GCA
GEOTHERMAL HEAT PUMP
WITH PURON ADVANCE™ (R-454B) REFRIGERANT
Sizes 24, 36, 48, 60, 72

Installation Instructions

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

SAFETY CONSIDERATIONS

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

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes and current editions of the National Electrical Code (NEC) NFPA 70. In Canada, refer to current editions of the Canadian electrical code CSA 22.1.

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 these signal words; DANGER, WARNING, and CAUTION. 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 would 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

ELECTRICAL SHOCK HAZARD

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

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.

⚠ WARNING

EXPLOSION HAZARD

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

Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

⚠ WARNING

Refrigerant Safety Group A2L

⚠ WARNING

FIRE HAZARD

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

- Risk of fire. Flammable refrigerant used.
- To be repaired only by trained service personnel. Do not puncture refrigerant tubing.
- Auxiliary devices which may be ignition sources shall not be installed in the ductwork, other than auxiliary devices listed for use with the specific appliance. See instructions.
- Dispose of refrigerant properly in accordance with federal or local regulations.
- Failure to follow proper R-454B mitigation system installation instructions can result in property damage, personal injury, or death. If any fault codes are listed, please troubleshoot to prevent system malfunction.
- Do not use means to accelerate the defrosting process or to clean, unless recommended in these instructions.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn refrigerant lines.
- Be aware that refrigerants may not contain an odor.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

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

Puron® Advance (R-454B) refrigerant systems are not compatible with any other refrigerants. Do not use Puron® (R-410A) to service equipment or components on Puron® Advance (R-454B) refrigerant equipment.

⚠ CAUTION

CUT HAZARD

Failure to follow this caution may result in personal injury.

Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing and gloves when handling parts.

INSTALLATION RECOMENDATIONS

The GCA Water-to-Air Heat Pumps are performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-1. All GCA water-to-air heat pumps are certified to UL60335-2-40 Standard. The Water-to-Air Heat Pumps are designed to operate with entering fluid temperature between 20°F to 80°F in the heating mode and between 45°F to 110°F in the cooling mode.

Safety devices are built into each unit to provide the maximum system protection possible when properly installed and maintained.

IMPORTANT: 50° Min. EWT (entering water temperature) for well water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed loop applications. Earth Coupled (Geothermal) applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. **Frozen water coils are not covered under warranty.**

IMPORTANT: This product should not be used for temporarily heating or cooling during construction. Doing so may effect the unit's warranty.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Discharge air configuration change is not possible on Heat Pumps equipped with Electric Heat Option.

Check Equipment and Job Site

Moving and Storage

If the equipment is not needed for immediate installation upon its arrival at the job site, it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal upright position as indicated by the "UP" arrows on each carton at all times.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

If unit stacking is required for storage, stack units as follows:

Do not stack units larger than 6 tons!

Vertical units: less than 6 tons, no more than two high. Horizontals units: less than 6 tons, no more than three high.

Inspect Equipment

Be certain to inspect all cartons or crates on each unit as received at the job site before signing the freight bill. Verify that all items have been received and that there are no visible damages; note any shortages or damages on all copies of the freight bill. In the event of damage or shortage, remember that the purchaser is responsible for filing the necessary claims with the carrier. Concealed damages not discovered until after removing the units from the packaging must be reported to the carrier within 24 hours of receipt.

Location / Clearance

Locate the unit in an indoor area that allows easy removal of the filter and access panels, and has enough room for service personnel to perform maintenance or repair. Provide sufficient room to make fluid, electrical, and duct connection(s). If the unit is located in a confined space such as a closet, provisions must be made for return air to freely enter the space. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping.

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in equipment damage and/or improper equipment operation.

It is extremely important to take the proper precautions to insure that the heat pump unit is installed in the proper location and that measures have been taken to prevent rupturing the water coil due to freezing conditions.

Frozen water coils are not covered under the limited product warranty.

