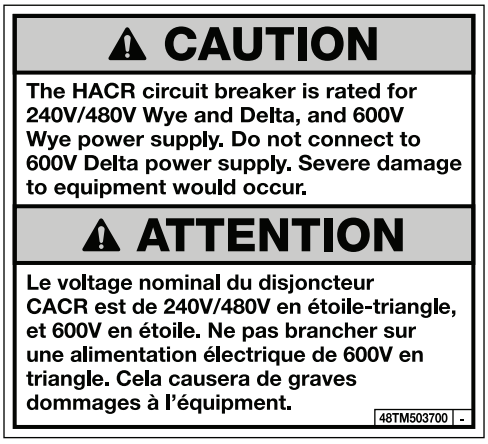


Fig. 42 — HACR Caution Label

FACTORY-OPTION THRU-BASE CONNECTIONS

This service connection kit consists of two 1/2 in. electrical bulkhead connectors and a 3/4 in. electrical bulkhead connector, all factory-installed in the embossed (raised) section of the unit basepan in the condenser section. The 3/4 in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The 1/2 in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan. See Fig. 43.

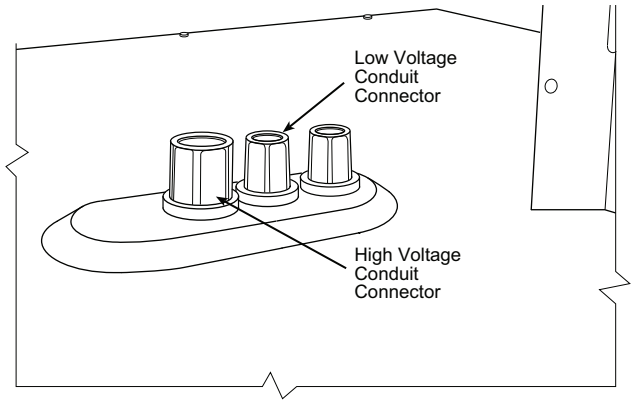


Fig. 43 — Thru-Base Connection Fittings

Check tightness of connector lock nuts before connecting electrical conduits.

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

UNITS WITHOUT THRU-BASE CONNECTIONS

1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 44.

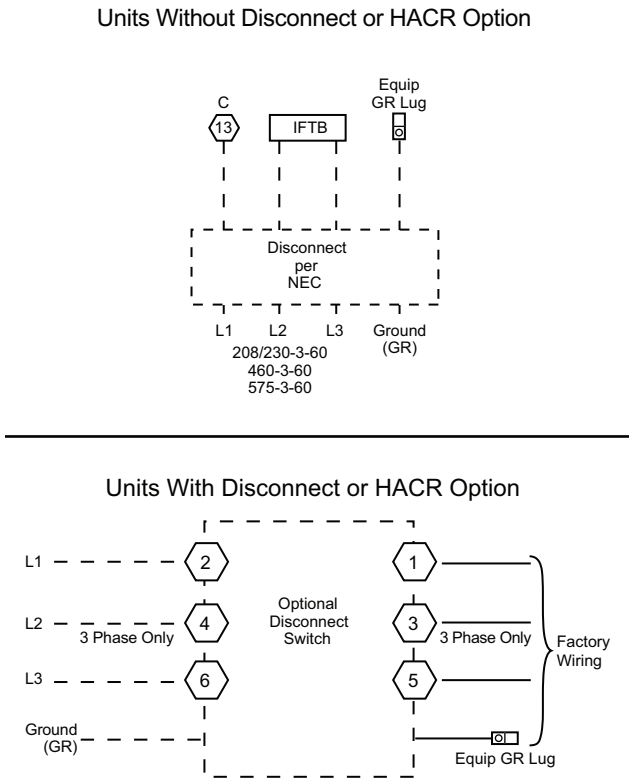


Fig. 44 — Power Wiring Connections

FIELD CONTROL WIRING

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

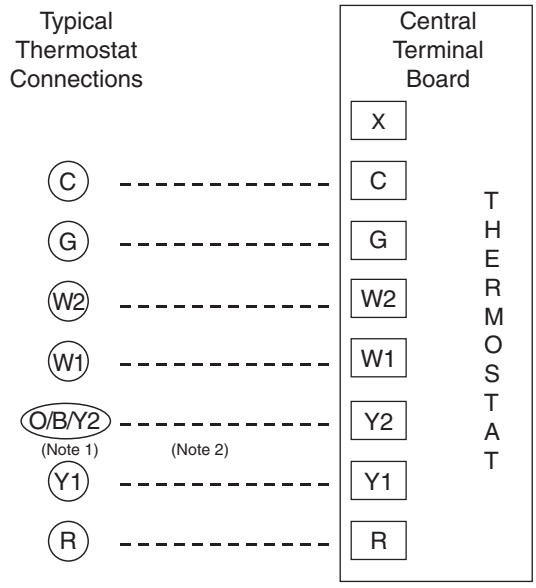
THERMOSTAT

Install a Carrier-approved accessory thermostat according to installation instructions included with the accessory. For complete economizer function and 3 stage compressor operation, select a three-stage cooling thermostat. If a 3-stage cooling thermostat is not available, use a 2-stage cooling thermostat instead, but note that this will limit cooling to just 2 stages. When electric heat is installed in the 48LC unit, the thermostat must be capable of energizing the G terminal (to energize the Indoor Fan Contactor) whenever there is a space call for heat (energizing the W1 terminal). The accessory thermostats listed on the unit price pages can provide this signal but they are not configured to enable this signal as shipped.

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. See Fig. 45.



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

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

Field Wiring

Fig. 45 — Low-Voltage Connections

UNIT WITHOUT THRU-BASE CONNECTION KIT

Pass the thermostat control wires through the hole provided in the corner post; then feed the wires through the raceway built into the corner post to the control box. Pull the wires over to the terminal strip on the upper-left corner of the Controls Connection Board. See Fig. 46.

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

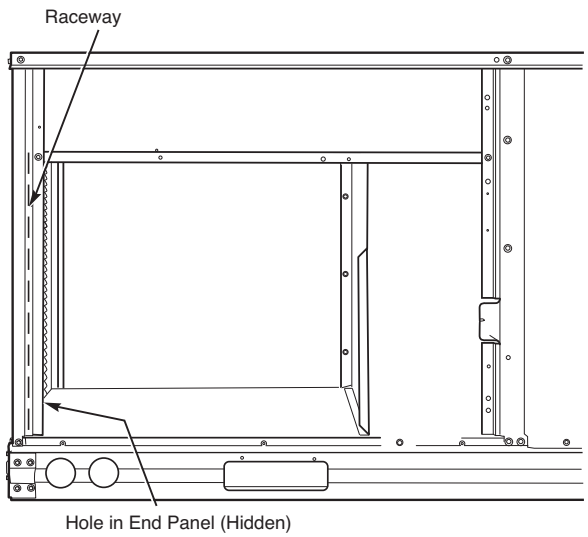


Fig. 46 — Field Control Wiring Raceway

HEAT ANTICIPATOR SETTINGS

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

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 units equipped with the factory installed SystemVu control option, refer to the *48/50LC 04-26 Single Package Rooftop Units with SystemVu Controls Version 2.X Controls, Start-Up, Operation and Troubleshooting* manual.

Economi$er® X (Factory Option)

The EconoMi$er X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 47). The W7220 can be configured with optional sensors.

Fig. 47 — W7220 Economizer Module

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

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

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

SYSTEM COMPONENTS

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

Economizer Module

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

S-Bus Enthalpy Control Sensors

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

CO_2 Sensor (optional)

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

SPECIFICATIONS

W7220 Economizer Module

The module is designed for use with 2 to 10 vdc or bus communicating actuator. The module includes terminals for CO_2 sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with bus sensors.

User Interface

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

Electrical

- Rated Voltage — 20 to 30 vac RMS, 50/60 Hz
- Transformer — 100 va maximum system input
- Nominal Power Consumption (at 24 vac, 60 Hz) — 11.5 VA without sensors or actuators
- Relay Digital Output Rating at 30 vac (maximum power from Class 2 input only) — 1.5A run: 3.5A inrush at 0.45PF (200,000 cycles) or 7.5A inrush at 0.45PF (100,000 cycles)
- External Sensors Power Output — 21 vdc ± 5% at 48 mA

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°F to 150°F (–40°C to 65°C)

Temperature accuracy: –0°F/+2°F (–0°C/+1°C)

Temperature and Humidity, C7400S1000 (optional)

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

Temperature: range –40°F to 150°F (–40°C to 65°C)

Temperature accuracy: –0°F/+2°F

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

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

4 Binary Inputs

1-wire 24 vac + common GND (see page 36 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°F to 150°F (–40°C to 65°C).

Exception of display operation down to –4°F (–20°C) with full recovery at –4°F (–20°C) from exposure to –40°F (–40°C)

Storage Temperature

–40°F to 150°F (–40°C to 65°C)

Shipping Temperature

–40°F to 150°F (–40°C to 65°C)

Relative Humidity

5% to 95% RH non-condensing

ECONOMIZER MODULE WIRING DETAILS

Use Fig. 48 and Tables 15 and 16 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.

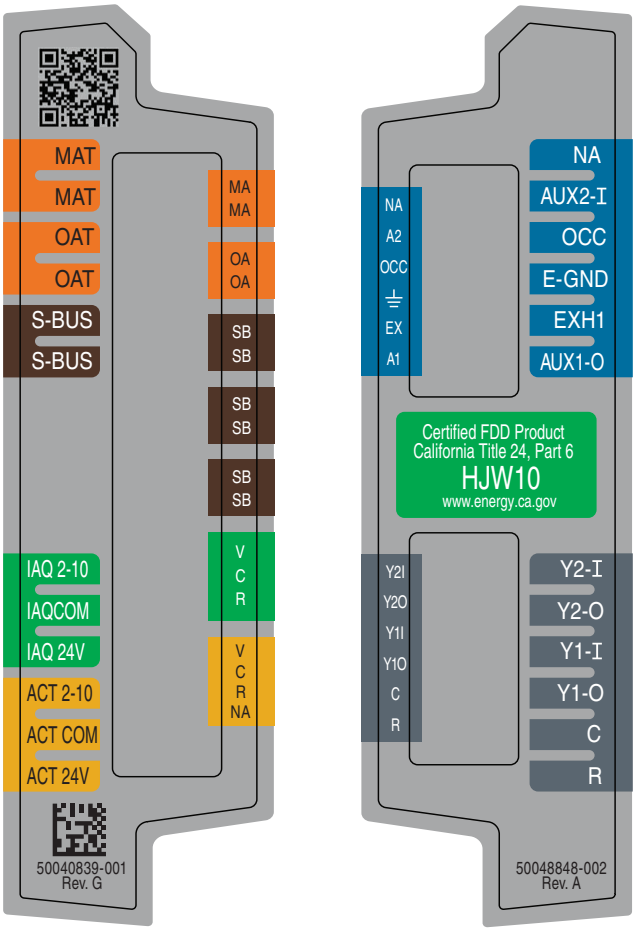


Fig. 48 — W7220 Wiring Terminals

Table 15 — Economizer Module - Left Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
Top Left Terminal Block		
MAT **MAT**	20k NTC and COM	Mixed Air Temperature Sensor (Polarity Insensitive Connection)
OAT **OAT**	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity Insensitive Connection)
S-BUS **S-BUS**	S-BUS (Sylk[a] Bus)	Enthalpy Control Sensor (Polarity Insensitive Connection)
Bottom Left Terminal Block		
IAQ 2-10	2-10 vdc	Air Quality Sensor Input (e.g. CO_2 sensor)
IAQ COM	COM	Air Quality Sensor Common
IAQ 24V	24 vac	Air Quality Sensor 24 vac Source
ACT 2-10	2-10 vdc	Damper Actuator Output (2-10 vdc)
ACT COM	COM	Damper Actuator Output Common
ACT 24v	24 vac	Damper Actuator 24 vac Source

NOTE(S):

a. Third-party trademarks and logos are the property of their respective owners.

Table 16 — Economizer Module - Right Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
Top Right Terminal Blocks		
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
Bottom Right Terminal Blocks		
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. 49 and Table 17 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 48 and Table 17 to locate the wiring terminals for each enthalpy control sensor.

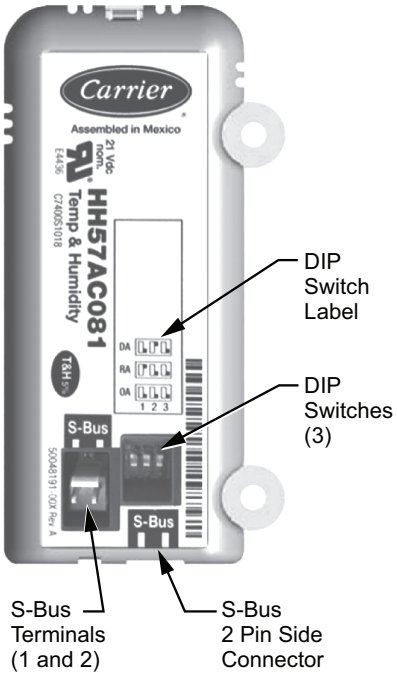


Fig. 49 — S-Bus Sensor DIP Switches

Table 17 — 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. 49 and Table 18 to set the DIP switches for the desired use of the sensor.

Table 18 — 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_2 Sensor Wiring

When using a CO_2 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_2 sensor OR make sure the ground for the power supplies are common. See Fig. 50 for CO_2 sensor wiring.

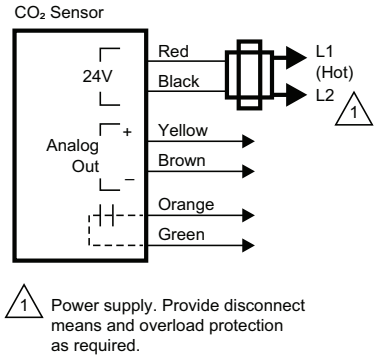


Fig. 50 — CO_2 Sensor Wiring

INTERFACE OVERVIEW

This section describes how to use the EconoMi$er® 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. 51) 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.

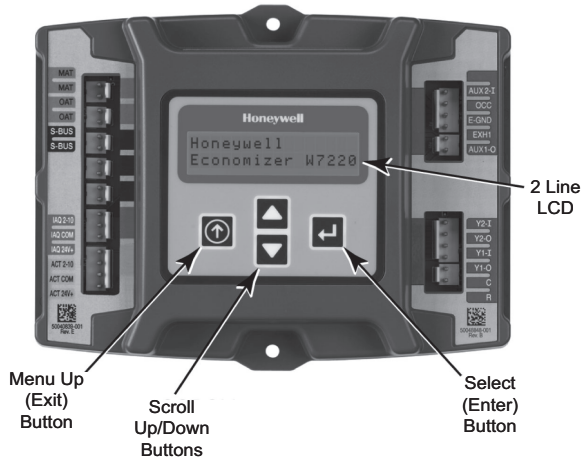


Fig. 51 — W7220 Controller Navigation Buttons

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 19 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 19 — W7220 Menu Structure[a]

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	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[c]	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 Sylk 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 Sylk Bus sensor. Displays _ _% if not connected short, or out of range.

Table 19 — W7220 Menu Structure[a] (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	EXPANDED PARAMETER NAME Notes
STATUS (cont)	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 Sylk 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 Sylk 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_2 Displays value of measured CO_2 from CO_2 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_2 sensor is connected.
	DAMPER OUT	2.0v	2.0 to 10.0v	Displays voltage output to the damper actuator.[d]
	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
	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.

Table 19 — W7220 Menu Structure[a] (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	EXPANDED PARAMETER NAME Notes
SETPOINTS	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°F	COMPRESSOR LOW TEMPERATURE LOCKOUT Set point determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. 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°F	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,ES 4, or ES5	ENTHALPY CHANGEOVER CURVE ES curve will only appear if using enthalpy changeover. Enthalpy boundary “curves” for economizing using single enthalpy. See page 46 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION Displays only if CO_2 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_2 sensor is NOT connected.
	VENTMAX	2.8 V	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION Displays only if a CO_2 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_2 sensor.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO_2 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_2 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_2 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 SPS[e]	32°F (0°C)	0°F to 50°F (–18°C to 10°C); increment by 1°F	ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV
	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.
	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.

Table 19 — W7220 Menu Structure[a] (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	EXPANDED PARAMETER NAME Notes
SYSTEM SETUP	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. 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.
	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[d] • 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.
ADVANCED SETUP	MA LO SET	45°F (7°C)	35°F to 65°F (2°C to 18°C); Increment by 1°F	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_2 ppm level to match CO_2 sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 50	CO_2 ppm span to match CO_2 sensor; e.g.: 500-1500 sensor output would be 500 CO_2 zero and 1000 CO_2 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.
	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_2) 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.

Table 19 — W7220 Menu Structure[a] (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	EXPANDED PARAMETER NAME Notes
ADVANCED SETUP (cont)	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.
CHECKOUT[e]	DAMPER MINIMUM POSITION	N/A	N/A	The checkout for the damper minimum position is based on the system. See Table 20.
	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.[d] • SYS — 24 vac out. Issues a system alarm
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 1 relay (EXH1)
ALARMS	Alarms display only when they are active. The menu title “ALARMS(#)” includes the number of active alarms in parenthesis ( ). When using SYLK bus sensors, “SYLK” will appear on the screen, and when using 20k OA temperature sensors, “SENS T” will appear on the screen			
	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_2 SENSOR ERROR CO_2 sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SYLK T ERR	N/A	N/A	OUTSIDE AIR S-BUS SENSOR ERROR Outdoor air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SYLK H ERR	N/A	N/A	
	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	RA SYLK H ERR	N/A	N/A	
	DA SYLK T ERR	N/A	N/A	DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring, then replace if the alarm continues.
	ACT ERROR	N/A	N/A	ACTUATOR ERROR Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu.
	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on set point menu. Check if Mixed air temperature on STATUS menu is below the Lo Set point on Advanced menu. When conditions are back in normal range, 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.

Table 19 — W7220 Menu Structure[a] (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT[b]	EXPANDED PARAMETER NAME Notes
ALARMS (cont)	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.

NOTE(S):

a. Table 19 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example if you do not have a DCV (CO_2) sensor, then none of the DCV parameters appear.
b. When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.
c. N/A = Not Applicable.
d. 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.
e. After 10 minutes without a command or mode change, the controller will change to normal operation

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

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 20. For dry bulb operation with or without DCV, see Tables 21 and 22. For enthalpy operation with or without DCV, see Tables 23 and 24.

Table 20 — Damper Minimum Position Settings and Readings on Checkout Menu

FAN SPEED	DEMAND CONTROLLED VENTILATION (CO_2 SENSOR)	SETPOINTS	CHECKOUT
1	NO	MIN POS	VMAX–HS
		N/A	N/A
	YES	VENT MIN	VMAX–HS
		VENT MAX	VMAX–HS

Table 21 — Dry Bulb Operation Without DCV (CO_2 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[a]	MIN POS to Full-Open	Closed to Full-Open

NOTE(S):

a. 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 22 — Dry Bulb Operation With DCV (CO_2 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_2 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_2 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[a]	VENTMIN to Full-Open	Closed to Full-Open

NOTE(S):

a. 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 23 — Enthalpy Operation Without DCV (CO_2 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[a]	MIN POS to Full-Open	Closed to Full-Open

NOTE(S):

a. 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 24 — Enthalpy Operation With DCV (CO_2 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_2 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_2 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[a] 24-v/On	0-v/Off[b]	VENTMIN to Full-Open	Closed to Full-Open

NOTE(S):

a. 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.
b. 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.