Operating Limits

GCA units are designed to be installed with a communicating User Interface. The unit will provide airflow at a rate commanded by the User Interface. The nominal airflow/ton rate is 350 CFM/ton. The User Interface will modify the commanded airflow under certain operating modes. Refer to the User Interface literature for further System Control details. This unit will not respond to commands from a common thermostat except under certain emergency situations explained in this document. The instructions contained herein provide guidance to successfully install the blower.

These units are designed specifically for Puron Advance (R-454B) refrigerant and must only be used with Puron Advance refrigerant. These units are designed to meet low air leak requirements currently in effect. Because of this, units need special attention in the condensate pan and drain connection area and when brazing tubing.

Factory-authorized, field-installed electric heater packages are available in 5 through 20 kW. See Product Data for available accessory kits.

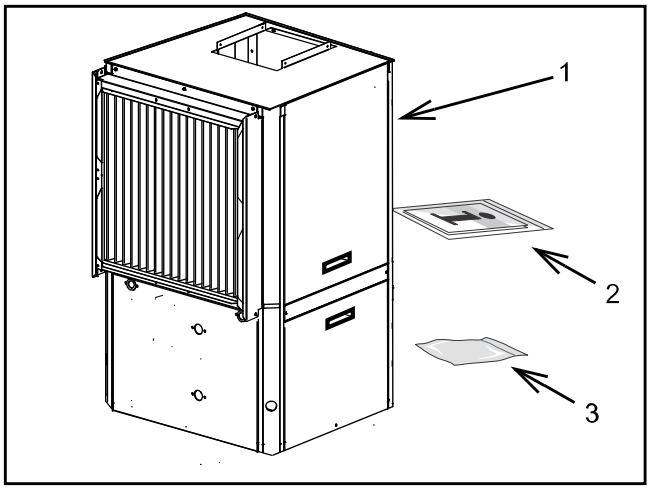

Fig. 1 – Standard Package

1. GCA Series Water-To-Air Heat Pump
2. Installation and Owner's Manual
3. Hanging Bracket Kit (HZ unit only)

Environment

This equipment is designed for indoor installation only. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life.

NOTE: Two factors determine the operating limits of a unit: entering-air temperature and water temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation.

POWER SUPPLY

A voltage variation of ± 10% of nameplate utilization voltage is acceptable.

UNIT STARTING CONDITIONS

Depending on the model, units should start and operate with entering water temperature temperatures between 20 and 110°F and entering air temperatures between 45°F and 95°F. Water flow rates should be between 1.5 and 3.0 GPM/nominal cooling ton.

NOTE: These operating limits are not normal or continuous operating conditions. Assume that such a start-up is for the purpose of bringing the building space up to occupancy temperature. See Table 1 for operating limits.

Table 1 – Operating Limits

FLUID TYPE	LIMIT		COOLING	HEATING
AIR	Minimum Ambient (F)		50	40
	Maximum Ambient (F)		100	85
	Rated Ambient (F)		80	68
	Minimum Entering (F db/wb)		65/57	45
	Maximum Entering (F db/wb)		95/85	80
	Rated Entering (F)		80/67	68/57
LIQUID	Minimum Entering (F)		45	20
	Max Entering (F)		110	80
	Typical Entering Range (°F)	Water Loop	-	-
		Ground Loop	50-80	25-50
		Ground Water	50-70	40-60
	Rated Entering (°F)	Water Loop	86	68
		Ground Loop	77	32
		Ground Water	59	50
	Anti-Freeze Requirement (LWT / EWT F)		<40 / <50	
	Maximum operating water pressure (PSI/kPa)		400 psi/2,758 kPa (Standard unit) 300 psi/2,068 kPa (with water valve option)	
	Minimum operating Flow Rate (GPM/Ton)		1.5	

LEGEND
DB = Dry Bulb
EWT = Entering Water Temperature
LWT = Leaving Water Temperature
WB = Wet Bulb

APPLICATION CONSIDERATIONS

Earth Coupled Geothermal Systems

Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Anti-freeze solutions are utilized when low evaporating conditions are expected to occur. Refer to the Flow Center installation manuals for more specific instructions. (See Fig. 2)

If the unit will be installed in a new installation, which includes new duct work, the installation should be designed using current Air Conditioning Contractors of America (ACCA), North American Technician Excellence (NATE), or other applicable standards. It is recommend that design and installation of the ground loop be per International Ground Loop Heat Pump (IGSPHA) standards.