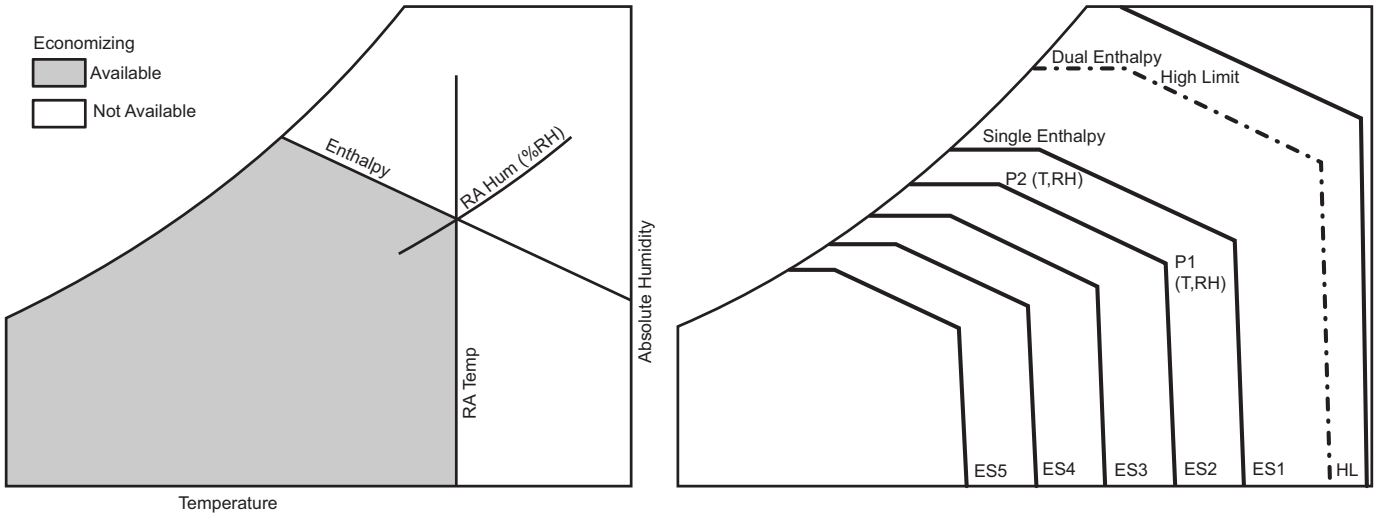


Fig. 52 — Single Enthalpy Curve Boundaries

Table 25 — Single Enthalpy and Dual Enthalpy High Limit Curves

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

ENTHALPY SETTINGS

When the OA temperature, enthalpy and dew point are below the respective set points, the Outdoor Air can be used for economizing. Figure 52 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 25 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 52 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.

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 37.

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 19) 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 37.

Checkout Tests

Use the Checkout menu (see page 42) 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 37.

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 shutdown 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.

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

VFD OPERATION WITH REMOTE KEYPAD

All 48LC size 04-06 units are equipped with a VFD (Variable Frequency Drive) to automatically adjust the indoor-fan motor speed in sequence with the unit's ventilation, cooling and heating operation. The VFD keypad is included as standard on electromechanical and RTU Open models. See Fig. 54 for location of the VFD and the VFD keypad in these units.

NOTE: SystemVu™ models do not include the VFD keypad as VFD control operation is accessed through the SystemVu™ controls.

The VFD keypad is shown in Fig. 53. The function of SOFT KEYS 1 and 2 change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. The UP and DOWN keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

For the VFD to operate on the units covered by this document, the drive must be set in AUTO mode. The word "AUTO" will appear in the upper left hand corner of the VFD display. Press the AUTO button to set the drive in AUTO mode.

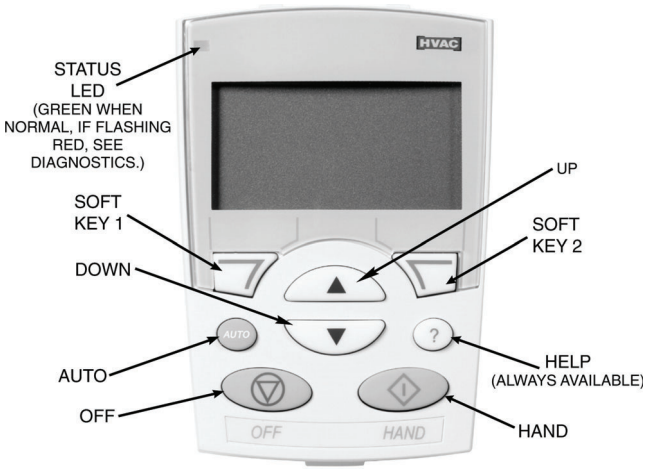


Fig. 53 — VFD Keypad

Use the RJ-45 (CAT5) cable (bundled with the Control Harness - see Fig. 54) to provide easier access for using the VFD Remote Keypad. The cable's length is long enough to route it through to the unit's control box, if desired.

To Connect the VFD Keypad using the RJ-45 Cable

1. Remove the keypad from the front of the VFD.
2. Remove the RJ-45 adapter from the back of the Remote Keypad and insert the adapter into the RJ-45 port on the front of the VFD.
3. Separate the RJ-45 (CAT5) cable from the Control Harness.
4. Use the CAT5 cable to connect the Remote Keypad to the VFD.

Start Up with Assistant

Initial start-up has been performed at the factory. Use of the start up assistant will override factory VFD configurations. DO NOT USE THE START-UP ASSISTANT ON THESE LC UNITS!

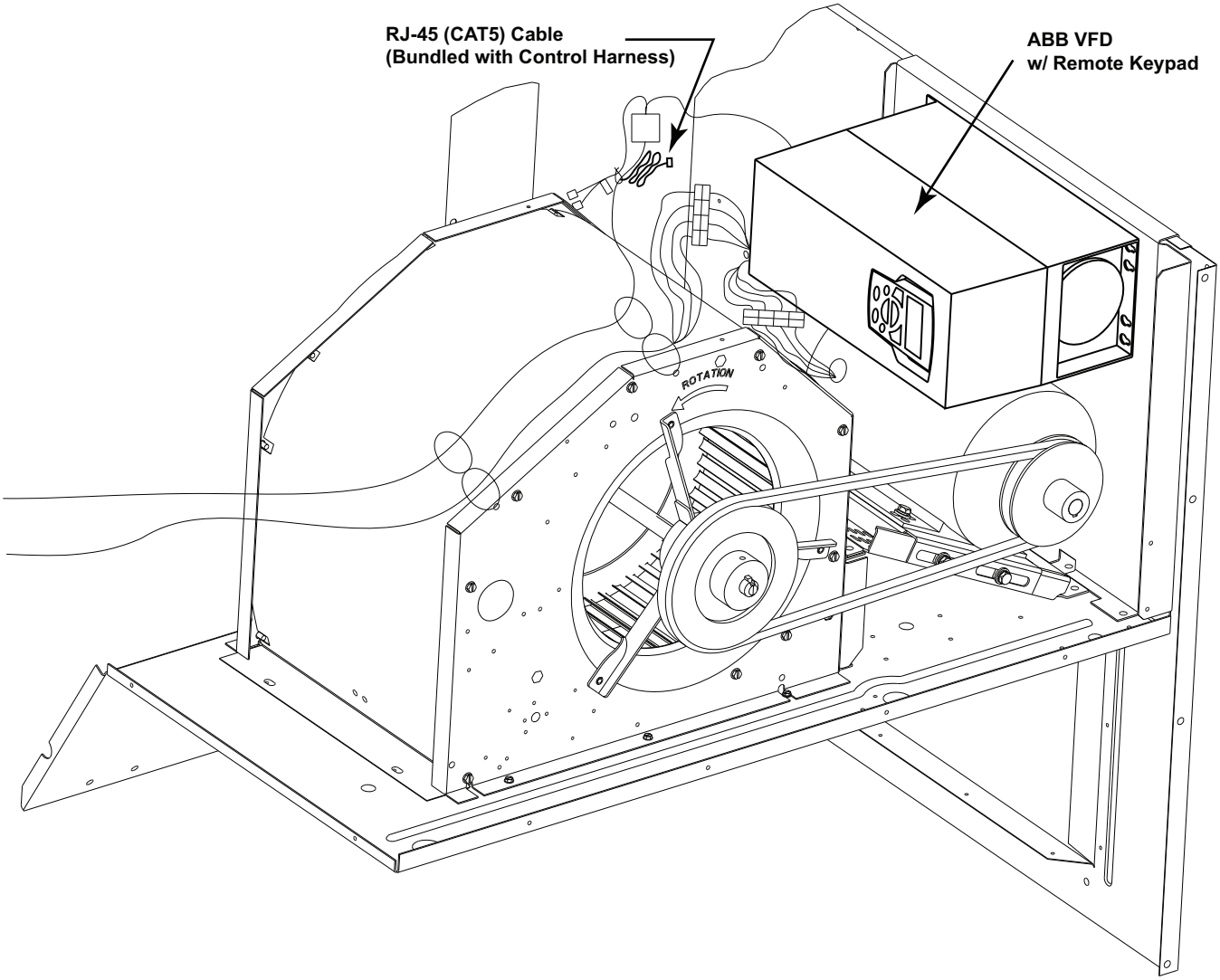


Fig. 54 — Location of VFD in 48LC 04-06 Units

Start Up by Changing Parameters Individually

Initial start-up is performed at the factory. To start up the VFD by changing individual parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the application macro "HVAC Default."

VFD Modes

The VFD has several different modes for configuring, operating, and diagnosing the VFD. The modes are:

- Standard Display mode—shows drive status information and operates the drive
- Parameters mode—edits parameter values individually
- Start-up Assistant mode—guides the start up and configuration. DO NOT USE THE START-UP ASSISTANT ON THESE LC UNITS!
- Changed Parameters mode—shows all changed parameters
- Drive Parameter Backup mode—stores or uploads the parameters
- Clock Set mode—sets the time and date for the drive
- I/O Settings mode—checks and edits the I/O settings

STANDARD DISPLAY MODE

Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press EXIT until the LCD display shows status information as described below. (See Fig. 55.)

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at setpoint. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper-right corner shows the frequency setpoint that the drive will maintain.

Using parameter group 34, the middle of the LCD display can be configured to display 3 parameter values. The default display shows parameters 0103 (OUTPUT FREQ) in percent speed, 0104 (CURRENT) in amperes, and 0120 (AI1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle screen displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

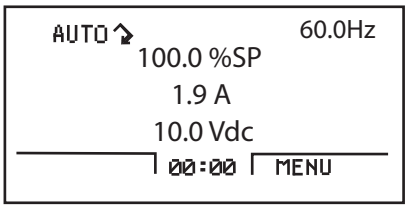


Fig. 55 — Standard Display Example

To adjust the speed in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

PARAMETERS MODE

The Parameters mode is used to change the parameters on the drive. To change parameters, perform the following procedure. See Tables 26-27 for a listing of the VFD parameters per motor and VFD drive models:

1. Select MENU (SOFT KEY 2). The main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the Carrier application macro.

CHANGED PARAMETERS MODE

The Changed Parameters mode is used to view and edit recently changed parameters on the drive. To view the changed parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The main menu will be displayed.
2. Use the UP or DOWN keys to highlight CHANGED PAR on the display screen and press ENTER (SOFT KEY 2). A list of the recently changed parameters will be displayed.
3. Use the UP or DOWN keys to highlight the desired parameter group and press EDIT (SOFT KEY 2) to change the parameter if desired.

4. Press EXIT (SOFT KEY 1) to exit the Changed Parameters mode.

DRIVE PARAMETER BACKUP MODE

The drive parameter back-up mode is used to export the parameters from one drive to another. The parameters can be uploaded from a VFD to the removable control panel. The control panel can then be transferred to another drive and the parameters are downloaded into memory.

Depending on the motor and application, there are two options available. The first option is to download all parameters. This copies both application and motor parameters to the drive from the control panel. This is recommended when using the same application for drives of the same size. This can also be used to create a backup of the parameters group for the drive.

The second option downloads only the application parameters to the drive. This is recommended when using the same application for drives of different sizes.

Upload All Parameters

To upload and store parameters in the control panel from the VFD, perform the following procedure:

1. Select MENU (SOFT KEY 2). The main menu will be displayed.
2. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight UPLOAD TO PANEL and press SEL (SOFT KEY 2).
4. The text "Copying Parameters" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
5. When the upload is complete, the text "Parameter upload successful" will be displayed.
6. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
7. The control panel can now be disconnected from the drive.

Download All Parameters

To download all parameters from the control panel to the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD TO DRIVE ALL and press SEL (SOFT KEY 2).
5. The text "Restoring Parameters" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

Download Application Parameters

To download application parameters only to the control panel from the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (SOFT KEY 2). The main menu will be displayed.
3. Use the UP or DOWN keys to highlight PAR BACKUP on the display screen and press ENTER (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight DOWNLOAD APPLICATION and press SEL (SOFT KEY 2).
5. The text "Downloading Parameters (partial)" will be displayed with a progress indicator. To stop the process, select ABORT (SOFT KEY 1).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select EXIT (SOFT KEY 1) to return to the main menu.
8. The control panel can now be disconnected from the drive.

CLOCK SET MODE

The clock set mode is used for setting the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs.

To set the clock, perform the following procedure:

1. Select MENU (SOFT KEY 2). The main menu will be displayed.
2. Use the UP or DOWN keys to highlight CLOCK SET on the display screen and press ENTER (SOFT KEY 2). The clock set parameter list will be displayed.
3. Use the UP or DOWN keys to highlight CLOCK VISIBILITY and press SEL (SOFT KEY 2). This parameter is used to display or hide the clock on the screen. Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
4. Use the UP or DOWN keys to highlight SET TIME and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the hours and minutes. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
5. Use the UP or DOWN keys to highlight TIME FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
6. Use the UP or DOWN keys to highlight SET DATE and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the day, month, and year. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
8. Press EXIT (SOFT KEY 1) twice to return to the main menu.

I/O SETTINGS MODE

The I/O Settings mode is used for viewing and editing the I/O settings.

To configure the I/O settings, perform the following procedure:

1. Select MENU (SOFT KEY 2). The main menu will be displayed.
2. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press ENTER (SOFT KEY 2). The I/O Settings parameter list will be displayed.
3. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to select the parameter to view. Press OK (SOFT KEY 2).
5. Use the UP or DOWN keys to change the parameter setting. Press SAVE (SOFT KEY 2) to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
6. Press EXIT (SOFT KEY 1) twice to return to the main menu.

Table 26 — 48LC 04-06 VFD Parameters

PARAMETER GROUP	PARAMETER NUMBER ACH550 / ACH580	UNIT SIZE	48LC 04				
		MOTOR DESCRIPTION	1.7 HP 575V	1.7 HP 208-230V	1.7 HP 460V	2.4 HP 575V	2.4 HP 208-230V
		DRIVE/MOTOR VOLTAGE	575V	208- 230V	460V	575V	208-230V
		MOTOR PART NUMBER	HD56FR579	HD56FR233	HD56FR463	HD56FE577	HD56FE653
		VFD PART NUMBER	HK30WA048 / HK30WB340	HK30WA045 / HK30WB303	HK30WA046 / HK30WB319	HK30WA048 / HK30WB340	HK30WA001 / HK30WB305
		ABB PART NUMBER	ACH550-CARUH-03A9-6 / ACH580-01-03A9-6	ACH550-CARUH-07A5-2 / ACH580-01-07A5-2	ACH550-CARUH-04A1-4 / ACH580-01-03A5-4	ACH550-CARUH-03A9-6 / ACH580-01-03A9-6	ACH550-CARUH-012A-2 / ACH580-01-017A-2
START-UP DATA	9902 / Not used	Application Macro	(1) HVAC DEFAULT / Not used	(1) HVAC DEFAULT / Not used	(1) HVAC DEFAULT / Not used	(1) HVAC DEFAULT / Not used	(1) HVAC DEFAULT / Not used
	9905 / 99.07	Motor Nominal Voltage	575	230	460	575	230
	9906 / 99.06	Motor Nominal Current	3.1	5.8	2.9	3.4	7.9
	9907 / 99.08	Motor Nominal Frequency	60	60	60	60	60
	9908 / 99.09	Motor Nominal Speed	1725	1725	1725	1725	1725
	9909 / 99.10	Motor Nominal Power	1.7	1.7	1.7	2.4	2.4
START/STOP/ DIR	1001 / Not used	EXT1 Commands	(1) DI1 / Not used	(1) DI1 / Not used	(1) DI1 / Not used	(1) DI1 / Not used	(1) DI1 / Not used
	1003 / Not used	Direction	(1) Forward / Not used	(1) Forward / Not used	(1) Forward / Not used	(1) Forward / Not used	(1) Forward / Not used
REFERENCE SELECT	1103 / Not used	REF1 Select	(1) AI1 / Not used	(1) AI1 / Not used	(1) AI1 / Not used	(1) AI1 / Not used	(1) AI1 / Not used
	1104 / Not used	REF1 Minimum	0 Hz / Not used	0 Hz / Not used	0 Hz / Not used	0 Hz / Not used	0 Hz / Not used
	1105 / Not used	REF1 Maximum	60 Hz / Not used	60 Hz / Not used	60 Hz / Not used	60 Hz / Not used	60 Hz / Not used
CONSTANT SPEEDS	1201 / 28.22 and 28.23	Constant Speed Select	(8) DI2,3 / DI2(28.22) and DI3(28.23)	(8) DI2,3 / DI2(28.22) and DI3(28.23)	(8) DI2,3 / DI2(28.22) and DI3(28.23)	(8) DI2,3 / DI2(28.22) and DI3(28.23)	(8) DI2,3 / DI2(28.22) and DI3(28.23)
	1202 / 28.26	Constant Speed 1	52.4	52.4	52.4	52.4	52.4
	1203 / 28.27	Constant Speed 2	60Hz	60Hz	60Hz	60Hz	60Hz
	1204 / 28.28	Constant Speed 3	60Hz	60Hz	60Hz	60Hz	60Hz
ANALOG INPUTS	1301 / Not used	Minimum AI--- 1	0.2 / Not used	0.2 / Not used	0.2 / Not used	0.2 / Not used	0.2 / Not used
	1302 / Not used	Maximum AI--- 1	1 / Not used	1 / Not used	1 / Not used	1 / Not used	1 / Not used
RELAY OUTPUTS	1401 / Not used	Relay Output 1	(1) Ready / Not used	(1) Ready / Not used	(1) Ready / Not used	(1) Ready / Not used	(1) Ready / Not used
	1402 / Not used	Relay Output 2	(2) Run / Not used	(2) Run / Not used	(2) Run / Not used	(2) Run / Not used	(2) Run / Not used
	1403 / 10.30	Relay Output 3	(16) FLT/ALARM / FLT (14) fault	(16) FLT/ALARM / FLT (14) fault	(16) FLT/ALARM / FLT (14) fault	(16) FLT/ALARM / FLT (14) fault	(16) FLT/ALARM / FLT (14) fault
SYSTEM CONTROL	1604 / Not used	Fault Reset Sel	(0) Keypad / Not used	(0) Keypad / Not used	(0) Keypad / Not used	(0) Keypad / Not used	(0) Keypad / Not used
	1608 / Not used	Start Enable 1	(4) DI4 / Not used	(4) DI4 / Not used	(4) DI4 / Not used	(4) DI4 / Not used	(4) DI4 / Not used
OVERRIDE	1701 / Not used	Override Sel	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used
LIMITS	2003 / Not used	Maximum Current	3.6 / Not used	6.7 / Not used	3.3 / Not used	3.9 / Not used	9.1 / Not used
	2007 / 30.13	Minimum Frequency	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
	2008 / 30.14	Maximum Frequency	60Hz	60Hz	60Hz	60Hz	60Hz
Start/Stop	2101 / 21.19	Start Function	(1) AUTO / (2) AUTO	(1) AUTO / (2) AUTO	(1) AUTO / (2) AUTO	(1) AUTO / (2) AUTO	(1) AUTO / (2) AUTO
	2102 / 21.03	Stop Function	(1) Coast	(1) Coast	(1) Coast	(1) Coast	(1) Coast
	2109 / Not used	EM STOP Sel	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used	(0) NOT SEL / Not used

Table 26 — 48LC 04-06 VFD Parameters (cont)