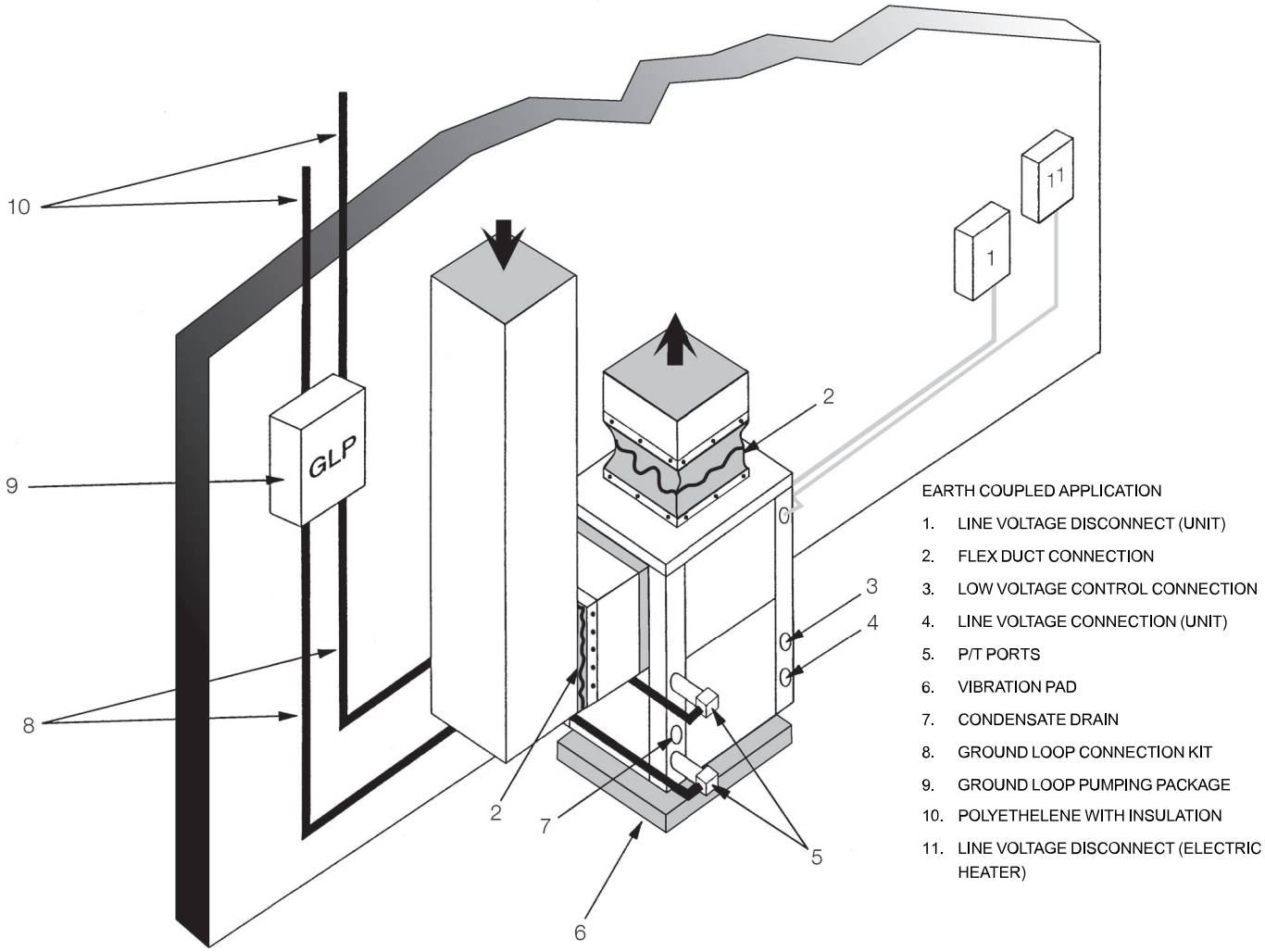

Fig. 2 – Example Geothermal System Setup

Well Water Systems

IMPORTANT: Table 2 must be consulted for water quality requirements when using open loop systems. A water sample must be obtained and tested, with the results compared to the table. Scaling potential should be assessed using the pH/Calcium hardness method. If the pH is <7.5 and the calcium hardness is <100 ppm, the potential for scaling is low. For numbers out of the range listed, a monitoring plan must be implemented due to probable scaling.