PARAMETER GROUP	PARAMETER NUMBER ACH550 / ACH580	UNIT SIZE	48LC 04				
		MOTOR DESCRIPTION	1.7 HP 575V	1.7 HP 208-230V	1.7 HP 460V	2.4 HP 575V	2.4 HP 208-230V
		DRIVE/MOTOR VOLTAGE	575V	208- 230V	460V	575V	208-230V
		MOTOR PART NUMBER	HD56FR579	HD56FR233	HD56FR463	HD56FE577	HD56FE653
		VFD PART NUMBER	HK30WA048 / HK30WB340	HK30WA045 / HK30WB303	HK30WA046 / HK30WB319	HK30WA048 / HK30WB340	HK30WA001 / HK30WB305
		ABB PART NUMBER	ACH550-CARUH-03A9-6 / ACH580-01-03A9-6	ACH550-CARUH-07A5-2 / ACH580-01-07A5-2	ACH550-CARUH-04A1-4 / ACH580-01-03A5-4	ACH550-CARUH-03A9-6 / ACH580-01-03A9-6	ACH550-CARUH-012A-2 / ACH580-01-017A-2
Accel/Decel	2201 / 28.71	Acc/Dec 1/2 Sel	(0) NOT SEL / Not select	(0) NOT SEL / Not select	(0) NOT SEL / Not select	(0) NOT SEL / Not select	(0) NOT SEL / Not select
	2202 / 28.72	Accelerate Time	30.0s	30.0s	30.0s	30.0s	30.0s
	2203 / 28.73	Decelerate Time	10.0s	10.0s	10.0s	10.0s	10.0s
Motor	2606 / 97.01	Switching Frequency	4 KHz	4 KHz	4 KHz	4 KHz	4 KHz
	2607 / Not used	Switching Frequency Control	(1) ON / Not used	(1) ON / Not used	(1) ON / Not used	(1) ON / Not used	(1) ON / Not used
Fault Functions	3005 / Not used	Motor Therm Prot	(1) Fault / Not used	(1) Fault / Not used	(1) Fault / Not used	(1) Fault / Not used	(1) Fault / Not used
	3006 / Not used	Motor Thermal Time	1050s / Not used	1050s / Not used	1050s / Not used	1050s / Not used	1050s / Not used
	3007 / Not used	Motor Load Curve	1 / Not used	1 / Not used	1 / Not used	1 / Not used	1 / Not used
	3008 / Not used	Zero Speed Load	%00705 / Not used	%00705 / Not used	%00705 / Not used	%00705 / Not used	%00705 / Not used
	3009 / Not used	Break Point Frequency	35 Hz / Not used	35 Hz / Not used	35 Hz / Not used	35 Hz / Not used	35 Hz / Not used
Automatic Reset	3104 / Not used	AR Overcurrent	(0) DISABLE / Not used	(0) DISABLE / Not used	(0) DISABLE / Not used	(0) DISABLE / Not used	(0) DISABLE / Not used
	3105 / Not used	AR Overvoltage	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used
	3106 / Not used	AR Undervoltage	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used	(1) ENABLE / Not used
EFB Protocol	5301 / Not used	EFB PROTOCOL ID	0601 (hex) / Not used	0601 (hex) / Not used	0601 (hex) / Not used	0601 (hex) / Not used	0601 (hex) / Not used
	5302 / 58.03	EFB STATION ID	41	41	41	41	41
	5303 / 58.04	EFB BAUD RATE	38400	38400	38400	38400	38400
	5304 / 58.05	EFB PARITY	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1
	5305 / 58.25	EFB CTRL PROFILE	DCU PROFILE / ABB DRIVES	DCU PROFILE / ABB DRIVES	DCU PROFILE / ABB DRIVES	DCU PROFILE / ABB DRIVES	DCU PROFILE / ABB DRIVES
Options	9802 / 58.01	COMM PROT SEL	6 (LEN) / 8 (LEN)	6 (LEN) / 8 (LEN)	6 (LEN) / 8 (LEN)	6 (LEN) / 8 (LEN)	6 (LEN) / 8 (LEN)

Table 26 — 48LC 04-06 VFD Parameters (cont)

PARAMETER GROUP	PARAMETER NUMBER	UNIT SIZE	48LC 04	48LC 05			48LC 06
		Motor Description	2.4 HP 460v	1.7 HP 575v	1.7 HP 208-230v	1.7 HP 460v	2.4 HP 575v
		Drive/motor Voltage	460v	575v	208-230v	460v	575v
		Motor Part Number	HD56FE653	HD56FR579	HD56FR233	HD56FR463	HD56FE577
		VFD Part Number	HK30WA008	HK30WA048	HK30WA045	HK30WA046	HK30WA048
		ABB Part Number	ACH550-CARUH -06A9-4	ACH550-CARUH -03A9-6	ACH550-CARUH -07A5-2	ACH550-CARUH -04A1-4	ACH550-CARUH -03A9-6
START-UP DATA	9902	Application Macro	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT
	9905	Motor Nominal Voltage	460	575	230	460	575
	9906	Motor Nominal Current	4.0	3.1	5.8	2.9	3.4
	9907	Motor Nominal Frequency	60	60	60	60	60
	9908	Motor Nominal Speed	1725	1725	1725	1725	1725
	9909	Motor Nominal Power	2.4	1.7	1.7	1.7	2.4
START/STOP/ DIR	1001	EXT1 Commands	(1) DI1	(1) DI1	(1) DI1	(1) DI1	(1) DI1
	1003	Direction	(1) Forward	(1) Forward	(1) Forward	(1) Forward	(1) Forward
REFERENCE SELECT	1103	REF1 Select	(1) AI1	(1) AI1	(1) AI1	(1) AI1	(1) AI1
	1104	REF1 Minimum	0 Hz	0 Hz	0 Hz	0 Hz	0 Hz
	1105	REF1 Maximum	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
CONSTANT SPEEDS	1201	Constant Speed Select	(8) DI2,3	(8) DI2,3	(8) DI2,3	(8) DI2,3	(8) DI2,3
	1202	Constant Speed 1	52.4	42.6	42.6	42.6	42.6
	1203	Constant Speed 2	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
	1204	Constant Speed 3	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
ANALOG INPUTS	1301	Minimum AI-1	20.00%	20.00%	20.00%	20.00%	20.00%
	1302	Maximum AI-1	100.00%	100.00%	100.00%	100.00%	100.00%
RELAY OUTPUTS	1401	Relay Output 1	(1) Ready	(1) Ready	(1) Ready	(1) Ready	(1) Ready
	1402	Relay Output 2	(2) Run	(2) Run	(2) Run	(2) Run	(2) Run
	1403	Relay Output 3	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM
SYSTEM CONTROL	1604	Fault Reset Sel	(0) Keypad	(0) Keypad	(0) Keypad	(0) Keypad	(0) Keypad
	1608	Start Enable 1	(4) DI4	(4) DI4	(4) DI4	(4) DI4	(4) DI4
OVERRIDE	1701	Override Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
LIMITS	2003	Maximum Current	4.6	3.6	6.7	3.3	3.9
	2007	Minimum Frequency	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
	2008	Maximum Frequency	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
START/STOP	2101	Start Function	(1) AUTO	(1) AUTO	(1) AUTO	(1) AUTO	(1) AUTO
	2102	Stop Function	(1) Coast	(1) Coast	(1) Coast	(1) Coast	(1) Coast
	2109	EM STOP Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
ACCEL/DECEL	2201	Acc/Dec 1/2 Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
	2202	Accelerate Time	30.0 s	30.0 s	30.0 s	30.0 s	30.0 s
	2203	Decelerate Time	10.0 s	10.0 s	10.0 s	10.0 s	10.0 s
MOTOR	2606	Switching Frequency	4 kHz	4 kHz	4 kHz	4 kHz	4 kHz
	2607	Switching Frequency Control	(1) ON	(1) ON	(1) ON	(1) ON	(1) ON

Table 26 — 48LC 04-06 VFD Parameters (cont)

PARAMETER GROUP	PARAMETER NUMBER	UNIT SIZE	48LC 04	48LC 05			48LC 06
		Motor Description	**2.4 HP 460v**	**1.7 HP 575v**	**1.7 HP 208-230v**	**1.7 HP 460v**	**2.4 HP 575v**
		Drive/motor Voltage	**460v**	**575v**	**208-230v**	**460v**	**575v**
		Motor Part Number	**HD56FE653**	**HD56FR579**	**HD56FR233**	**HD56FR463**	**HD56FE577**
		VFD Part Number	**HK30WA008**	**HK30WA048**	**HK30WA045**	**HK30WA046**	**HK30WA048**
		ABB Part Number	**ACH550-CARUH -06A9-4**	**ACH550-CARUH -03A9-6**	**ACH550-CARUH -07A5-2**	**ACH550-CARUH -04A1-4**	**ACH550-CARUH -03A9-6**
FAULT FUNCTIONS	**3005**	Motor Therm Prot	(1) Fault	(1) Fault	(1) Fault	(1) Fault	(1) Fault
	3006	Motor Thermal Time	1050 s	1050 s	1050 s	1050 s	1050 s
	3007	Motor Load Curve	100%	100%	100%	100%	100%
	3008	Zero Speed Load	%00705	%00705	%00705	%00705	%00705
	3009	Break Point Frequency	35 Hz	35 Hz	35 Hz	35 Hz	35 Hz
AUTOMATIC RESET	**3104**	AR Overcurrent	(0) DISABLE	(0) DISABLE	(0) DISABLE	(0) DISABLE	(0) DISABLE
	3105	AR Overvoltage	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE
	3106	AR Undervoltage	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE
EFB PROTOCOL	**5301**	EFB PROTOCOL ID	0601 (hex)	0601 (hex)	0601 (hex)	0601 (hex)	0601 (hex)
	5302	EFB STATION ID	41	41	41	41	41
	5303	EFB BAUD RATE	38400	38400	38400	38400	38400
	5304	EFB PARITY	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1
	5305	EFB CTRL PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE
OPTIONS	**9802**	COMM PROT SEL	6 (LEN)	6 (LEN)	6 (LEN)	6 (LEN)	6 (LEN)

Table 26 — 48LC 04-06 VFD Parameters (cont)

PARAMETER GROUP	PARAMETER NUMBER	UNIT SIZE	48LC 04	48LC 05			48LC 06
		Motor Description	2.4 HP 208-230v	2.4 HP 460v	2.9 HP 208-230v	2.9 HP 460v	3.7 HP 575v
		Drive/Motor Voltage	208-230v	460v	208-230v	460v	575v
		Motor Part Number	HD56FE653	HD56FE653	HD58FE654	HD58FE654	HD58FE577
		VFD Part Number	HK30WA001	HK30WA008	HK30WA001	HK30WA008	HK30WA021
		ABB Part Number	ACH550-CARUH -012A-2	ACH550-CARUH -06A9-4	ACH550-CARUH -012A-2	ACH550-CARUH -06A9-4	ACH550-CARUH -06A1-6
START-UP DATA	9902	Application Macro	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT	(1) HVAC DEFAULT
	9905	Motor Nominal Voltage	230	460	230	460	575
	9906	Motor Nominal Current	7.9	4.0	9.2	4.6	4.2
	9907	Motor Nominal Frequency	60	60	60	60	60
	9908	Motor Nominal Speed	1725	1725	1725	1725	1725
	9909	Motor Nominal Power	2.4	2.4	2.4	2.4	2.4
START/STOP/ DIR	1001	EXT1 Commands	(1) DI1	(1) DI1	(1) DI1	(1) DI1	(1) DI1
	1003	Direction	(1) Forward	(1) Forward	(1) Forward	(1) Forward	(1) Forward
REFERENCE SELECT	1103	REF1 Select	(1) AI1	(1) AI1	(1) AI1	(1) AI1	(1) AI1
	1104	REF1 Minimum	0 Hz	0 Hz	0 Hz	0 Hz	0 Hz
	1105	REF1 Maximum	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
CONSTANT SPEEDS	1201	Constant Speed Select	(8) DI2,3	(8) DI2,3	(8) DI2,3	(8) DI2,3	(8) DI2,3
	1202	Constant Speed 1	42.6	42.6	41.2	41.2	41.2
	1203	Constant Speed 2	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
	1204	Constant Speed 3	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
ANALOG INPUTS	1301	Minimum AI-1	20.00%	20.00%	20.00%	20.00%	20.00%
	1302	Maximum AI-1	100.00%	100.00%	100.00%	100.00%	100.00%
RELAY OUTPUTS	1401	Relay Output 1	(1) Ready	(1) Ready	(1) Ready	(1) Ready	(1) Ready
	1402	Relay Output 2	(2) Run	(2) Run	(2) Run	(2) Run	(2) Run
	1403	Relay Output 3	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM	(16) FLT/ALARM
SYSTEM CONTROL	1604	Fault Reset Sel	(0) Keypad	(0) Keypad	(0) Keypad	(0) Keypad	(0) Keypad
	1608	Start Enable 1	(4) DI4	(4) DI4	(4) DI4	(4) DI4	(4) DI4
OVERRIDE	1701	Override Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
LIMITS	2003	Maximum Current	9.1	4.6	10.6	5.3	4.8
	2007	Minimum Frequency	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
	2008	Maximum Frequency	60 Hz	60 Hz	60 Hz	60 Hz	60 Hz
START/STOP	2101	Start Function	(1) AUTO	(1) AUTO	(1) AUTO	(1) AUTO	(1) AUTO
	2102	Stop Function	(1) Coast	(1) Coast	(1) Coast	(1) Coast	(1) Coast
	2109	EM STOP Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
ACCEL/DECEL	2201	Acc/Dec 1/2 Sel	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL	(0) NOT SEL
	2202	Accelerate Time	30.0 s	30.0 s	30.0 s	30.0 s	30.0 s
	2203	Decelerate Time	10.0 s	10.0 s	10.0 s	10.0 s	10.0 s
MOTOR	2606	Switching Frequency	4 kHz	4 kHz	4 kHz	4 kHz	4 kHz
	2607	Switching Frequency Control	(1) ON	(1) ON	(1) ON	(1) ON	(1) ON
FAULT FUNCTIONS	3005	Motor Therm Prot	(1) Fault	(1) Fault	(1) Fault	(1) Fault	(1) Fault
	3006	Motor Thermal Time	1050 s	1050 s	1050 s	1050 s	1050 s
	3007	Motor Load Curve	100%	100%	100%	100%	100%
	3008	Zero Speed Load	%00705	%00705	%00705	%00705	%00705
	3009	Break Point Frequency	35 Hz	35 Hz	35 Hz	35 Hz	35 Hz

Table 26 — 48LC 04-06 VFD Parameters (cont)

PARAMETER GROUP	PARAMETER NUMBER	UNIT SIZE	48LC 04	48LC 05			48LC 06
		Motor Description	2.4 HP 208-230v	2.4 HP 460v	2.9 HP 208-230v	2.9 HP 460v	3.7 HP 575v
		Drive/Motor Voltage	208-230v	460v	208-230v	460v	575v
		Motor Part Number	HD56FE653	HD56FE653	HD58FE654	HD58FE654	HD58FE577
		VFD Part Number	HK30WA001	HK30WA008	HK30WA001	HK30WA008	HK30WA021
		ABB Part Number	ACH550-CARUH -012A-2	ACH550-CARUH -06A9-4	ACH550-CARUH -012A-2	ACH550-CARUH -06A9-4	ACH550-CARUH -06A1-6
AUTOMATIC RESET	3104	AR Overcurrent	(0) DISABLE	(0) DISABLE	(0) DISABLE	(0) DISABLE	(0) DISABLE
	3105	AR Overvoltage	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE
	3106	AR Undervoltage	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE	(1) ENABLE
EFB PROTOCOL	5301	EFB PROTOCOL ID	0601 (hex)	0601 (hex)	0601 (hex)	0601 (hex)	0601 (hex)
	5302	EFB STATION ID	41	41	41	41	41
	5303	EFB BAUD RATE	38400	38400	38400	38400	38400
	5304	EFB PARITY	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1	8 NONE 1
	5305	EFB CTRL PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE	DCU PROFILE
OPTIONS	9802	COMM PROT SEL	6 (LEN)	6 (LEN)	6 (LEN)	6 (LEN)	6 (LEN)

VFD DIAGNOSTICS

The drive detects error situations and reports them using:

1. Green and red LEDs on the body of the drive (located under the keypad).
2. Status LED on the control panel.
3. Control panel display.
4. The Fault Word and Alarm Word parameter bits (parameters 0305 to 0309).

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

Faults (Red LED Lit)

The VFD signals that it has detected a severe error, or fault, by:

1. Enabling the red LED on the drive (LED is either steady or flashing).
2. Setting an appropriate bit in a Fault Word parameter (0305 to 0307).
3. Overriding the control panel display with the display of a fault code.
4. Stopping the motor (if it was on).
5. Setting an appropriate bit in Fault Word parameter 0305-0307.

The fault code on the control panel display is temporary. Pressing the MENU, ENTER, UP button or DOWN buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

Alarms (Green LED Flashing)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it detects something unusual.

In these situations, the drive:

1. Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors).
2. Sets an appropriate bit in an Alarm Word parameter (0308 or 0309).
3. Overrides the control panel display with the display of an alarm code and/or name.

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

Correcting Faults

The recommended corrective action for faults is shown in Table 27. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter 1604 (FAULT RESET SELECT), digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

History

For reference, the last three fault codes are stored into parameters 0401, 0412, 0413. For the most recent fault (identified by parameter 0401), the drive stores additional data (in parameters 0402 through 0411) to aid in troubleshooting a problem. For example, a parameter 0404 stores the motor speed at the time of the fault. To clear the fault history (all of Group 04, Fault History parameters), follow these steps:

1. In the control panel, Parameters mode, select parameter 0401.
2. Press EDIT.
3. Press the UP and DOWN buttons simultaneously.
4. Press SAVE.

Correcting Alarms

To correct alarms, first determine if the Alarm requires any corrective action (action is not always required). Use Table 28 to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact ABB Automation Inc., at 1-800-435-7365, option 4, option 3. A qualified technician will review the problem with the caller and make a determination regarding how to proceed. This may involve dispatching a designated service station (DSS) representative from an

authorized station, dispatching a replacement unit, or advising return for repair.

Control Panel Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery Replacement

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Table 27 — Fault Codes

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1	OVERCURRENT	Output current is excessive. Check for excessive motor load, insufficient acceleration time (parameters 2202 ACCELER TIME 1, default 30 seconds), or faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for static or transient over voltages in the input power supply, insufficient deceleration time (parameters 2203 DECELER TIME 1, default 30 seconds), or undersized brake chopper (if present).
3	DEV OVERTEMP	Drive heat sink is overheated. Temperature is at or above 115°C (239°F). Check for fan failure, obstructions in the airflow, dirt or dust coating on the heat sink, excessive ambient temperature, or excessive motor load.
4	SHORT CIRC	Fault current. Check for short-circuit in the motor cable(s) or motor or supply disturbances.
5	OVERLOAD	Inverter overload condition. The drive output current exceeds the ratings.
6	DC OVERVOLT	Intermediate circuit DC voltage is not sufficient. Check for missing phase in the input power supply, blown fuse, or under voltage on main circuit.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1 FLT LIMIT (3021). Check source and connection for analog input and parameter settings for AI1 FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2 FLT LIMIT (3022). Check source and connection for analog input and parameter settings for AI2 FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT OVERTEMP	Motor is too hot, as estimated by the drive. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either drive is in local control mode (the control panel displays LOC), or drive is in remote control mode (REM) and is parameterized to accept start/stop, direction or reference from the control panel. To correct check the communication lines and connections. Check parameter 3002 PANEL COMM ERROR, parameters in Group 10: Command Inputs and Group 11:Reference Select (if drive operation is REM).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check motor connections.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for excessive load or insufficient motor power. Check parameters 3010 through 3012.
13	RESERVED	Not used.
14	EXT FAULT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXT FAULT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 2.
16	EARTH FAULT	The load on the input power system is out of balance. Check for faults in the motor or motor cable. Verify that motor cable does not exceed maximum specified length.
17	UNDERLOAD	Motor load is lower than expected. Check for disconnected load. Check parameters 3013 UNDERLOAD FUNCTION through 3015 UNDERLOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact Carrier.
19	OPEX LINK	Internal fault. A communication-related problem has been detected between the OMIO and OINT boards. Contact Carrier.
20	OPEX PWR	Internal fault. Low voltage condition detected on the OINT board. Contact Carrier.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact Carrier.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for missing main phase or blown fuse.
23	RESERVED	Not used.
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED parameters. Check parameter settings for 2001 and 2002. Check adequacy of motor braking torque. Check applicability of torque control. Check brake chopper and resistor.
25	RESERVED	Not used.
26	DRIVE ID	Internal fault. Configuration block drive ID is not valid.
27	CONFIG FILE	Internal configuration file has an error. Contact Carrier.
28	SERIAL 1 ERR	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
29	EFB CON FILE	Error in reading the configuration file for the field bus adapter.
30	FORCE TRIP	Fault trip forced by the field bus. See the field bus reference literature.
31	EFB 1	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
32	EFB 2	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
33	EFB 3	Fault code reserved for the EFB protocol application. The meaning is protocol dependent.
34	MOTOR PHASE	Fault in the motor circuit. One of the motor phases is lost. Check for motor fault, motor cable fault, thermal relay fault, or internal fault.
35	OUTP WIRING	Error in power wiring suspected. Check that input power is wired to drive output. Check for ground faults.
101-105	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.
201-206	SYSTEM ERROR	Error internal to the drive. Contact Carrier and report the error number.