Other potential issues such as iron fouling, corrosion, erosion and clogging must be considered. Careful attention to water conditions must be exercised when considering a well water application.

Failure to perform water testing and/or applying a geothermal heat pump to a water supply that does not fall within the accepted quality parameters will be considered a mis-application of the unit and resulting heat exchanger failures will not be covered under warranty. Where a geothermal system will be used with adverse water conditions, a suitable plate-frame heat exchanger MUST be used to isolate the well water from the geothermal unit.

Proper testing is required to assure the well water quality is suitable for use with water source equipment.

In conditions anticipating moderate scale formation or in brackish water, a cupronickel heat exchanger is recommended. Copper is adequate for ground water that is not high in mineral content.

In well water applications, water pressure must always be maintained in the heat exchanger. This is accomplished either a control valve or a bladder type expansion tank

When well water is used exclusively for supplying water to the heat pump, the pump should operate only when the heat pump operates. A 24 volt double pole single throw (DP/ST) contactor (Fig. 3) can be used to operate the well pump with the heat pump.

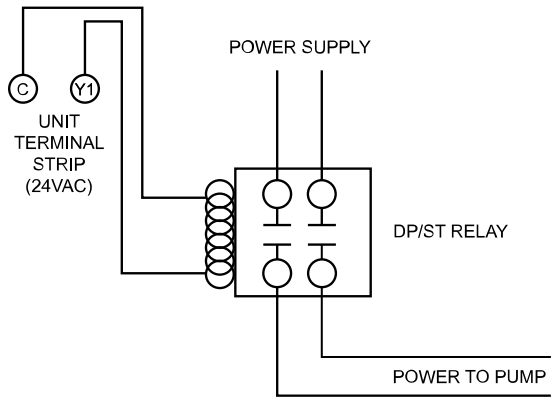

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Fig. 3 – 24V DP/ST Contactor

When two or more units are supplied from one well, the pump can be wired to operate independently from either unit (see Fig. 4). An up-sized VA transformer may be required in either case.