Table 27 — Fault Codes (cont)

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1000	PAR HZRPM	Parameter values are inconsistent. Check for any of the following: 2001 MINIMUM SPEED > 2002 MAXIMUM SPEED 2007 MINIMUM FREQ > 2008 MAXIMUM FREQ 2001 MINIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2002 MAXIMUM SPEED / 9908 MOTOR NOM SPEED is outside of the range: -128/+128 2007 MINIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128 2008 MAXIMUM FREQ / 9907 MOTOR NOM FREQ is outside of the range: -128/+128
1001	PAR PFA REFNG	Parameter values are inconsistent. Check that 2007 MINIMUM FREQ is negative, when 8123 PFA ENABLE is active.
1002	PAR PFA IOCNF	Parameter values are inconsistent. The number of programmed PFA relays does not match with Interlock configuration, when 8123 PFA ENABLE is active. Check consistency of RELAY OUTPUT parameters 1401 through 1403, and 1410 through 1412. Check 8117 NR OF AUX MOTORS, 8118 AUTOCHANGE INTERV, and 8120 INTERLOCKS.
1003	PAR AI SCALE	Parameter values are inconsistent. Check that parameter 1301 AI 1 MIN > 1302 AI 1 MAX and that parameter 1304 AI 2 MIN > 1305 AI 2 MAX.
1004	PAR AO SCALE	Parameter values are inconsistent. Check that parameter 1504 AO 1 MIN > 1505 AO 1 MAX and that parameter 1510 AO 2 MIN > 1511 AO 2 MAX.
1005	PAR PCU 2	Parameter values for power control are inconsistent: Improper motor nominal kVA or motor nominal power. Check the following parameters: 1.1 < (9906 MOTOR NOM CURR * 9905 MOTOR NOM VOLT * 1.73 / PN) < 2.6 Where: PN = 1000 * 9909 MOTOR NOM POWER (if units are kW) or PN = 746 * 9909 MOTOR NOM POWER (if units are HP, e.g., in US)
1006	PAR EXT RO	Parameter values are inconsistent. Check the extension relay module for connection and 1410 through 1412 RELAY OUTPUTS 4 through 6 have non-zero values.
1007	PAR FBUS	Parameter values are inconsistent. Check that a parameter is set for field bus control (e.g., 1001 EXT1 COMMANDS = 10 (COMM)), but 9802 COMM PROT SEL = 0.
1008	PAR PFA MODE	Parameter values are inconsistent. The 9904 MOTOR CTRL MODE must = 3 (SCALAR SPEED) when 8123 PFA ENABLE activated.
1009	PAR PCU 1	Parameter values for power control are inconsistent or improper motor nominal frequency or speed. Check for both of the following: 1 < (60 * 9907 MOTOR NOM FREQ / 9908 MOTOR NOM SPEED < 16 0.8 < 9908 MOTOR NOM SPEED / (120 * 9907 MOTOR NOM FREQ / Motor poles) < 0.992
1010	OVERRIDE/PFA CONFLICT	Override mode is enabled and PFA is activated at the same time. This cannot be done because PFA interlocks cannot be observed in the override mode.

Table 28 — Alarm Codes

ALARM CODE	ALARM NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
2001	—	Reserved
2002	—	Reserved
2003	—	Reserved
2004	DIR LOCK	The change in direction being attempted is not allowed. Do not attempt to change the direction of motor rotation, or change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3021) and the parameter that sets the Alarm/Fault operation (3001).
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check input source and connections. Check parameter that sets the minimum (3022) and the parameter that sets the Alarm/Fault operation (3001).
2008	PANEL LOSS	Panel communication is lost and either the VFD is in local control mode (the control panel displays HAND), or the VFD is in remote control mode (AUTO) and is parameterized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections, Parameter 3002 PANEL LOSS, and parameters in groups 10 COMMAND INPUTS and 11 REFERENCE SELECT (if drive operation is REM).
2009	—	Reserved
2010	MOT OVERTEMP	Motor is hot, based on either the VFD estimate or on temperature feedback. This alarm warns that a Motor Overload fault trip may be near. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check that the motor and drive ratings match (motor is NOT undersized for the drive). Check the settings on parameters 3013 to 3015.
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013*	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. To control automatic reset, use parameter group 31 (AUTOMATIC RESET).
2014	AUTOCHANGE	This alarm warns that the PFA autochange function is active. To control PFA, use parameter group 81 (PFA) and the Pump Alternation macro.
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start any motor (when Autochange is used), or a speed regulated motor (when Autochange is not used).
2016	—	Reserved
2017*	OFF BUTTON	This alarm indicates that the OFF button has been pressed.
2018	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. To control PID sleep, use parameters 4022 through 4026 or 4122 through 4126.
2019	ID RUN	The VFD is performing an ID run.
2020	OVERRIDE	Override mode is activated.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. To control Start Enable 1 function, use parameter 1608. To correct, check the digital input configuration and the communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. To control Start Enable 2 function, use parameter 1609. To correct, check the digital input configuration and the communication settings.
2023	EMERGENCY STOP	Emergency stop is activated.

ACH580 VFD Operation

The VFD keypad is shown in Fig 56 and Fig. 57. The functions of SOFT KEYS (and) change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. Arrow Keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

For the VFD to operate on the units covered by this document, the drive must be set in AUTO mode. The word "AUTO" will appear in the upper left-hand corner of the VFD display. Press the AUTO button to set the drive in AUTO mode.

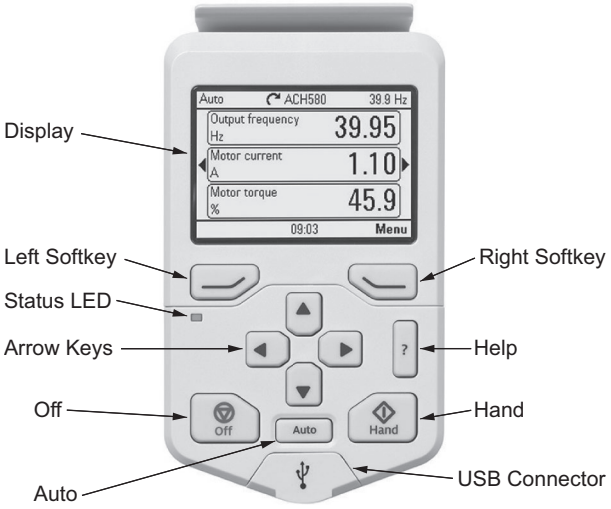


Fig. 56 — ACH580 VFD Keypad

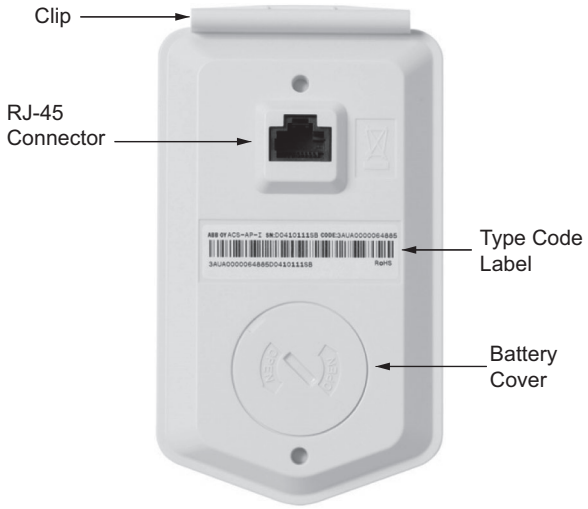


Fig. 57 — ACH580 VFD Keypad (cont)

START UP CHANGING PARAMETERS INDIVIDUALLY

Initial start-up is performed at the factory. To start up the VFD by changing individual parameters, perform the following procedure:

1. Select MENU (Press) The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press SEL (Press).
3. Use the UP or DOWN keys to highlight the desired parameter group and press SEL (Press).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (Press).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (Press) to store the modified value. Press CANCEL (Press) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT/BACK (Press) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT/BACK (Press) to return to the main menu.

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously.

VFD Modes

The VFD has several different modes for configuring, operating, and diagnosing the VFD.

The modes are:

- Standard Display mode - shows drive status information and operates the drive
- Parameters mode - edits parameter values individually
- Start-up Assistant mode - guides start-up and configuration
- Changed Parameters mode - shows all changed parameters
- Drive Parameter Backup mode - stores or uploads the parameters
- Clock Set mode - sets the time and date for the drive
- I/O Settings mode - checks and edits the I/O settings

ACH580 Standard Display Mode

Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press BACK until the LCD display shows status information as described below. (See Fig. 56.)

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain. From Home view press "Options" then "Edit Home View" to change the Home layout, the middle of the LCD display can be configured to display 3 parameter values, Graphs or digital indicators. The default display shows (OUTPUT FREQ) in percent speed, (CURRENT) in amperes, and (Al1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

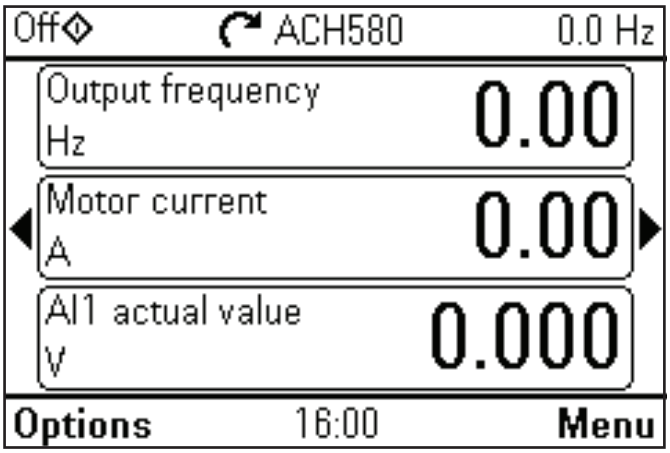


Fig. 58 — Standard Display Example

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive is in remote control mode, such as the basic I/O or field bus.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running and at set point and the shaft direction is forward or reverse. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For the units covered in this manual, the correct display rotation is clockwise.

The upper right corner shows the frequency set point that the drive will maintain.

From Home view press "Options" then "Edit Home View" to change the home layout, the middle of the LCD display can be configured to display 3 parameter values, Graphs or digital indicators. The default display shows (OUTPUT FREQ) in percent speed, (CURRENT) in amperes, and (AI1) in voltage DC.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control panel, press and hold the HAND button. Pressing the HAND button switches the drive to hand control while keeping the drive running. Press the AUTO button to switch to remote input control. To start the drive press the HAND or AUTO buttons, to stop the drive press the OFF button.

To adjust the speed in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

Parameters Mode

The Parameters mode is used to change the parameters on the drive. To change parameters, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press Select (Press).
3. Use the UP or DOWN keys to highlight the desired parameter group and press Select (Press).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (Press).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (Press).to store the modified value. Press CANCEL (Press) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press BACK (Press) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (Press) to return to the main menu.

Changed Parameters Mode

The Changed Parameters mode is used to view and edit recently changed parameters on the drive. To view the changed parameters, perform the following procedure:

1. Select MENU (Press).The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press Select (Press).
3. Use the UP or DOWN keys to highlight MODIFIED on the display screen and press Select (Press). A list of the recently changed parameters will be displayed.
4. Use the UP or DOWN keys to highlight the desired parameter group and press EDIT (Press) to change the parameter if desired.
5. Press BACK (Press) to exit the Changed Parameters mode.

Drive Parameter Backup Mode

The drive parameter back up mode is used to export the parameters from one drive to another. The parameters can be uploaded from a VFD to the removable control panel. The control panel can then be transferred to another drive and the parameters downloaded into memory.

Depending on the motor and application, there are two options available. The first option is to download all parameters. This copies both application and motor parameters to the drive from the control panel. This is recommended when using the same application for drives of the same size. This can also be used to create a backup of the parameters group for the drive.

The second option downloads only the application parameters to the drive. This is recommended when using the same application for drives of different sizes. Parameters 99.07, 99.06, 99.08, 99.09, 99.10, and group 51 parameters and internal motor parameters are not copied.

Upload All Parameters

To upload and store parameters in the control panel from the VFD, only is required to insert the Keypad in the VFD slot (Fig. 59) and animation will appear loading the VFD configuration.

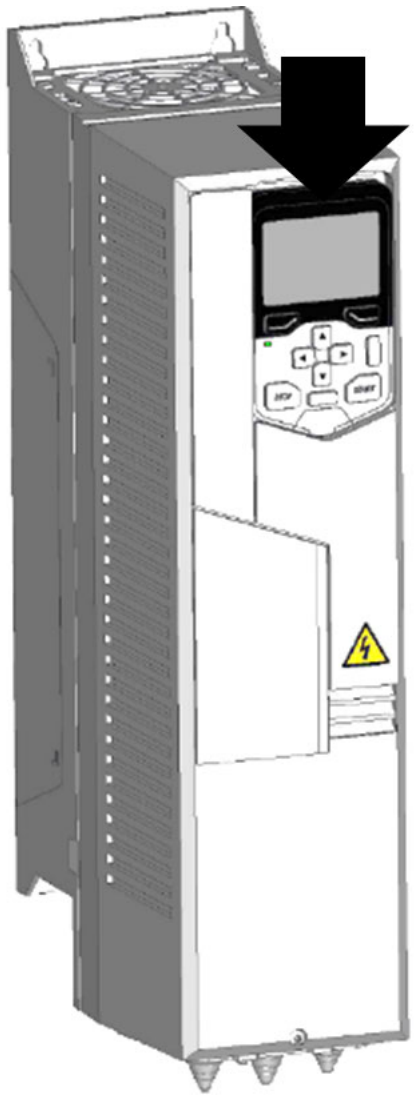


Fig. 59 — Insert keypad in Slot

DOWNLOAD ALL PARAMETERS FROM BACKUP

To download all parameters from the control panel to the VFD, perform the following procedure:

1. Install the control panel with the correct parameters onto the VFD.
2. Select MENU (Press). The Main menu will be displayed.
3. Use the UP or DOWN keys to highlight BACKUPS on the display screen and press SEL (Press).
4. Use the UP or DOWN keys to highlight the backup file and press SEL (Press).
5. The text "Restoring Parameters" will be displayed with a progress indicator. To stop the process, select CANCEL (Press).
6. When the download is complete, the text "Parameter download successful" will be displayed.
7. The display will then return to the PAR BACKUP menu. Select BACK (Press) to return to the main menu.
8. The control panel can now be disconnected from the drive.

Clock Set Mode

Use the clock set mode to set the date and time for the internal clock of the VFD. In order to use the timer functions of the VFD control, the internal clock must be set. The date is used to determine weekdays and is visible in the fault logs.

To set the clock, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PRIMARY SETT. on the display screen and press ENTER (Press). The Sub list will be displayed.
3. Use the UP or DOWN keys to highlight Clock, region, display and press SEL (Press). This parameter is used to display or hide the clock on the screen. Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Sub list menu.
4. Use the UP or DOWN keys to highlight SET TIME and press SEL (Press). Use the UP or DOWN keys to change the hours and minutes. Press OK (Press) to save the configuration and return to the Clock Set menu.
5. Use the UP or DOWN keys to highlight TIME FORMAT and press SEL (Press). Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Clock Set menu.
6. Use the UP or DOWN keys to highlight SET DATE and press SEL (Press). Use the UP or DOWN keys to change the day, month, and year. Press OK (Press) to save the configuration and return to the Clock Set menu.
7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (Press). Use the UP or DOWN keys to change the parameter setting. Press OK (Press) to save the configuration and return to the Clock Set menu.
8. Press BACK (Press). twice to return to the main menu.

I/O Settings Mode

Use the I/O Settings mode to view and edit the I/O settings. To configure the I/O settings, perform the following procedure:

1. Select MENU (Press). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PRIMARY SETT. on the display screen and press SEL (Press). The Sub list will be displayed.
3. Use the UP or DOWN keys to highlight ADVANCED OPTIONS/FUNCTIONS. on the display screen and press SEL (Press). The Sub list will be displayed.
4. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press SEL (Press). The I/O Settings parameter list will be displayed.
5. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (Press).
6. Use the UP or DOWN keys to select the parameter to view. Press OK (Press).
7. Use the UP or DOWN keys to change the parameter setting. Press SAVE (Press). to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
8. Press BACK (Press) twice to return to the main menu.

VFD Diagnostics

The drive detects error situations and reports them using:

1. Status LED on the control panel
2. Control panel display
3. The Fault Word and Alarm Word parameter bits

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

Faults (Red LED Lit)

The VFD signals that it has detected a severe error, or fault, by:

1. Enabling the red LED on the drive (LED is either steady or flashing)
2. Setting an appropriate bit in a Fault Word parameter
3. Overriding the control panel display with the display of a fault code
4. Stopping the motor (if it was on)

The fault code on the control panel display is temporary. Pressing the MENU, (Press ⏎). buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched, and the fault is still active. See Table 29 for a list of fault codes.

Alarms (Green LED Flashing)

For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

1. Flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
2. Sets an appropriate bit in an Alarm Word parameter
3. Overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists. See Table 29 for a list of alarm codes.

Correcting Faults

The recommended corrective action for faults is shown in the Fault Listing Table 29. The VFD can also be reset to remove the fault. If an external source for a start command is selected and is active, the VFD may start immediately after fault reset.

To reset a fault indicated by a flashing red LED, turn off the power for 5 minutes. To reset a fault indicated by a red LED (not flashing), press RESET from the control panel or turn off the power for 5 minutes. Depending on the value of parameter, digital input or serial communication could also be used to reset the drive. When the fault has been corrected, the motor can be started.

Correcting Alarms

To correct alarms, first determine if the alarm requires any corrective action (action is not always required). Use Table 29 to find and address the root cause of the problem.

If diagnostics troubleshooting has determined that the drive is defective during the warranty period, contact Carrier.

Control Panel Cleaning

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

Battery Replacement

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

Table 29 — Fault and Alarm Codes for ACH580 VFD

CODE (HEX)	WARNING / AUX. CODE	CAUSE	WHAT TO DO
A2B1	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this warning may also be caused by an earth fault or supply phase loss.	Check motor load. Check acceleration times in parameter group *23 Speed reference ramp* (speed control) or *28 Frequency reference chain* (frequency control). Also check parameters *46.01 Speed scaling*, *46.02 Frequency scaling* and *46.03 Torque scaling*. Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter *Electrical installation*, section *Checking the insulation of the assembly* in the *Hardware manual* of the drive. Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group *99 Motor data* corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable.
A2B3	Earth leakage	Drive has detected load unbalance typically due to earth fault in motor or motor cable.	Check there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter *Electrical installation*, section *Checking the insulation of the assembly* in the *Hardware manual* of the drive. If an earth fault is found, fix or change the motor cable and/or motor. If no earth fault can be detected, contact your local ABB representative.
A2B4	Short circuit	Short-circuit in motor cable(s) or motor.	Check motor and motor cable for cabling errors. Check motor and motor cable (including phasing and delta/star connection). Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter *Electrical installation*, section *Checking the insulation of the assembly* in the *Hardware manual* of the drive. Check there are no power factor correction capacitors or surge absorbers in motor cable.
A6A4	Motor nominal value	The motor parameters are set incorrectly.	Check the auxiliary code. See actions for each code below.
A6A4	Motor nominal value 0001	The drive is not dimensioned correctly.	Check the auxiliary code. See actions for each code below. Check the settings of the motor configuration parameters in groups 98 and 99. Check that the drive is sized correctly for the motor.
A780	Motor stall Programmable warning: *31.24 Stall function*	Motor is operating in stall region because of, for example, excessive load or insufficient motor power.	Check motor load and drive ratings. Check fault function parameters.
A783	Motor overload	Motor current is too high.	Check for overloaded motor. Adjust the parameters used for the motor overload function (*35.51*...*35.53*) and *35.55*...*35.56*.
A784	Motor disconnect	All three output phases are disconnected from motor.	Check that switches between drive and motor are closed. Check that all cables between drive and motor are connected and secured. If no issue was detected and drive output was actually connected to motor, contact ABB.
A7AB	Extension I/O configuration failure	Installed extension module is not the same as configured.	Check that the installed extension module (shown by parameter *15.02 Detected extension module*) is the same as selected by parameter *15.01 Extension module type*.
A7C1	FBA A communication Programmable warning: *50.02 FBA A comm loss func*	Cyclical communication between drive and fieldbus adapter module A or between PLC and fieldbus adapter module A is lost.	Check status of fieldbus communication. See user documentation of fieldbus interface. Check settings of parameter groups *50 Fieldbus adapter (FBA)*, *51 FBA A settings*, *52 FBA A data in* and *53 FBA A data out*. Check cable connections. Check if communication master is able to communicate.
A7CE	EFB comm loss Programmable warning: *58.14 Communication loss action*	Communication break in embedded fieldbus (EFB) communication.	Check the status of the fieldbus master (online/offline/error etc.). Check cable connections to the EIA-485/X5 terminals 29, 30 and 31 on the control unit.
A7EE	Panel loss Programmable warning: *49.05 Communication loss action*	Control panel or PC tool selected as active control location for drive has ceased communicating.	Check PC tool or control panel connection. Check control panel connector. Check mounting platform if being used. Disconnect and reconnect the control panel.
A88F	Cooling fan	Maintenance timer limit exceeded.	Consider changing the cooling fan. Parameter *05.04 Fan on-time counter* shows the running time of the cooling fan.
AFAA	Auto reset	A fault is about to be auto reset.	Informative warning. See the settings in parameter group *31 Fault functions*.
AFE1	Emergency stop (off2)	Drive has received an emergency stop (mode selection off2) command.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. If the emergency stop was unintentional, check the source selected by parameter *21.05 Emergency stop source*.
AFE2	Emergency stop (off 1 or off3)	Drive has received an emergency stop (mode selection off1 or off3) command.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. If the emergency stop was unintentional, check the source selected by parameter *21.05 Emergency stop source*. Informative warning. See parameter *21.22 Start delay*.

Table 29 — Fault and Alarm Codes for ACH580 VFD (cont)

CODE (HEX)	WARNING / AUX. CODE	CAUSE	WHAT TO DO
AFE9	Start delay	The start delay is active and the drive will start the motor after a predefined delay.	Check that it is safe to continue operation. Then return emergency stop push button to normal position. Restart drive. If the emergency stop was unintentional, check the source selected by parameter *21.05 Emergency stop source*. Informative warning. See parameter *21.22 Start delay*. Check the setting of (and source selected by) parameter *20.40 Run permissive*.
AFED	Run permissive	Run permissive is keeping the drive from running the motor.	
AFEE	Start interlock 1	Start interlock 1 is keeping the drive from starting.	Check the signal source selected for parameter *20.41 Start interlock 1*.
AFEF	Start interlock 2	Start interlock 2 is keeping the drive from starting.	Check the signal source selected for parameter *20.42 Start interlock 2*.
AFF0	Start interlock 3	Start interlock 3 is keeping the drive from starting.	Check the signal source selected for parameter *20.43 Start interlock 3*.
AFF1	Start interlock 4	Start interlock 4 is keeping the drive from starting.	Check the signal source selected for parameter *20.44 Start interlock 4*.
AFF2	Run permissive forced warning	A forced DI is used as a source for parameter *20.40 Run permissive*.	If *20.40 Run permissive* uses DIx as the source, check if the bit corresponding to DIx in parameter *10.03 DI force selection* is 1.
AFF3	Start interlock forced warning	One or more forced DIs is used as a source for one or more of parameters *20.41 Start interlock 1 ... 20.44 Start interlock 4*.	Check all parameters *20.41 Start interlock 1*. *20.44 Start interlock 4*. If any of these parameters uses DIx as the source, check if the bit corresponding to DIx in parameter *10.03 DI force selection* is 1.
AFF5	Override new start required	The Safe torque off function was active and has been reset while in Override.	A new start signal is required to start the drive again.
AFF6	Identification run	Motor ID run will occur at next start.	Informative warning.
AFF8	Motor heating active	Pre-heating is being performed	Informative warning. Motor pre-heating is active. Current specified by parameter *21.16 Preheating current* is being passed through the motor.
AFFE	Override active	Drive is in Override mode.	Informative warning.
B5A2	Power applied	The drive was powered up or the control board was rebooted successfully.	Informative event.
B681	Hand mode selected	The drive was placed in Hand mode.	Informative event. Check the control panel to ensure that the current control location is correct.
B682	Off mode selected	The drive was placed in Off mode.	Informative event. Check the control panel to ensure that the current control location is correct.
B683	Auto mode selected	The drive was placed in Auto mode.	Informative event. Check the control panel to ensure that the current control location is correct.
2310	Overcurrent	Output current has exceeded internal fault limit. In addition to an actual overcurrent situation, this fault may also be caused by an earth fault or supply phase loss.	Check motor load. Check acceleration times in parameter group *23 Speed reference ramp* (speed control) or *28 Frequency reference chain* (frequency control). Also check parameters *46.01 Speed scaling*, *46.02 Frequency scaling* and *46.03 Torque scaling*. Check motor and motor cable (including phasing and delta/star connection). Check there are no contactors opening and closing in motor cable. Check that the start-up data in parameter group 99 corresponds to the motor rating plate. Check that there are no power factor correction capacitors or surge absorbers in motor cable. Check for an earth fault in motor or motor cables by measuring the insulation resistances of motor and motor cable. See chapter *Electrical installation*, section *Checking the insulation of the assembly* in the *Hardware manual* of the drive.
FF61	ID run	Motor ID run was not completed successfully.	Check safety circuit connections. For more information, see chapter *The Safe torque off function* in the *Hardware manual* of the drive and description of parameter *31.22 STO indication run/stop*(page *520*). Check the value of parameter *95.04 Control board supply*. Check the nominal motor values in parameter group *99 Motor data*. Check that no external control system is connected to the drive. Cycle the power to the drive (and its control unit, if powered separately). Check that no operation limits prevent the completion of the ID run. Restore parameters to default settings and try again. Check that the motor shaft is not locked. Check the auxiliary code. See actions for each code below.

ACH580 Maintenance Schedule

Valid for drives manufactured or maintained in 2017 onwards.

Recommended maintenance intervals and component replacements are based on specified operational and environmental conditions. Annual drive inspections are recommended to ensure the highest reliability and optimum performance.

NOTE: Long term operation near the maximum specified ratings or environmental conditions may require shorter maintenance intervals for certain components.

LEGEND

I — Inspection (inspection and maintenance action if needed)

P — Performance of on/off-site work (commissioning, tests, measurements, or other work)

R — Replacement

Table 30 — Maintenance - Annual Actions

RECOMMENDED ANNUAL ACTIONS BY THE USER	YEARS FROM START-UP
Connections and environment	
Cabinet door filters IP54	**R**
Quality of supply voltage	**P**
Spare parts	
Spare parts	**I**
DC circuit capacitors reforming for spare modules and spare capacitors	**P**
Inspections by user	
IP22 and IP42 air inlet and outlet meshes	**I**
Tightness of terminals	**I**
Dustiness, corrosion and temperature	**I**
Heat sink cleaning	**I**

Table 31 — Maintenance Cooling

COOLING	YEARS FROM START-UP						
	3	6	9	12	15	18	21
Fans, IP21 UL (NEMA) Type 1 frames R1 to R9							
Main cooling fans R0-R5		**R**		**R**		**R**	
Main cooling fans R6-R8 LONGLIFE			**R**			**R**	
Auxiliary cooling fan for circuit boards, R4v2 89A/ IP21 & R4v2 77A/IP21		**R**		**R**		**R**	
Auxiliary cooling fan for circuit boards, only R5 - R8 LONGLIFE			**R**			**R**	
Fans, IP55 UL (NEMA) Type 12 frames R1 to R8 (Not standard offering)							
Main cooling fans R1-R5		**R**		**R**		**R**	
Main cooling fans R6-R8 LONGLIFE			**R**			**R**	
Auxiliary cooling fan for circuit boards R1-R2	**R**	**R**	**R**	**R**	**R**	**R**	**R**
Auxiliary cooling fan for circuit boards R3, R4 LONGLIFE			**R**			**R**	
Auxiliary cooling fan for circuit boards R4v2		**R**		**R**		**R**	
Auxiliary cooling fan for circuit boards R5-R8 LONGLIFE			**R**			**R**	
Second Auxiliary cooling fan, only R8 LONGLIFE			**R**			**R**	

Table 32 — Maintenance Aging

AGING	YEARS FROM START-UP						
	3	6	9	12	15	18	21
Common, control panel battery							
Control panel battery			**R**			**R**	
Cabinet auxiliary 24VDC power supplies and buffers >-<				**R**			
Frequency converter frames R1 to R8							
CCU control unit				**R**			
Frequency converter frames R6 to R8							
Flat ribbon cables				**R**			
DC circuit elecrolytic capacitors and discharging resistors			**R**			**R**	
ZINT, ZPOW, ZINP, QINT module internal circuit boards				**R**			

MAIN FAN REPLACEMENT IP21 AND IP55 (UL TYPE 1 AND UL TYPE 12)

The main cooling fan of the VFD has a life span of about 60,000 operating hours at maximum rated operating temperature and drive load. The expected life span doubles for each 18°F drop in the fan temperature (fan temperature is a function of ambient temperatures and drive loads).

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heat sink temperature in spite of heat sink cleaning. If the drive is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from Carrier.

To replace the main fan for frame sizes R1 through R8, perform the following (see Fig. 60 through Fig. 64):

1. Remove power from drive. Wait for 5 minutes and then make sure by measuring that there is no voltage
2. Remove drive cover.
3. For frame sizes R1, R2, R3 and R4 press together the retaining clips on the fan cover and lift. For frame sizes R5, R6, R7 and R8, remove the two mounting screws of the fan mounting plate at the bottom of the drive.
4. Disconnect the fan cable.
5. Install the new fan by reversing Steps 2 to 4.
6. Restore power.

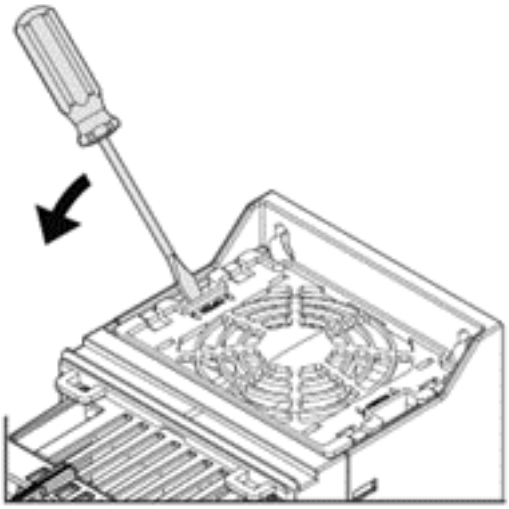


Fig. 60 — Main Fan Remove (Frame Sizes R1 up to R4)

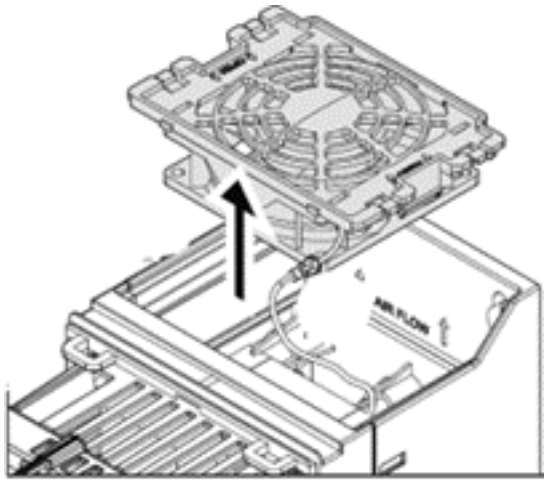


Fig. 61 — Main Fan Remove (Frames Sizes R1 up to R3)

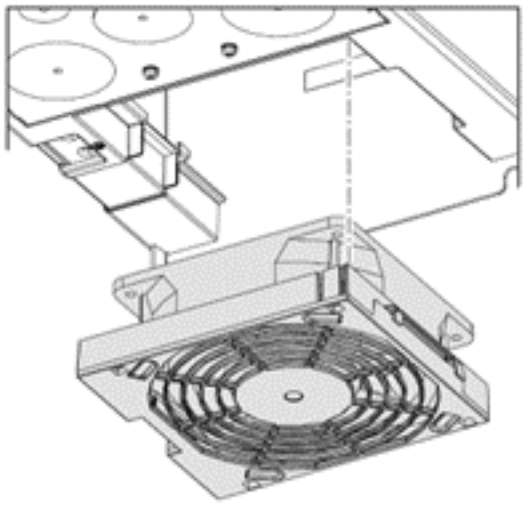


Fig. 62 — Main Fan remove (Frames Sizes R4)

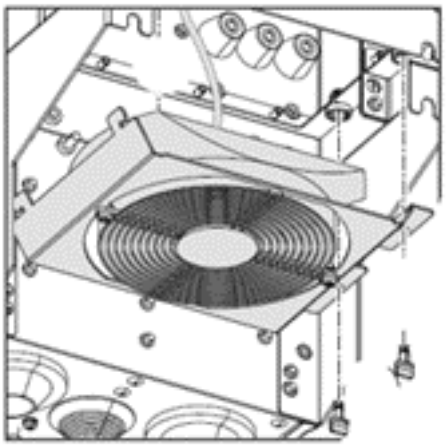


Fig. 63 — Main Fan remove (Frame Sizes R5 up to R8)

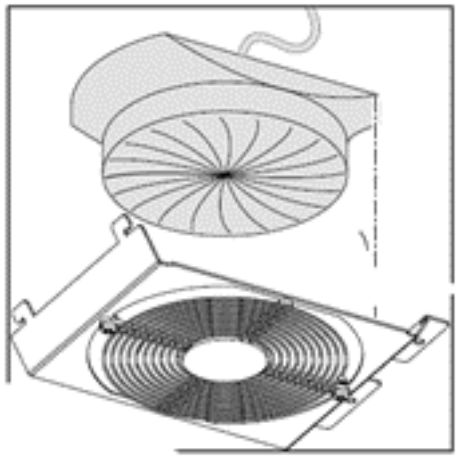


Fig. 64 — Main Fan remove (Frame Sizes R5 up to R8)

AUXILIARY COOLING FAN REPLACEMENT IP21 AND IP55 (UL TYPE 1 AND UL TYPE 12)

The VFD IP21 and IP55 / UL Type 1 and 12 enclosures have an additional internal fan to circulate air inside the enclosure.

To replace the internal enclosure fan for frame sizes R6 to R8, perform the following (see Fig. 65 and 66):

1. Remove power from drive. Wait for 5 minutes and then make sure by measuring that there is no voltage.
2. Remove the front cover.
3. Unplug fan power supply wires from the drive.
4. Release the retaining clips.
5. Pull off the fan.
6. Install the new fan in reverse order.

NOTE: Make sure that the arrow on the fan points up.

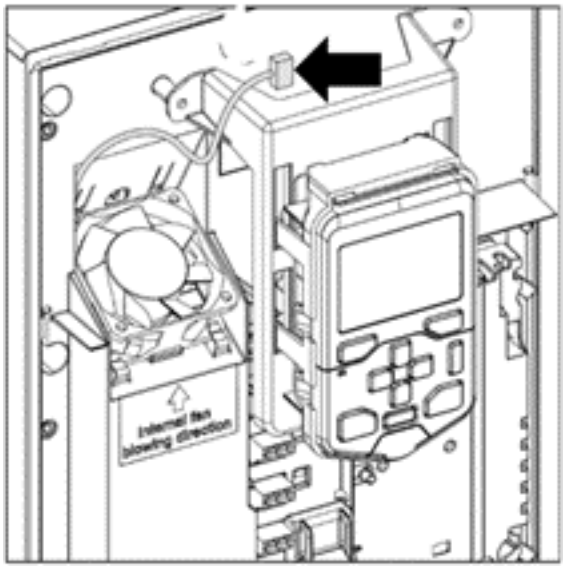


Fig. 65 — Auxiliary Fan Remove (Frame Sizes R6 up to R8)

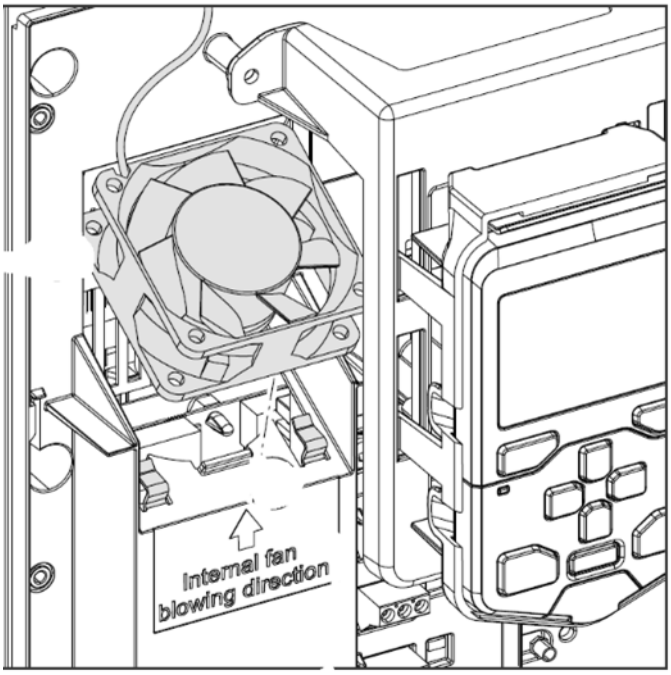


Fig. 66 — Auxiliary Fan Remove (Frame Sizes R6 up to R8)

To replace the internal enclosure fan for frame sizes IP55 (UL Type 12) R1, R2 and R3, perform the following (see Fig. 67, 68, 69 and 70):

1. Remove power from drive. (R1, R2 and R3).
2. Remove the front cover. (R1, R2 and R3).
3. Unplug fan power supply wires from the drive. (R1, R2 and R3).
4. Remove the fingerguard: Insert a screwdriver into the hole of the fingerguard. (R1, R2 Only).
5. Unplug the fan power supply wires from the drive. (R1, R2 and R3).
6. Pull off the plastic housing. (R3 Only).
7. Pull off the fan. (R1, R2 and R3).
8. Install the new fan in reverse order. (R1, R2 and R3).

Note: Make sure that the arrow on the fan points to the same direction as the arrow on the drive frame.

To replace the internal enclosure fan for frame sizes IP55 (UL Type 12) R1, R2 and R3, perform the following (see Fig. 67, 68 and 71):

1. Remove power from drive.
2. Remove the front cover.
3. Unplug fan power supply wires from the drive.
4. Remove the fingerguard: Insert a screwdriver into the hole of the fingerguard.
5. Unplug the fan power supply wires from the drive.
6. Pull off the plastic housing.
7. Pull off the fan.
8. Install the new fan in reverse order.

NOTE: Make sure that the arrow on the fan points to the same direction as the arrow on the drive frame.

CONTROL PANEL CLEANING

Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

BATTERY REPLACEMENT

A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with CR2032.

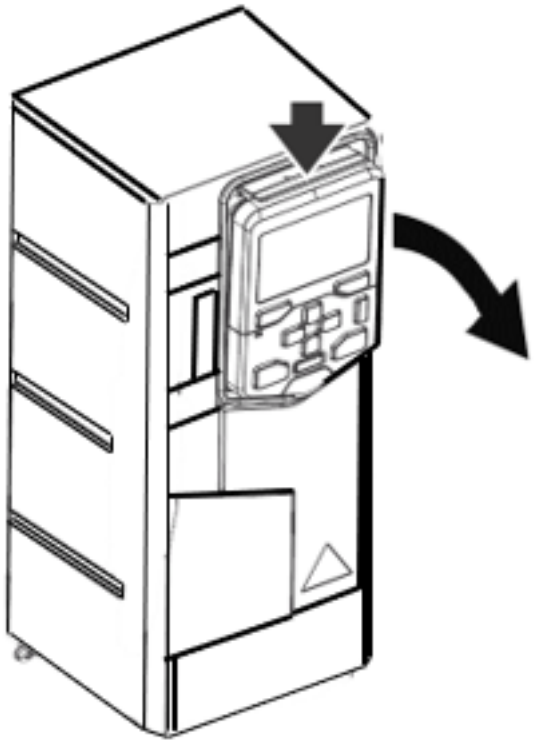


Fig. 67 — Auxiliary Fan remove (Frame Sizes R1, R2, R3, R4 and R5)

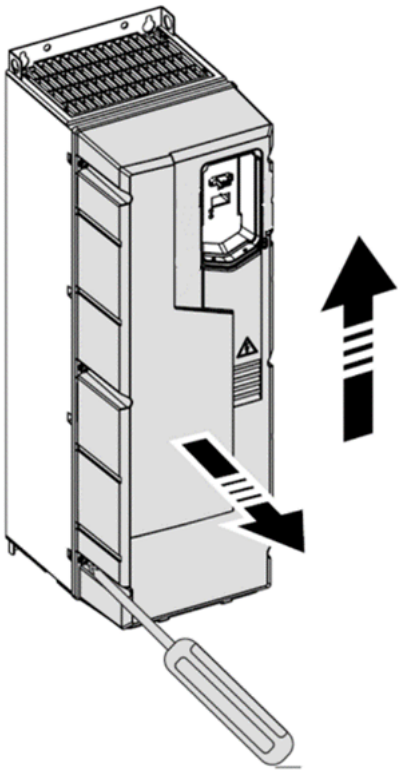


Fig. 68 — Drive cover remove (Frame Sizes R1, R2, R3, R4 and R5)

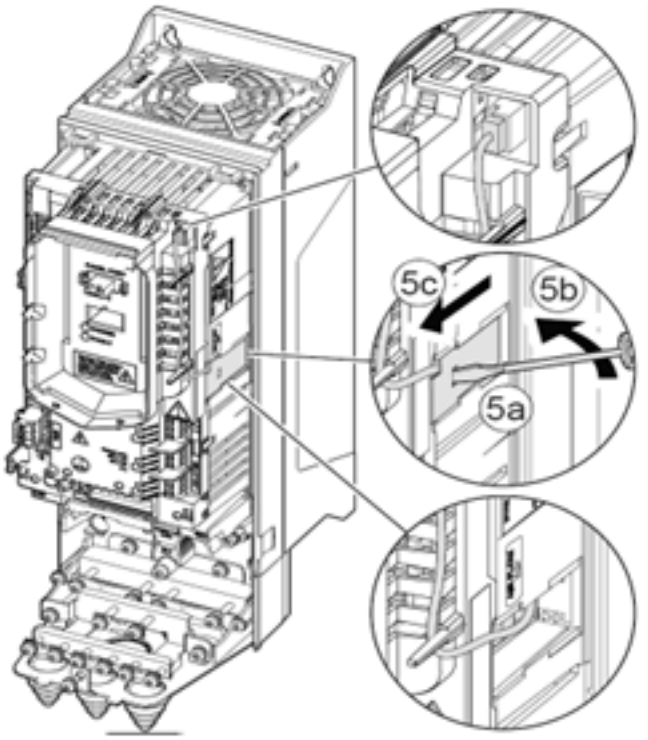


Fig. 69 — Drive cover remove (Frame Sizes R1, R2, R3, R4 and R5)