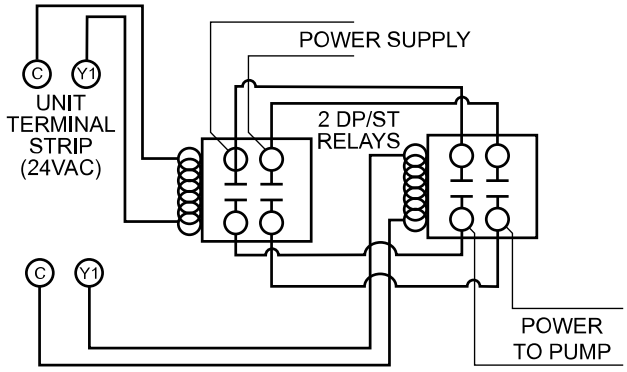

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Fig. 4 – Independent Wiring

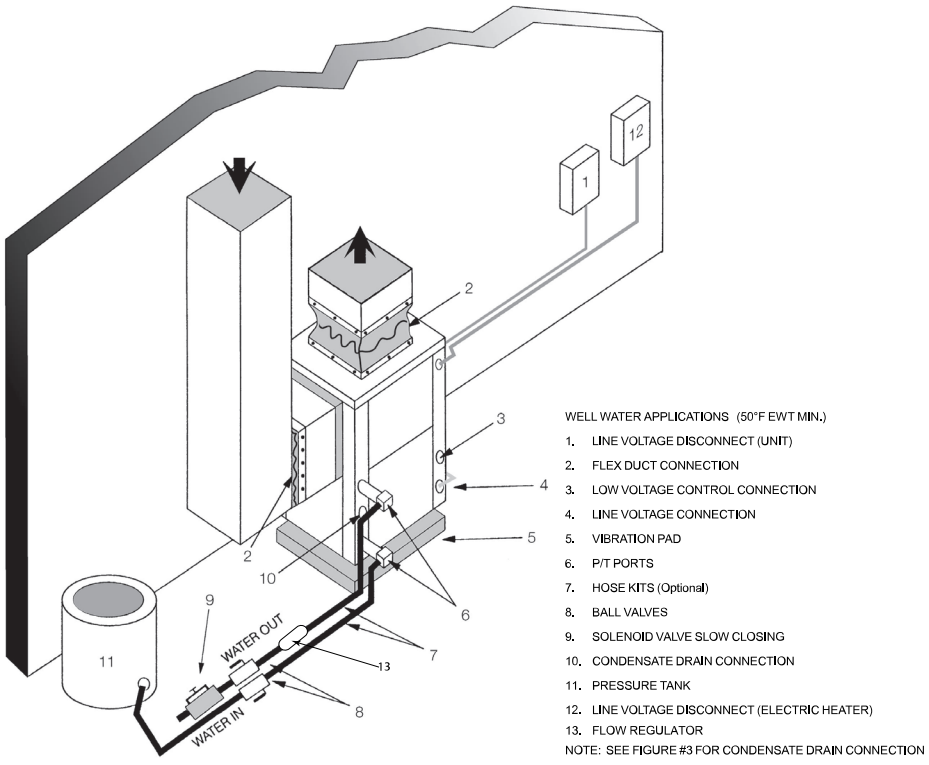

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Fig. 5 – Example Well Water System Setup

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information in the back of this manual.

The discharge water from the heat pump is not contaminated in any manner and can be disposed of in various ways depending on local codes (i.e. discharge well, dry well, storm sewer, drain field, stream, pond, etc.)

When using a single water well to supply both domestic water and the heat pump care must be taken to insure that the well can provide sufficient flow for both. In well water applications a slow closing solenoid valve must be used to prevent water hammer.

Solenoid valves should be connected across Y and C on the interface board for all. Make sure that the VA draw of the valve does not exceed the contact rating of the thermostat.

Pressure/temperature ports are recommended in both supply and return lines for system flow balancing. Water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See specification sheets for water flow vs. pressure drop information in the back of this manual.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Water piping exposed to extreme low ambient temperatures is subject to freezing.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

Discharge air configuration change is not possible on Heat Pumps equipped with Electric Heat Option.

Table 2 – Water Quality Requirements for Open-Loop Geothermal Heat Pump System

POTENTIAL PROBLEM	WATER CHARACTERISTIC	ACCEPTABLE VALUE	
		COPPER	CUPRO-NICKEL
SCALING	pH (Acidity / Alkalinity)	7-9	7-9
	Hardness (CaCO3, MgCO3)	< 350 ppm	< 350 ppm
	Ryznar Stability Index	6.0 - 7.5	6.0 - 7.5
	Langelier Saturation Index	-0.5 - +0.5	-0.5 - +0.5
CORROSION	Hydrogen Sulfide (H2S)	< 0.5 ppm*	10-50 ppm
	Sulfates	< 125 ppm	< 125 ppm
	Chlorine	< 0.5 ppm	< 0.5 ppm
	Chlorides	< 20 ppm	< 150 ppm
	Carbon Dioxide	< 50 ppm	< 50 ppm
	Ammonia	< 2 ppm	< 2 ppm
	Ammonia Chloride	< 0.5 ppm	< 0.5 ppm
	Ammonia Nitrate	< 0.5 ppm	< 0.5 ppm
	Ammonia Hydroxide	< 0.5 ppm	< 0.5 ppm
	Ammonia Sulfate	< 0.5 ppm	< 0.5 ppm
	Dissolved Solids	< 1,000 ppm	< 1,500 ppm
IRON FOULING	Iron (Fe2+ Iron Bacteria Potential)	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	< 1 ppm	< 1 ppm
EROSION	Suspended Solids	< 10 ppm, < 600 µm size**	< 10 ppm, < 600 µm size**
	Maximum Water Velocity	6 ft. / sec.	6 ft. / sec.

* No “rotten egg” smell present at < 0.5 ppm H2S.

** Equivalent to 30 mesh strainer

INSTALLATION

Vertical Units

GCA Vertical units up to five tons are available in left or right air return configurations. Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. It is not necessary to anchor the unit to the floor. See Fig. 6.

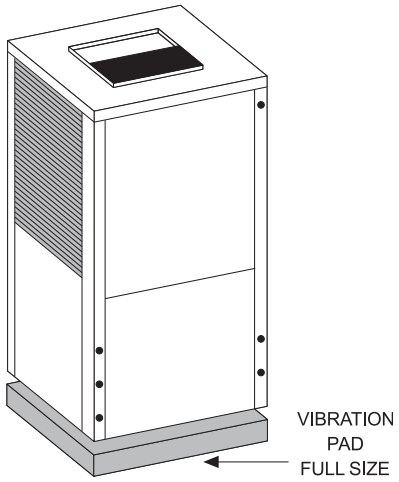

Fig. 6 – Vibration Absorbing Pad

Horizontal Units

While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. All horizontal units come with a Hanging Bracket Kit to facilitate suspended unit mounting. Hanging brackets are installed as shown in Fig. 7.

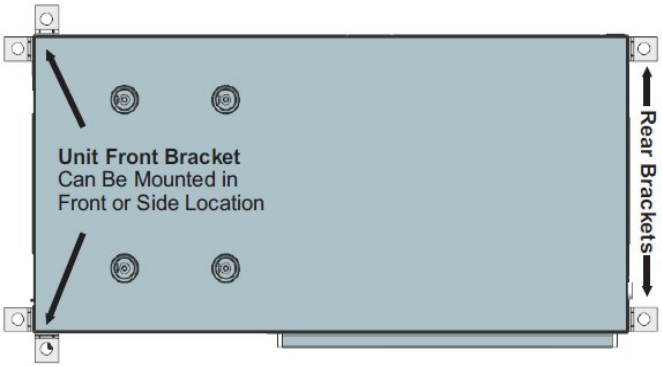

Fig. 7 – Hanging Bracket Locations

The hanging bracket kit includes the following:

- (5) brackets
- (5) rubber vibration isolators
- (8) screws no. 10 x 1/2 in.
- (10) Bolts 1/4 – 28 x 1/2 in. hex bolt (not used on this model)

The following additional materials are needed and must be field supplied:

- threaded rod (3/8 in. maximum diameter)
- hex nuts
- washers (1-3/4 in. minimum O.D.)

Hanging Bracket Installation

4. Remove and discard factory-provided screws from location where hanging brackets will be installed. See Fig. 8.

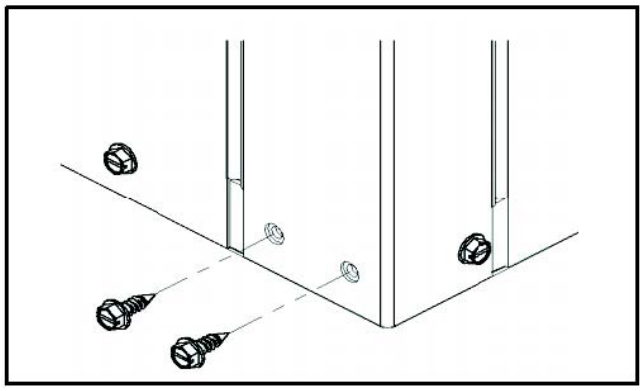

Fig. 8 – Removing Factory Screws

5. Mount 4 brackets to unit corner post using the bolts provided in the kit, as shown in Fig. 9. DO NOT re-use the screws removed from the unit during Step 1 to mount the hanging brackets on the unit.