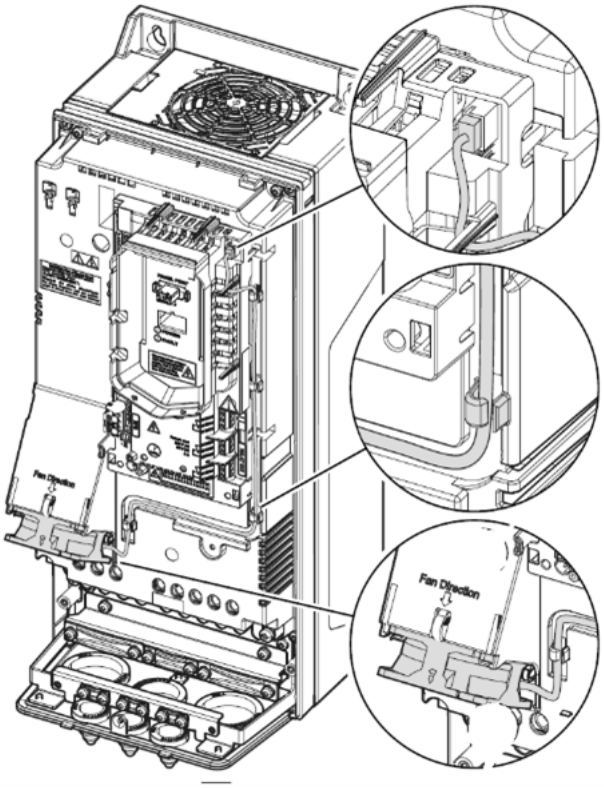


Fig. 70 — Auxiliary Fan Remove (Frame Sizes R1 and R2)

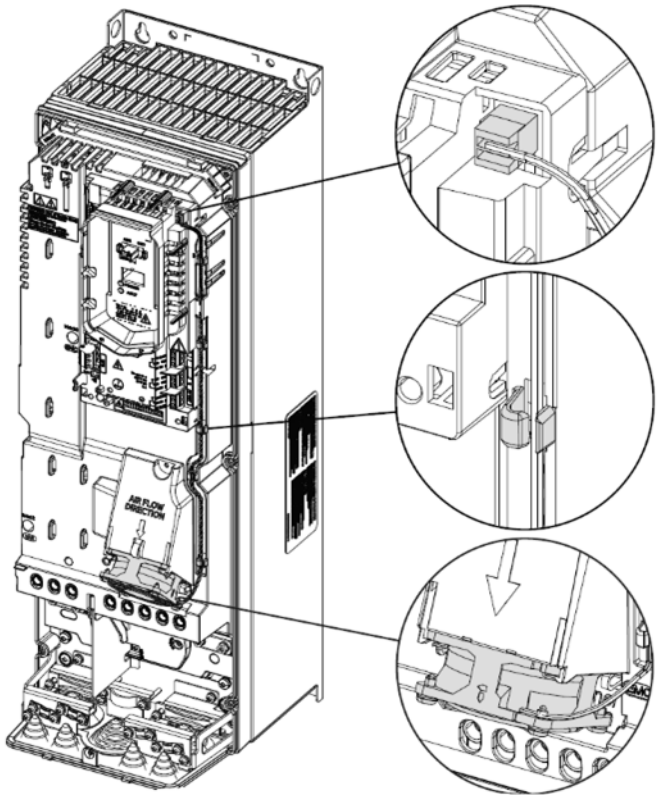


Fig. 71 — Auxiliary Fan Remove (Frame Sizes R4 and R5)

Fan Speed Relay Board

This board (P/N HK50ZA002) is designated as the VFD Fan Board on the unit wiring diagram labels. It is a small (3.0 x 3.12 in., 76 x 79 mm) printed circuit board with four SPDT control relays. See Fig. 72. There is no software on this board. The relay board is located in the unit's main control box; refer to unit label diagram for Component Location view.

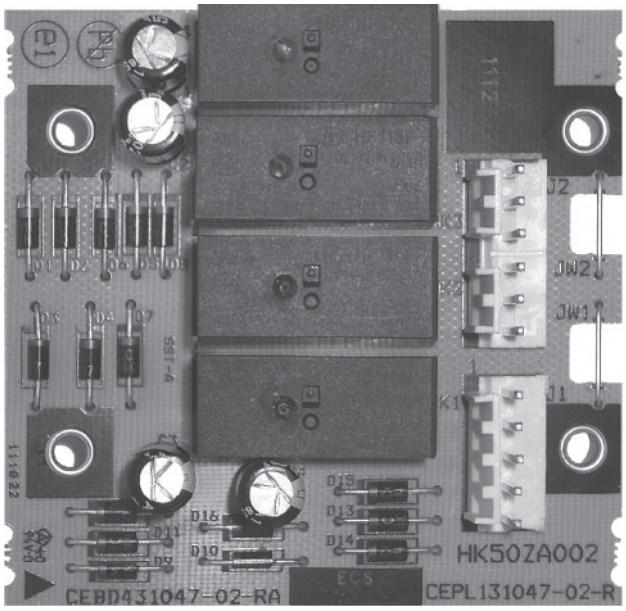


Fig. 72 — VFD Fan Board

The board is arranged in two separate circuits with individual pin connectors. Connector J1 is connected to the 24-vac input signal circuit with the four relay coils. Connector J2 is connected to the 24-VDC output circuit that connects to the VFD's terminal strip. See Fig. 74 (on page 71).for a simplified connection schematic for Fan Speed Relay board and the VFD.

In this SAV application, there are three inputs to the relay board, originating from the space thermostat's G, Y2 and W1 terminals. An input from terminal G (for continuous fan operation for ventilation or from a Y1 call) will result in the VFD starting the indoor fan motor and running the motor at LOW speed. An input from either Y2 or W1 will result in the VFD running the indoor fan motor at HIGH speed. See Table 33 for relay operation for each unit mode. Relay K4 is not used in this 2-speed application.

Table 33 — Two-Speed Configuration Logic (Thermostat Control)

INPUT	RELAY COIL STATUS			CONTROLLING OUTPUT	FAN MOTOR SPEED
	K1	K2	K3		
G	Off	Off	On	K3	Low (40 Hz)
Y1	Off	Off	On	K3	Low (40 Hz)
Y2	Off	On	On	K2	High (60 Hz)
W1	On	On	On	K1	High (60 Hz)

Configuration Jumpers

The relay board has two configuration jumpers, marked JW1 and JW2. For this 2-speed motor application, both jumpers must be cut and open (see Fig. 73). Factory-installed boards will have these jumpers cut. Service replacement boards have these jumpers intact; servicer must cut both jumpers when installing a new service board. Failure to cut these jumpers will cause continuous fan motor operation.

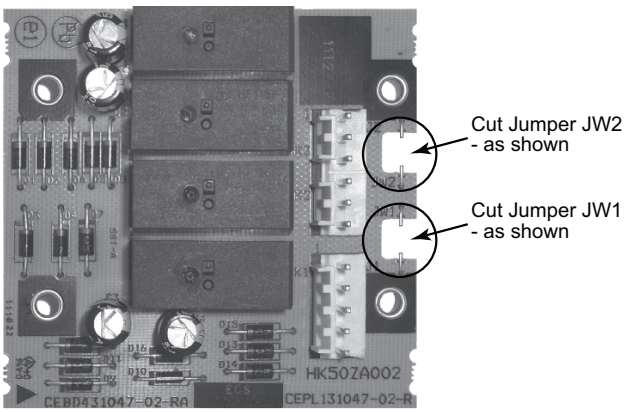


Fig. 73 — Jumpers JW1 and JW2 Cut for Two-Speed Fan Board Configuration

Variable Frequency Drive

The VFD is used to switch the indoor fan motor speed between full/high speed (60 Hz motor operation) and reduced/low speed (40 Hz motor operation) as required by ASHRAE 90.1-2016 and IECC-2015 requirements for two-stage HVAC units. The VFD is factory-configured to match the current and power requirements for each motor selection and all wiring connections are completed by the factory; no field adjustments or connections are necessary.

While the basic VFD retains all of its standard capabilities, the SAV 2-speed application uses only a limited portion of these features to provide two discrete output speeds to the motor. Consequently the VFD is not equipped with a keypad. A keypad is available as an accessory (P/N CRDISKIT001A00) for field-installation or expanded service access to VFD parameter and troubleshooting tables.

IMPORTANT: DO NOT use ABB or Carrier Start-Up Assistant on this VFD application!

Use of Start-Up Assistant will override the factory VFD configurations.

The SAV control circuit inputs to the VFD are 24-VDC signals.

- For ACS320 VFDs, the voltage is sourced from the VFD at its terminal 9 (+24 V). SAV speed inputs are received at terminals 13 (DI-2) for low speed (40 Hz) motor operation and 14 (DI-3) for high speed (60 Hz) motor operation. See Table 34 and Fig. 75 (on page 72).
- For ACH550 VFDs, the voltage is sourced from the VFD at its terminal 10 (+24 V). SAV speed inputs are received at terminals 14 (DI-2) for low speed (40 Hz) motor operation and 13 (DI-3) for high speed (60 Hz) motor operation. See Table 35 and Fig. 76 (on page 72).

When neither input is present, the VFD will shut the fan motor off. There is no separate indoor fan contactor required in this application.

The VFD used in the SAV™ system has soft start capabilities to slowly ramp up the speeds, eliminating any high inrush of air volume during speed changes. It also has internal over current protection for the fan motor.

INDOOR FAN MOTOR

The indoor fan motors used with the VFD are specially manufactured for use with VFD power circuits. The motor winding insulation is specially formulated to resist breakdown due to voltage stress issues. The motor shaft includes grounding rings to prevent damage to bearings caused by grounding currents. Replace these motors with Factory Authorized Parts available from Replacement Components Division (RCD).

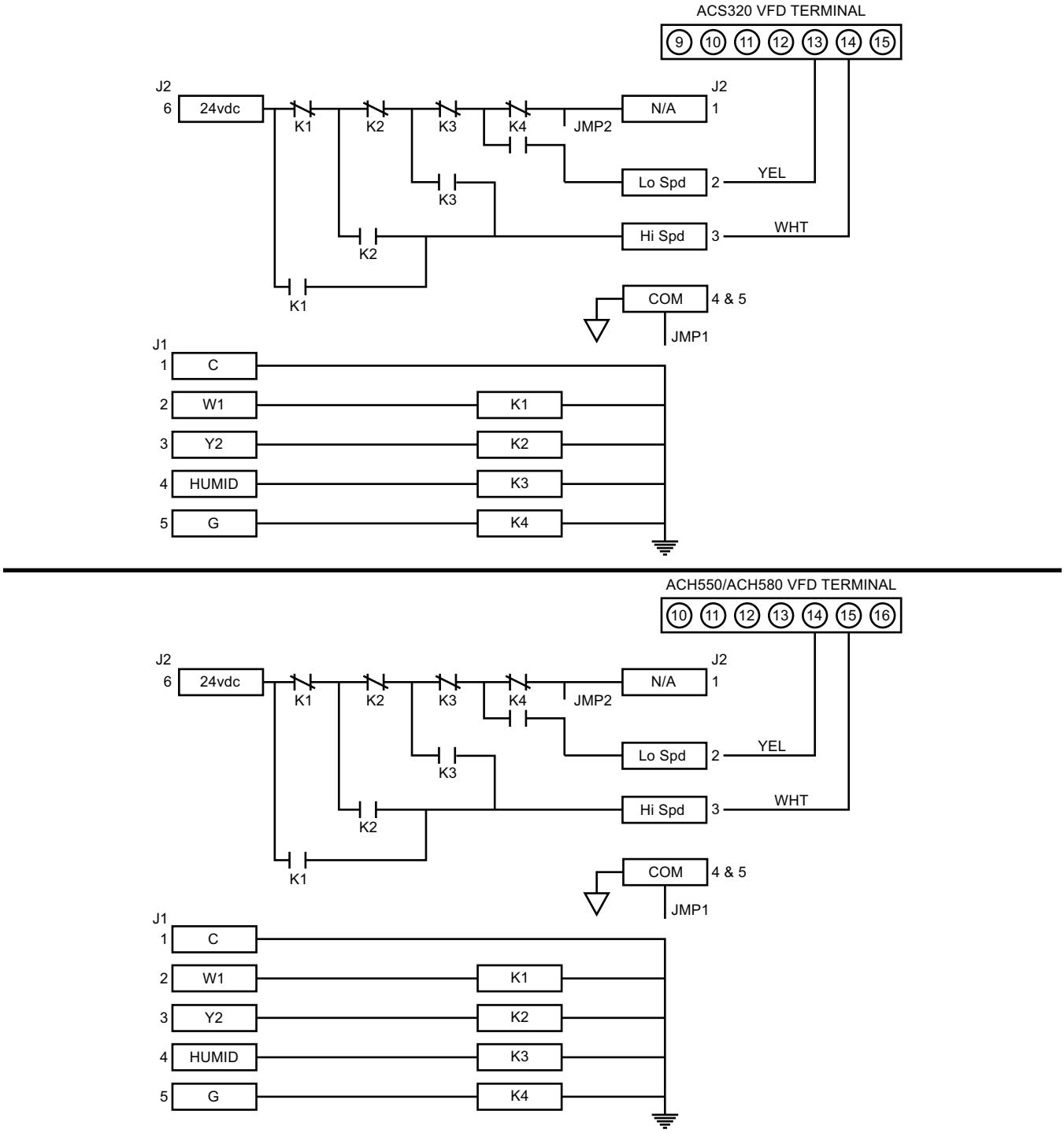


Fig. 74 — Connection Schematic - Fan Speed Relay Board and VFD

Table 34 — ACS320 VFD Terminal Designations

TERMINAL	FUNCTION
U1 V1 W1	Three-Phase main circuit input power supply
U2 V2 W2	Three-Phase AC output to motor, 0V to maximum input voltage level
10 (GND) 12 (COMMON)	Factory-supplied jumper
9 (24 VDC) 11 (DI-1)	Run (factory-supplied jumper)
9 (24 VDC) 15 (DI-4)	Start Enable 1 (factory-supplied jumper). When opened, the drive goes to emergency stop
13 (DI-2) 14 (DI-3)	Factory wired for 24 Vdc input from Fan Speed Board

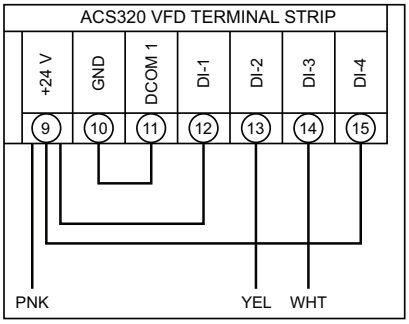


Fig. 75 — ACS320 VFD Wiring

Table 35 — ACH550/ACH580 VFD Terminal Designations

TERMINAL	FUNCTION
U1 V1 W1	Three-Phase main circuit input power supply
U2 V2 W2	Three-Phase AC output to motor, 0V to maximum input voltage level
11 (GND) 12 (COMMON)	Factory-supplied jumper
10 (24 VDC) 13 (DI-1)	Run (factory-supplied jumper)
10 (24 VDC) 16 (DI-4)	Start Enable 1 (factory-supplied jumper). When opened, the drive goes to emergency stop
14 (DI-2) 15 (DI-3)	Factory wired for 24 Vdc input from Fan Speed Board

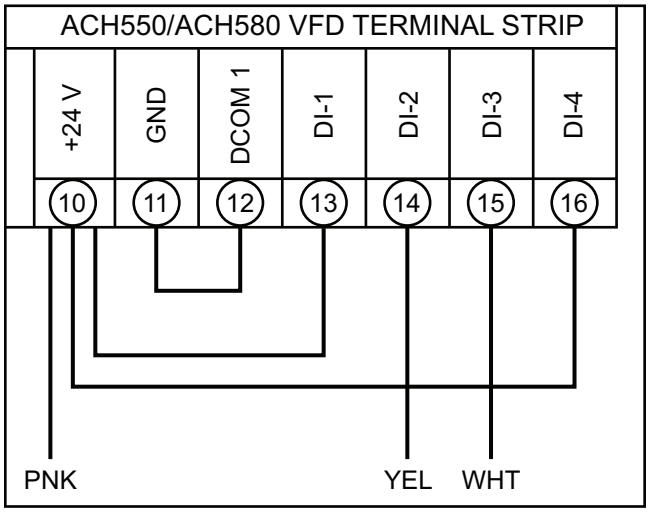


Fig. 76 — ACH550/ACH580 VFD Wiring

FASTENER TORQUE VALUES

See Table 36 for torque values.

Table 36 — 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

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	0	6	A	0	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
L = Low NOx – Low Gas Heat
M = Low NOx – Medium Gas Heat
N = Low NOx – High Gas Heat
S = Low Heat w/ Stainless Steel Exchanger
R = Medium Heat w/ Stainless Steel Exchanger
T = High Heat w/ Stainless Steel Exchanger
(Low NOx models include – Stainless Steel HX)

Refrig. Systems Options
0 = Two stage cooling capacity
A = Two stage cooling capacity with Humidi-MiZer® System

Cooling Tons
04 – 3 ton
05 – 4 ton
06 – 5 ton

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

Indoor Fan Options
0 = Standard Electrical (Direct) Drive x13 ECM Motor
2 = Medium Static Belt Drive with VFD controller
3 = High Static Belt Drive with VFD controller

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

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

Design Revision
– = Factory Design Revision

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

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

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

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

Packaging
0 = Standard
1 = LTL

APPENDIX B — PHYSICAL DATA

Table A — 48LC**04-06 Physical Data (3 to 5 Tons)

		48LC*004	48LC*A04	48LC*005	48LC*A05	48LC*006	48LC*A06
REFRIGERATION SYSTEM							
	# Circuits / # Comp. / Type	1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll	1 / 1 / Scroll
	R-410A charge A/B (lb - oz)	9 - 2	—	9 - 0	—	11 - 0	—
	Humidi-MiZer R-410A charge A/B (lb - oz)	—	11 - 8	—	15 - 10	—	16 - 5
	oil A/B (oz)	25	25	42	42	42	42
	Metering device	TXV	TXV	TXV	TXV	TXV	TXV
	High-press. Trip / Reset (psig)	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505	630 / 505
	Low-press. Trip / Reset (psig)	27 / 44	27 / 44	27 / 44	27 / 44	27 / 44	27 / 44
EVAP. COIL							
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil type	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF
	Rows / FPI	3 / 15	3 / 15	3 / 15	3 / 15	4 / 15	4 / 15
	Total face area (ft^2)	5.5	5.5	7.3	7.3	7.3	7.3
	Condensate drain conn. size	3/4 in.	3/4 in.	3/4 in.	3/4 in.	3/4 in.	3/4 n.
HUMIDI-MIZER COIL							
	Material	—	Cu/Al	—	Cu/Al	—	Cu/Al
	Coil type	—	3/8 in. RTPF	—	3/8 in. RTPF	—	3/8 in. RTPF
	Rows / FPI	—	1 / 17	—	2/17	—	2/17
	Total face area (ft^2)	—	3.9	—	5.2	—	5.2
EVAP. FAN AND MOTOR							
Standard Static 3 phase	Motor qty / Drive type	1 / Direct	1 / Direct	1 / Direct	1 / Direct	1 / Direct	1 / Direct
	Max BHP	1	1	1	1	1	1
	Rpm range	600-1200	600-1200	600-1200	600-1200	600-1200	600-1200
	Motor frame size	48	48	48	48	48	48
	Fan qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan diameter (in.)	10 x 10	10 x 10	10 x 10	10 x 10	11 x 10	11 x 10
Medium Static 3 phase	Motor qty / Drive type	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	1.7	1.7	1.7	1.7	2.4	2.4
	Rpm range	770-1175	770-1175	920-1303	920-1303	1035-1466	1035-1466
	Motor frame size	56	56	56	56	56	56
	Fan qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan diameter (in.)	10 x 10	10 x 10	10 x 10	10 x 10	10 x 10	10 x 10
High Static 3 phase	Motor qty / Drive type	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt	1 / Belt
	Max BHP	2.4	2.4	2.9	2.9	2.9	2.9
	Rpm range	1035-1466	1035-1466	1208-1550	1208-1550	1303-1550	1303-1550
	Motor frame size	56	56	56	56	56	56
	Fan qty / Type	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal	1 / Centrifugal
	Fan diameter (in.)	10 x 10	10 x 10	10 x 10	10 x 10	10 x 10	10 x 10
CONDENSER COIL							
	Material	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al	Cu / Al
	Coil type	7mm RTPF	7mm RTPF	7mm RTPF	7mm RTPF	7mm RTPF	7mm RTPF
	Rows / FPI	2 / 20	2 / 20	2 / 20	2 / 20	2 / 20	2 / 20
	Total face area (ft^2)	16.4	16.4	21.4	21.4	21.4	21.4
CONDENSER FAN/MOTOR							
	Qty / Motor drive type	1 / direct	1 / direct	1 / direct	1 / direct	1 / direct	1 / direct
	Motor HP / Rpm	1/3 / 1001	1/3 / 1001	1/3 / 1082	1/3 / 1001	1/3 / 1082	1/3 / 1082
	Fan diameter (in.)	22	22	22	22	22	22
FILTERS							
	RA filter # / Size (in.)	2 / 16 x 25 x 2	2 / 16 x 25 x 2	4 / 16 x 16 x 2	4 / 16 x 16 x 2	4 / 16 x 16 x 2	4 / 16 x 16 x 2
	OA inlet screen # / Size (in.)	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1	1 / 20 x 24 x 1

APPENDIX C — FAN DATA

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 the product specifications book.
6. For more information on the performance limits of Carrier motors, see the application data section of the product specifications 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 B — 48LC**04 Direct Drive (Horizontal)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	750	0.39	0.19
	900	0.18	0.14
	1050	—	—
	1125	—	—
	1200	—	—
	1275	—	—
	1350	—	—
	1425	—	—
	1500	—	—
2	750	0.69	0.26
	900	0.45	0.23
	1050	0.22	0.20
	1125	0.12	0.19
	1200	0.05	0.17
	1275	—	—
	1350	—	—
	1425	—	—
	1500	—	—
3	750	1.28	0.44
	900	1.11	0.46
	1050	0.88	0.45
	1125	0.75	0.44
	1200	0.63	0.44
	1275	0.50	0.44
	1350	0.38	0.41
	1425	0.25	0.39
	1500	0.13	0.38
4	750	1.30	0.45
	900	1.17	0.48
	1050	1.04	0.52
	1125	0.97	0.54
	1200	0.91	0.56
	1275	0.84	0.58
	1350	0.76	0.60
	1425	0.68	0.61
	1500	0.60	0.62
5	750	1.31	0.45
	900	1.18	0.48
	1050	1.05	0.52
	1125	0.99	0.54
	1200	0.92	0.56
	1275	0.86	0.59
	1350	0.80	0.61
	1425	0.74	0.64
	1500	0.68	0.66

To convert BHP to watts, use 84% motor efficiency.

Table C — 48LC**04 Direct Drive (Vertical)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	750	0.27	0.15
	900	0.07	0.11
	1050	—	—
	1125	—	—
	1200	—	—
	1275	—	—
	1350	—	—
	1425	—	—
	1500	—	—
2	750	0.54	0.21
	900	0.29	0.18
	1050	0.06	0.16
	1125	—	—
	1200	—	—
	1275	—	—
	1350	—	—
	1425	—	—
	1500	—	—
3	750	1.15	0.42
	900	0.96	0.43
	1050	0.70	0.40
	1125	0.55	0.40
	1200	0.41	0.39
	1275	0.27	0.39
	1350	—	—
	1425	—	—
	1500	—	—
4	750	1.19	0.43
	900	1.06	0.46
	1050	0.91	0.50
	1125	0.83	0.53
	1200	0.75	0.55
	1275	0.66	0.56
	1350	0.56	0.57
	1425	—	—
	1500	—	—
5	750	1.21	0.42
	900	1.07	0.46
	1050	0.93	0.50
	1125	0.86	0.52
	1200	0.79	0.55
	1275	0.71	0.57
	1350	0.63	0.59
	1425	0.56	0.62
	1500	0.47	0.64

To convert BHP to watts, use 84% motor efficiency.

Table D — 48LC**05 Direct Drive (Horizontal)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	1000	0.12	0.14
	1200	0.00	0.21
	1400	—	—
	1500	—	—
	1600	—	—
	1700	—	—
	1800	—	—
	1900	—	—
	2000	—	—
2	1000	0.89	0.43
	1200	0.60	0.40
	1400	0.30	0.36
	1500	0.16	0.34
	1600	0.02	0.32
	1700	—	—
	1800	—	—
	1900	—	—
	2000	—	—
3	1000	1.14	0.52
	1200	0.96	0.59
	1400	0.70	0.65
	1500	0.54	0.64
	1600	0.37	0.61
	1700	0.18	0.61
	1800	—	—
	1900	—	—
	2000	—	—
4	1000	1.15	0.52
	1200	1.01	0.59
	1400	0.86	0.65
	1500	0.79	0.69
	1600	0.72	0.72
	1700	0.64	0.75
	1800	0.56	0.79
	1900	0.47	0.82
	2000	0.37	0.84
5	1000	1.15	0.53
	1200	1.02	0.60
	1400	0.88	0.67
	1500	0.81	0.70
	1600	0.74	0.74
	1700	0.67	0.78
	1800	0.59	0.82
	1900	0.51	0.86
	2000	0.42	0.92

To convert BHP to watts, use 84% motor efficiency.

Table E — 48LC**05 Direct Drive (Vertical)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	1000	0.08	0.11
	1200	—	—
	1400	—	—
	1500	—	—
	1600	—	—
	1700	—	—
	1800	—	—
	1900	—	—
	2000	—	—
2	1000	0.79	0.37
	1200	0.49	0.34
	1400	0.20	0.31
	1500	0.05	0.29
	1600	—	—
	1700	—	—
	1800	—	—
	1900	—	—
	2000	—	—
3	1000	1.11	0.50
	1200	0.90	0.57
	1400	0.59	0.62
	1500	0.40	0.59
	1600	0.20	0.52
	1700	—	—
	1800	—	—
	1900	—	—
	2000	—	—
4	1000	1.12	0.50
	1200	0.95	0.57
	1400	0.79	0.63
	1500	0.70	0.67
	1600	0.61	0.70
	1700	0.52	0.73
	1800	0.41	0.75
	1900	0.30	0.77
	2000	—	—
5	1000	1.13	0.51
	1200	0.97	0.58
	1400	0.81	0.65
	1500	0.73	0.68
	1600	0.64	0.72
	1700	0.55	0.75
	1800	0.46	0.79
	1900	0.35	0.82
	2000	0.25	0.89

To convert BHP to watts, use 84% motor efficiency.

Table F — 48LC**06 Direct Drive (Horizontal)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	1250	0.04	0.18
	1500	—	—
	1750	—	—
	1875	—	—
	2000	—	—
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
2	1250	0.99	0.63
	1500	0.55	0.58
	1750	0.14	0.53
	1875	0.01	0.49
	2000	—	—
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
3	1250	1.24	0.76
	1500	0.88	0.77
	1750	0.44	0.73
	1875	0.24	0.70
	2000	0.07	0.66
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
4	1250	1.33	0.81
	1500	1.07	0.89
	1750	0.74	0.93
	1875	0.56	0.88
	2000	0.36	0.91
	2125	0.15	0.88
	2250	—	—
	2375	—	—
	2500	—	—
5	1250	1.35	0.82
	1500	1.12	0.92
	1750	0.86	1.00
	1875	0.72	1.04
	2000	0.56	1.08
	2125	0.39	0.95
	2250	0.19	1.09
	2375	—	—
	2500	—	—

To convert BHP to watts, use 84% motor efficiency.

Table G — 48LC**06 Direct Drive (Vertical)

SPEED (TORQUE) TAP	CFM	ESP	BHP
1	1250	0.03	0.16
	1500	—	—
	1750	—	—
	1875	—	—
	2000	—	—
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
2	1250	0.89	0.57
	1500	0.41	0.53
	1750	0.03	0.49
	1875	—	—
	2000	—	—
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
3	1250	1.15	0.72
	1500	0.74	0.72
	1750	0.30	0.68
	1875	0.10	0.65
	2000	—	—
	2125	—	—
	2250	—	—
	2375	—	—
	2500	—	—
4	1250	1.20	0.76
	1500	0.94	0.83
	1750	0.59	0.87
	1875	0.40	0.82
	2000	0.20	0.83
	2125	0.01	0.80
	2250	—	—
	2375	—	—
	2500	—	—
5	1250	1.28	0.78
	1500	1.00	0.87
	1750	0.71	0.95
	1875	0.57	0.98
	2000	0.41	1.01
	2125	0.25	0.88
	2250	0.06	1.01
	2375	—	—
	2500	—	—

To convert BHP to watts, use 84% motor efficiency.

APPENDIX C — FAN DATA (cont)

Table H — 48LC**04 Horizontal Supply (3 tons)

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
900	**582**	**0.14**	**715**	**0.24**	825	0.35	921	0.48	1007	0.63
975	**606**	**0.16**	**735**	**0.26**	843	0.38	938	0.51	1023	0.66
1050	**630**	**0.18**	**756**	**0.29**	862	0.41	955	0.55	1040	0.70
1125	**655**	**0.21**	778	0.32	882	0.45	974	0.58	1057	0.74
1200	**681**	**0.24**	800	0.35	902	0.48	992	0.63	1074	0.78
1275	**708**	**0.27**	823	0.39	923	0.53	1012	0.67	1093	0.83
1350	**735**	**0.31**	847	0.43	945	0.57	1032	0.72	1112	0.88
1425	**762**	**0.35**	871	0.48	967	0.62	1053	0.77	1131	0.94
1500	790	0.40	896	0.53	990	0.67	1074	0.83	1151	1.00

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
900	1086	0.79	1159	0.96	1228	1.14	1293	1.33	1354	1.53
975	1101	0.82	1174	0.99	1242	1.18	1306	1.37	1367	1.57
1050	1117	0.86	1189	1.03	1256	1.22	1320	1.41	1381	1.62
1125	1133	0.90	1204	1.08	1271	1.26	1335	1.46	1395	1.67
1200	1150	0.95	1221	1.13	1287	1.31	1350	1.51	1410	1.72
1275	1168	1.00	1237	1.18	1303	1.37	1365	1.57	1425	1.78
1350	1186	1.05	1255	1.24	1320	1.43	1382	1.63	1441	1.84
1425	1204	1.11	1272	1.30	1337	1.49	1398	1.70	1457	1.91
1500	1223	1.18	1291	1.36	1355	1.56	1415	1.77	**1473**	**1.99**

Medium static: 770-1175 rpm, 1.7 max BHP
High static: 1035-1466 rpm, 2.4 max BHP

Boldface indicates field-supplied drive is required.

Table I — 48LC**04 Vertical Supply (3 tons)

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
900	**592**	**0.14**	**721**	**0.25**	826	0.38	916	0.53	997	0.69
975	**616**	**0.17**	**744**	**0.28**	847	0.41	936	0.56	1016	0.72
1050	**641**	**0.19**	**766**	**0.30**	868	0.44	957	0.59	1036	0.76
1125	**667**	**0.22**	790	0.33	890	0.47	978	0.63	1056	0.80
1200	**693**	**0.25**	813	0.37	913	0.51	999	0.67	1077	0.84
1275	**720**	**0.29**	837	0.41	935	0.55	1021	0.71	1098	0.88
1350	**747**	**0.33**	862	0.45	958	0.60	1043	0.76	1119	0.94
1425	775	0.37	887	0.50	982	0.65	1066	0.81	1141	0.99
1500	802	0.42	912	0.55	1006	0.70	1088	0.87	1163	1.05

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
900	1070	0.88	1137	1.07	1201	1.29	1260	1.51	1317	1.75
975	1089	0.91	1156	1.11	1219	1.32	1279	1.54	1335	1.78
1050	1108	0.94	1175	1.14	1238	1.36	1297	1.58	1353	1.82
1125	1128	0.98	1195	1.18	1257	1.40	1316	1.62	1372	1.86
1200	1148	1.03	1214	1.23	1276	1.44	1335	1.67	1391	1.91
1275	1169	1.07	1235	1.28	1296	1.50	1354	1.72	1410	1.97
1350	1190	1.13	1255	1.33	1316	1.55	1374	1.78	1429	2.03
1425	1211	1.19	1276	1.39	1337	1.61	1394	1.85	1449	2.09
1500	1232	1.25	1297	1.46	1357	1.68	1415	1.91	**1469**	**2.16**

Medium static: 770-1175 rpm, 1.7 max BHP
High static: 1035-1466 rpm, 2.4 max BHP

Boldface indicates field-supplied drive is required.

APPENDIX C — FAN DATA (cont)

Table J — 48LC**05 Horizontal Supply (4 tons)

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
1200	**681**	**0.24**	**800**	**0.35**	**902**	**0.48**	992	0.63	1074	0.78
1300	**717**	**0.29**	**831**	**0.41**	930	0.54	1019	0.69	1099	0.85
1400	**753**	**0.34**	**863**	**0.46**	959	0.60	1046	0.75	1125	0.92
1500	**790**	**0.40**	**896**	**0.53**	990	0.67	1074	0.83	1151	1.00
1600	**828**	**0.46**	930	0.60	1021	0.75	1103	0.91	1179	1.09
1700	**866**	**0.54**	964	0.68	1053	0.84	1133	1.01	1207	1.18
1800	**905**	**0.62**	1000	0.77	1085	0.94	1164	1.11	1236	1.29
1900	944	0.71	1036	0.87	1119	1.04	1195	1.22	1266	1.41
2000	984	0.82	1072	0.98	1153	1.15	1227	1.34	1297	1.53

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
1200	1150	0.95	1221	1.13	1287	1.31	1350	1.51	1410	1.72
1300	1173	1.02	1243	1.20	1309	1.39	1371	1.59	1430	1.80
1400	1198	1.09	1266	1.28	1331	1.47	1393	1.68	1451	1.89
1500	1223	1.18	1291	1.36	1355	1.56	1415	1.77	1473	1.99
1600	1249	1.27	1316	1.46	1379	1.66	1439	1.87	1496	2.09
1700	1277	1.37	1342	1.57	1404	1.77	1463	1.99	1520	2.21
1800	1305	1.48	1369	1.68	1430	1.89	1489	2.11	1545	2.34
1900	1333	1.60	1397	1.81	1457	2.02	1514	2.25	—	—
2000	1363	1.73	1425	1.94	1484	2.16	1541	2.39	—	—

Medium static: 920-1303 rpm, 1.7 max BHP
High static: 1208-1550 rpm, 2.9 max BHP

Boldface indicates field-supplied drive is required.

Table K — 48LC**05 Vertical Supply (4 tons)

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
1200	**693**	**0.25**	**813**	**0.37**	**913**	**0.51**	999	0.67	1077	0.84
1300	**729**	**0.30**	**846**	**0.42**	943	0.57	1028	0.73	1105	0.90
1400	**765**	**0.35**	**879**	**0.48**	974	0.63	1058	0.79	1134	0.97
1500	**802**	**0.42**	**912**	**0.55**	1006	0.70	1088	0.87	1163	1.05
1600	**840**	**0.49**	947	0.63	1038	0.78	1119	0.95	1193	1.14
1700	**878**	**0.57**	982	0.71	1071	0.87	1151	1.05	1224	1.24
1800	**917**	**0.65**	1017	0.81	1105	0.97	1183	1.15	1255	1.35
1900	956	0.75	1053	0.91	1139	1.08	1216	1.27	1287	1.47
2000	995	0.86	1090	1.02	1173	1.20	1249	1.39	1319	1.59

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
1200	1148	1.03	1214	1.23	1276	1.44	1335	1.67	1391	1.91
1300	1176	1.09	1241	1.30	1303	1.51	1361	1.74	1416	1.98
1400	1204	1.17	1269	1.37	1330	1.59	1388	1.82	1442	2.07
1500	1232	1.25	1297	1.46	1357	1.68	1415	1.91	1469	2.16
1600	1262	1.34	1325	1.55	1385	1.78	1442	2.01	1496	2.26
1700	1291	1.44	1354	1.66	1414	1.89	1470	2.12	1524	2.37
1800	1322	1.55	1384	1.77	1443	2.00	1499	2.25	—	—
1900	1352	1.68	1414	1.90	1472	2.13	1528	2.38	—	—
2000	1384	1.81	1445	2.04	1502	2.27	—	—	—	—

Medium static: 920-1303 rpm, 1.7 max BHP
High static: 1208-1550 rpm, 2.9 max BHP

Boldface indicates field-supplied drive is required.

APPENDIX C — FAN DATA (cont)

Table L — 48LC**06 Horizontal Supply (5 tons)

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
1500	**798**	**0.41**	**906**	**0.55**	**1002**	**0.71**	1088	0.87	1167	1.05
1625	**845**	**0.50**	**949**	**0.65**	1041	0.81	1125	0.98	1202	1.17
1750	**893**	**0.60**	**993**	**0.76**	1081	0.93	1163	1.11	1238	1.30
1875	**942**	**0.71**	1037	0.88	1123	1.06	1202	1.25	1275	1.44
2000	**992**	**0.84**	1083	1.02	1166	1.21	1242	1.40	1313	1.61
2125	1043	0.98	1129	1.17	1209	1.37	1283	1.57	1353	1.79
2250	1093	1.14	1177	1.34	1254	1.55	1325	1.76	1393	1.98
2375	1145	1.32	1225	1.53	1299	1.74	1369	1.97	1434	2.20
2500	1196	1.51	1273	1.73	1345	1.96	1413	2.19	1477	2.43

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
1500	1241	1.23	1310	1.42	1375	1.63	1438	1.84	1497	2.06
1625	1274	1.36	1342	1.56	1406	1.77	1467	1.98	1526	2.21
1750	1308	1.50	1375	1.70	1438	1.92	1498	2.14	—	—
1875	1344	1.65	1409	1.86	1471	2.09	1530	2.32	—	—
2000	1380	1.82	1444	2.04	1505	2.27	—	—	—	—
2125	1418	2.01	1481	2.24	1540	2.47	—	—	—	—
2250	1457	2.21	1518	2.45	—	—	—	—	—	—
2375	1497	2.43	—	—	—	—	—	—	—	—
2500	1538	2.68	—	—	—	—	—	—	—	—

Medium static: 1035-1466 rpm, 2.4 max BHP
High static: 1303-1550 rpm, 2.9 max BHP

Boldface indicates field-supplied drive is required.

Table M — 48LC**06 Vertical Supply (5 tons)

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
1500	**847**	**0.41**	**966**	**0.55**	1067	0.68	1158	0.81	1240	0.93
1625	**896**	**0.50**	**1010**	**0.65**	1109	0.79	1198	0.93	1278	1.07
1750	**947**	**0.59**	1056	0.76	1152	0.92	1238	1.07	1318	1.22
1875	**998**	**0.70**	1103	0.88	1196	1.05	1280	1.22	1358	1.38
2000	1049	0.82	1151	1.02	1241	1.20	1323	1.38	1399	1.56
2125	1102	0.96	1199	1.17	1287	1.37	1367	1.56	1441	1.75
2250	1154	1.11	1248	1.33	1333	1.55	1411	1.75	1484	1.96
2375	1208	1.28	1298	1.52	1381	1.74	1457	1.96	1528	2.18
2500	1261	1.47	1349	1.72	1429	1.96	1503	2.19	—	—

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
1500	1316	1.05	1387	1.17	1454	1.28	1517	1.39	—	—
1625	1353	1.20	1423	1.33	1489	1.46	—	—	—	—
1750	1391	1.36	1460	1.51	1525	1.65	—	—	—	—
1875	1430	1.54	1498	1.70	—	—	—	—	—	—
2000	1470	1.73	1537	1.90	—	—	—	—	—	—
2125	1511	1.93	—	—	—	—	—	—	—	—
2250	—	—	—	—	—	—	—	—	—	—
2375	—	—	—	—	—	—	—	—	—	—
2500	—	—	—	—	—	—	—	—	—	—

Medium static: 1035-1466 rpm, 2.4 max BHP
High static: 1303-1550 rpm, 2.9 max BHP

Boldface indicates field-supplied drive is required.

APPENDIX C — FAN DATA

Table N — PULLEY ADJUSTMENT

UNIT		MOTOR/DRIVE COMBO	MOTOR PULLEY TURNS OPEN										
			0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
04	3 phase	Standard Static[a]	—	—	—	—	—	—	—	—	—	—	—
		Medium Static	1175	1135	1094	1054	1013	973	932	892	851	811	770
		High Static	1466	1423	1380	1337	1294	1251	1207	1164	1121	1078	1035
05	3 phase	Standard Static[a]	—	—	—	—	—	—	—	—	—	—	—
		Medium Static	1303	1265	1226	1188	1150	1112	1073	1035	997	958	920
		High Static	1550	1516	1482	1447	1413	1379	1345	1311	1276	1242	1208
06	3 phase	Standard Static[a]	—	—	—	—	—	—	—	—	—	—	—
		Medium Static	1466	1423	1380	1337	1294	1251	1207	1164	1121	1078	1035
		High Static	1550	1525	1501	1476	1451	1427	1402	1377	1352	1328	1303

NOTE(S):

a. Standard static uses direct drive motor.