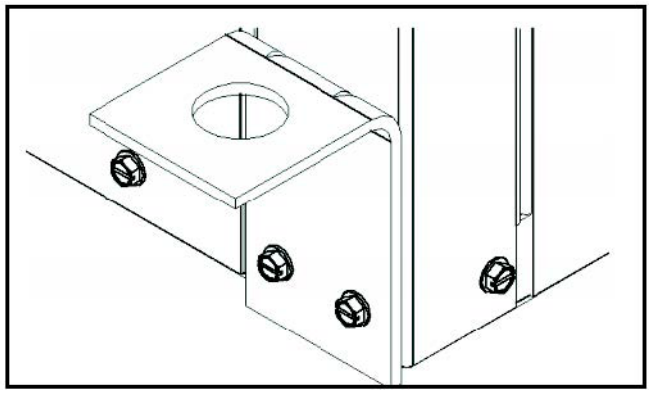

Fig. 9 – Mounting Brackets

6. Install rubber grommet on the bracket as shown in Fig. 10.
7. Hang the unit and assemble the field-provided threaded rod, nuts, and washers on the brackets as shown in Fig. 10.

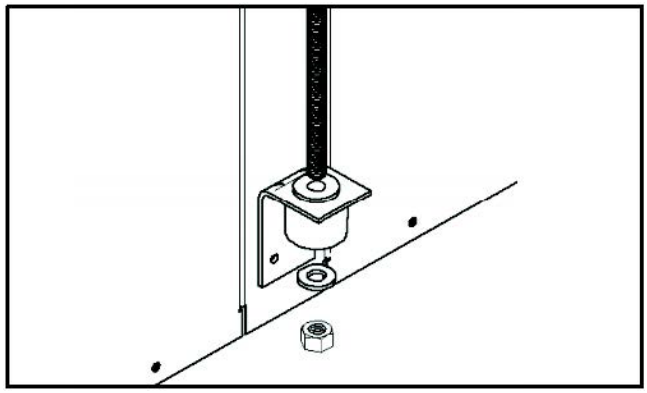

Fig. 10 – Hanging the Unit

IMPORTANT: larger than six tons include an integral angle iron frame with mounting holes present.

Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan, if required by code, should be at least 4 in. larger than the bottom of the heat pump.

Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc. Some applications require an attic floor installation of the horizontal unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh.

The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4 in. drain connected to this secondary pan should be run to an eave at a location that will be noticeable.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage or improper operation.

If the unit is located in a crawl space, the bottom of the unit must be at least 4-in. above grade to prevent flooding of the electrical parts due to heavy rains.

Mounting Horizontal Units

Horizontal Supply Air Configuration

The supply air location can be field converted from end blow (back discharge) to straight through or vice-versa.

NOTE: Blower configuration changes should be done prior to unit being installed in the final location.

NOTE: EH not available if unit is converted to side.

To convert the supply air direction, follow the steps below (see Fig. 11 - Fig. 13):

1. If the unit is connected to power, shut Off the unit and disconnect switch or circuit breaker.
2. Locate the motor access panel (A). Remove the three screws at top and the three screws at the bottom of the panel.
   Remove the access panel and place it aside.
3. Be careful not to damage the refrigerant coils or any other internal unit components.
4. Locate blower panel (B). Remove the three screws from top and the three screws from bottom of the panel. Leave the blower panel in place on the base pan.
5. Locate access panel corner post (C). Remove the four screws from top and the four screws from the bottom. Remove the corner post and set it aside.
6. Locate blower support bracket (D). Remove the one screw and set it aside.
7. Move blower panel (B) with blower to desired location, rotating it 180°. (See Fig. 13.) The motor power and control harness can be unplugged to facilitate blower relocation.
8. Reinstall access panel corner post (C) using the eight screws previously removed.
9. Fasten blower panel (B) using the six screws previously removed.
10. Reinstall and fasten blower support bracket (D) using the one screw previously removed.
11. Reattach the motor power and control harness if disconnected earlier.
12. Reinstall and fasten motor access panel (A) using the six screws previously removed.