Factory setting

APPENDIX D — WIRING DIAGRAMS

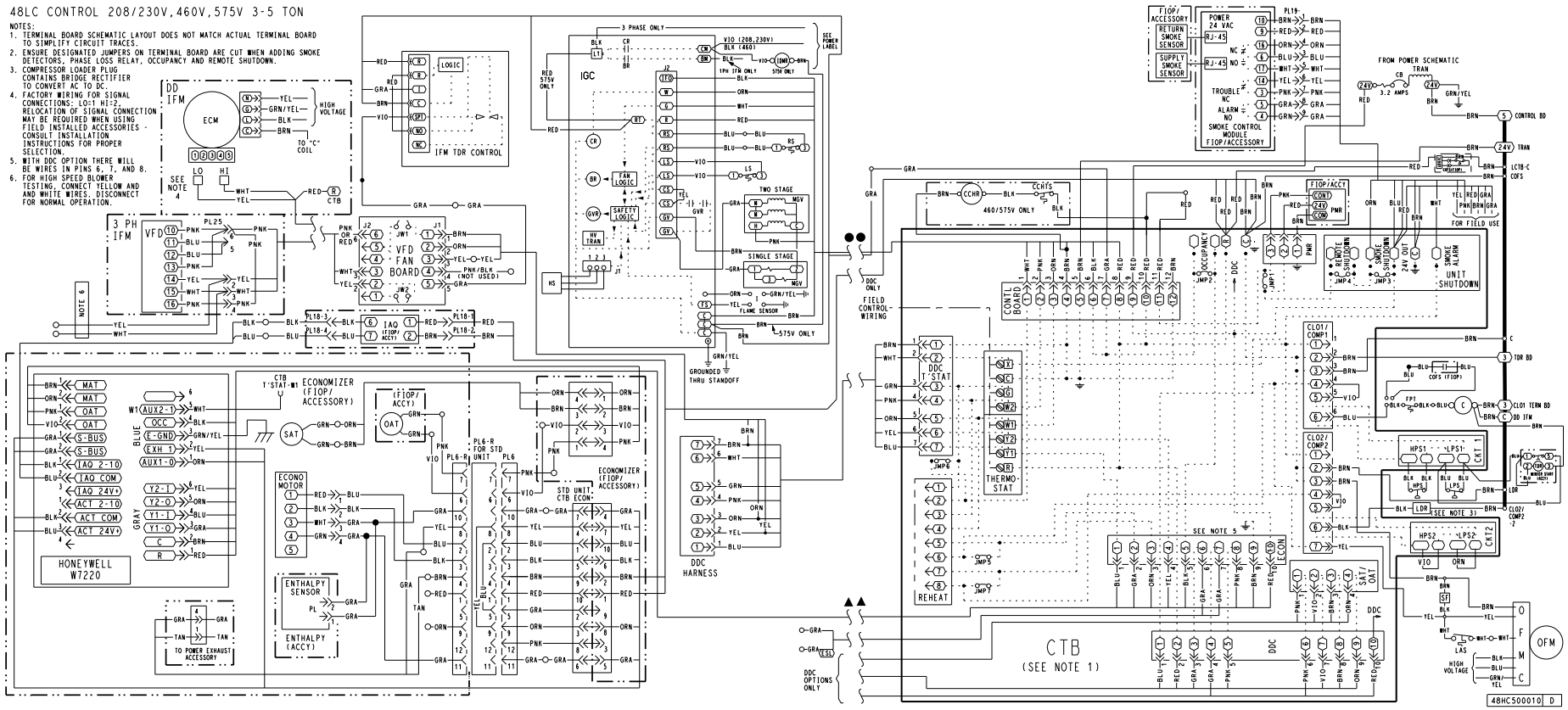


Fig. A — 48LC04-06 Control Wiring Diagram**

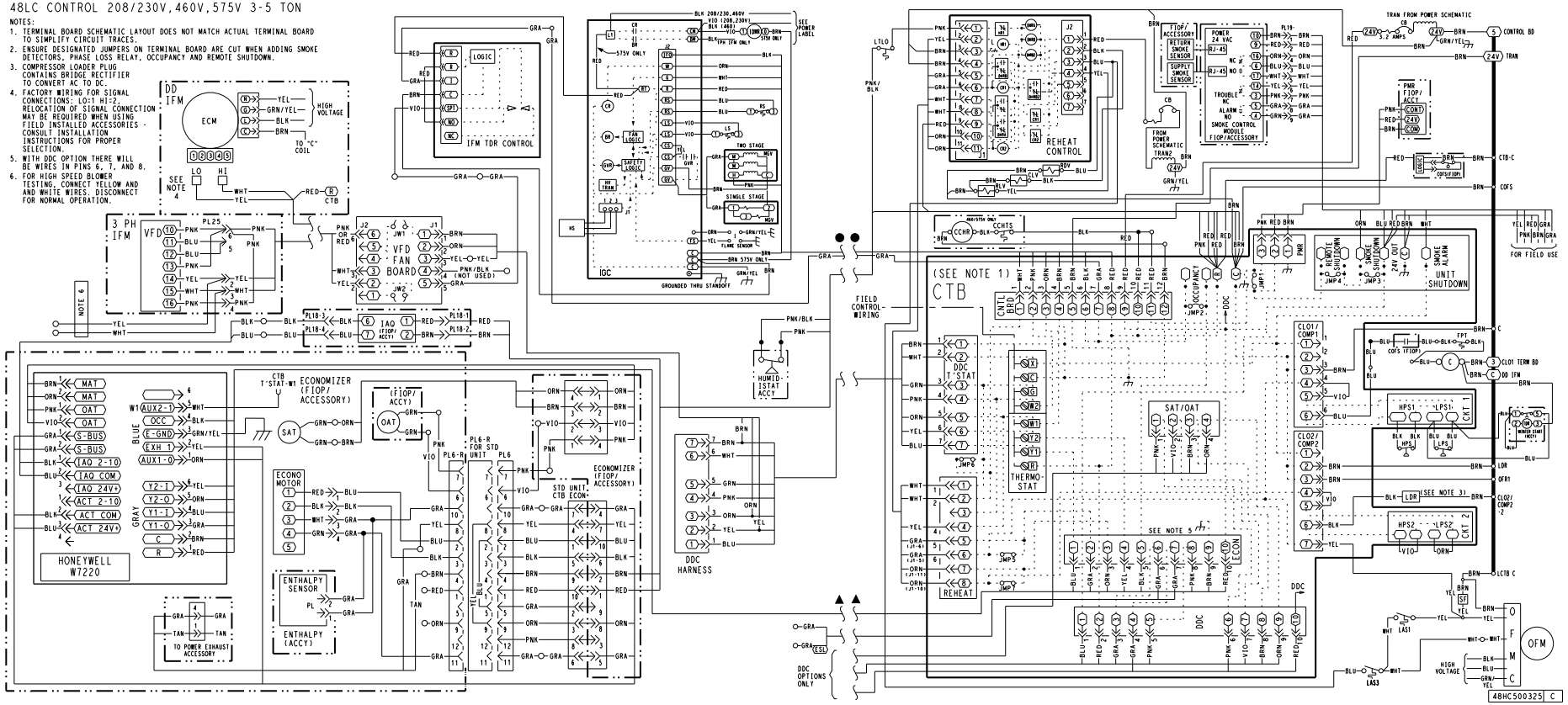
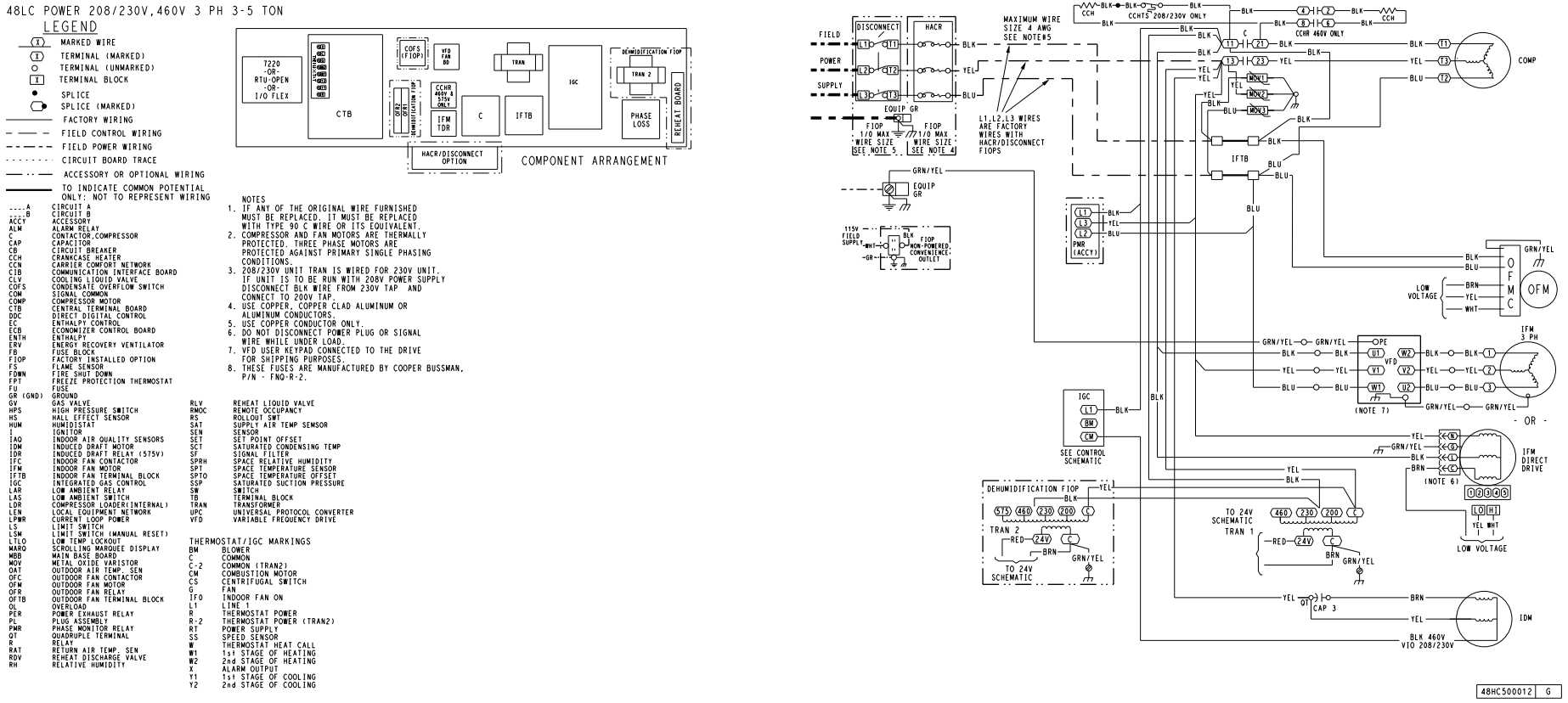


Fig. B — 48LC04-06 Control Wiring Diagram with Humidi-MiZer® System**



----A	CIRCUIT A	RLV	REHEAT LIQUID VALVE
----B	CIRCUIT B	RMOC	REMOTE OCCUPANCY
ACCY	ACCESSORY	RS	ROLLOUT SWT
ALM	ALARM RELAY	SAT	SUPPLY AIR TEMP SENSOR
C	CONTACTOR,COMPRESSOR	SEN	SENSOR
CAP	CAPACITOR	SET	SET POINT OFFSET
CB	CIRCUIT BREAKER	SCT	SATURATED CONDENSING TEMP
CCH	CRANKCASE HEATER	SF	SIGNAL FILTER
CCN	CARRIER COMFORT NETWORK	SPRH	SPACE RELATIVE HUMIDITY
CIB	COMMUNICATION INTERFACE BOARD	SPT	SPACE TEMPERATURE SENSOR
CLV	COOLING LIQUID VALVE	SPTO	SPACE TEMPERATURE OFFSET
COFS	CONDENSATE OVERFLOW SWITCH	SSP	SATURATED SUCTION PRESSURE
COM	SIGNAL COMMON	SW	SWITCH
COMP	COMPRESSOR MOTOR	TB	TERMINAL BLOCK
CTB	CENTRAL TERMINAL BOARD	TRAN	TRANSFORMER
DDC	DIRECT DIGITAL CONTROL	UPC	UNIVERSAL PROTOCOL CONVERTER
EC	ENTHALPY CONTROL	VFD	VARIABLE FREQUENCY DRIVE
ECB	ECONOMIZER CONTROL BOARD		
ENTH	ENTHALPY		
ERV	ENERGY RECOVERY VENTILATOR		
FB	FUSE BLOCK		
FIOP	FACTORY INSTALLED OPTION		
FS	FLAME SENSOR		
FDWN	FIRE SHUT DOWN		
FPT	FREEZE PROTECTION THERMOSTAT		
FU	FUSE		
GR (GND)	GROUND		
GV	GAS VALVE		
HPS	HIGH PRESSURE SWITCH		
HS	HALL EFFECT SENSOR		
HUM	HUMIDISTAT		
I	IGNITOR		
IAQ	INDOOR AIR QUALITY SENSORS		
IDM	INDUCED DRAFT MOTOR		
IDR	INDUCED DRAFT RELAY (575V)		
IFC	INDOOR FAN CONTACTOR		
IFM	INDOOR FAN MOTOR		
IFTB	INDOOR FAN TERMINAL BLOCK		
IGC	INTEGRATED GAS CONTROL		
LAR	LOW AMBIENT RELAY		
LAS	LOW AMBIENT SWITCH		
LDR	COMPRESSOR LOADER(INTERNAL)		
LEN	LOCAL EQUIPMENT NETWORK		
LPWR	CURRENT LOOP POWER		
LS	LIMIT SWITCH		
LSW	LIMIT SWITCH (MANUAL RESET)		
LTLO	LOW TEMP LOCKOUT		
MARQ	SCROLLING MARQUEE DISPLAY		
MBB	MAIN BASE BOARD		
MOV	METAL OXIDE VARISTOR		
OAT	OUTDOOR AIR TEMP. SEN		
OFC	OUTDOOR FAN CONTACTOR		
OFM	OUTDOOR FAN MOTOR		
OFR	OUTDOOR FAN RELAY		
OFTB	OUTDOOR FAN TERMINAL BLOCK		
OL	OVERLOAD		
PER	POWER EXHAUST RELAY		
PL	PLUG ASSEMBLY		
PWR	PHASE MONITOR RELAY		
QT	QUADRUPLE TERMINAL		
R	RELAY		
RAT	RETURN AIR TEMP. SEN		
RDV	REHEAT DISCHARGE VALVE		
RH	RELATIVE HUMIDITY		

BM	BLOWER
C	COMMON
C-2	COMMON (TRAN2)
CM	COMBUSTION MOTOR
CS	CENTRIFUGAL SWITCH
G	FAN
IFO	INDOOR FAN ON
L1	LINE 1
R	THERMOSTAT POWER
R-2	THERMOSTAT POWER (TRAN2)
RT	POWER SUPPLY
SS	SPEED SENSOR
W	THERMOSTAT HEAT CALL
W1	1st STAGE OF HEATING
W2	2nd STAGE OF HEATING
X	ALARM OUTPUT
Y1	1st STAGE OF COOLING
Y2	2nd STAGE OF COOLING

Fig. C — 48LC04-06 Power Wiring Diagram (208/230-3-60, 460-3-60)**

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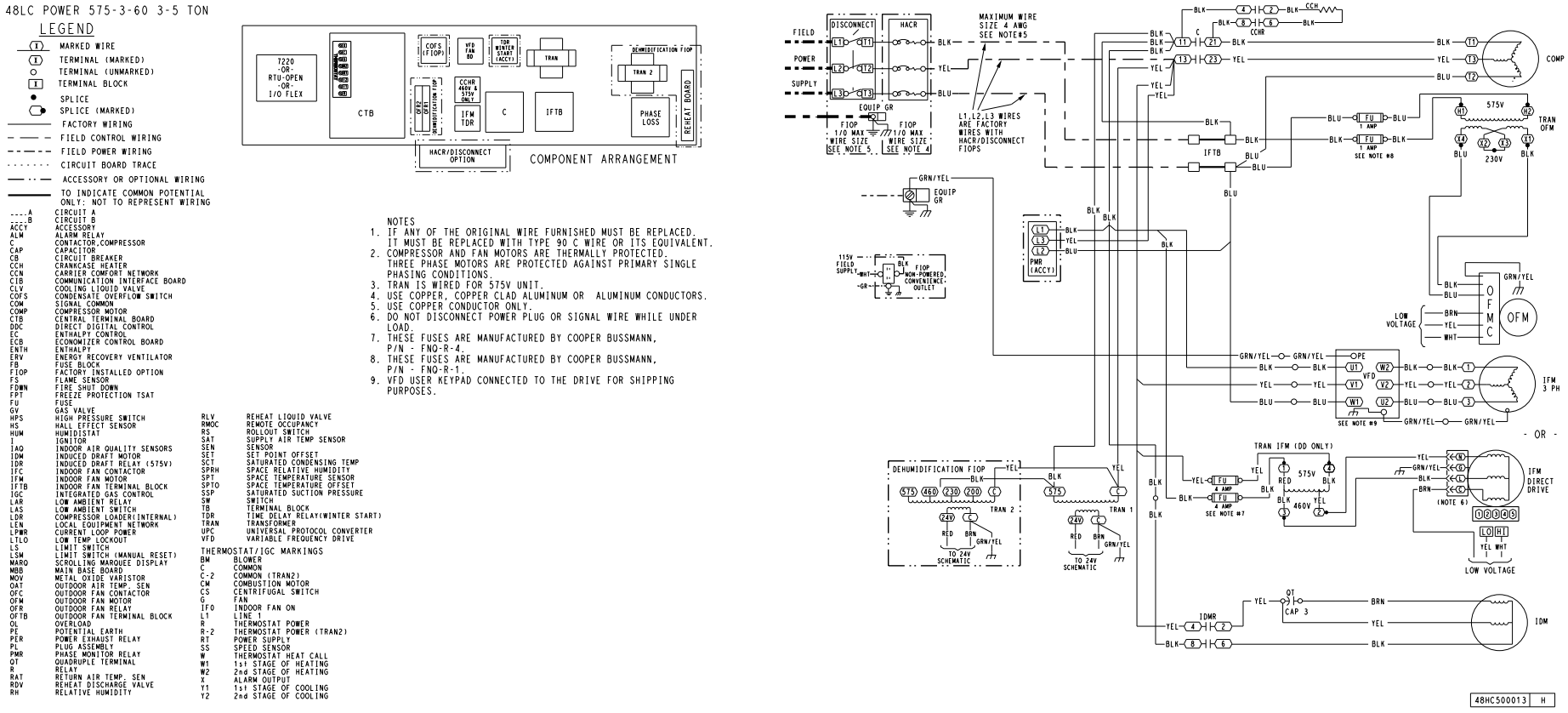

Fig. D — 48LC**04-06 Power Wiring Diagram (575-3-60)

START-UP CHECKLIST FOR 48LC SINGLE PACKAGE ROOFTOP COOLING ONLY (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 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 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® START-UP

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

STEPS

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

OBSERVE AND RECORD

A. Suction pressure _____ PSIG
B. Discharge pressure _____ PSIG
C. Entering air temperature _____ ° F
D. Liquid line temperature at outlet or reheat coil _____ ° F
E. Confirm correct rotation for compressor (Y/N) _____
F. Check for correct ramp-up of outdoor fan motor as condenser coil warms (Y/N) _____

4. Check unit charge per charging chart (Y/N) _____
   (Jumper 32L Motormaster® temperature sensor during this check. Remove jumper when complete.)
5. Switch unit to high-latent mode (sub-cooler) by closing humidistat with Y1 closed (Y/N) _____

OBSERVE

A. Reduction in suction pressure (5 to 7 psi expected) (Y/N) _____
B. Discharge pressure unchanged (Y/N) _____
C. Liquid temperature drops to 50°F to 55°F range (Y/N) _____
D. LSV solenoid energized (valve closes) (Y/N) _____

6. Switch unit to dehumid (reheat) by opening Y1 (Y/N) _____

OBSERVE

A. Suction pressure increases to normal cooling level
B. Discharge pressure decreases (35 to 50 psi) (Limited by Motormaster control)
C. Liquid temperature returns to normal cooling level
D. LSV solenoid energized (valve closes)
E. DSV solenoid energized, valve opens

7. With unit in dehumid mode close W1 compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) _____
8. Open W1 restore unit to dehumid mode (Y/N) _____
9. Open humidistat input compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) _____
10. Restore set-points for thermostat and humidistat (Y/N) _____

REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS.

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE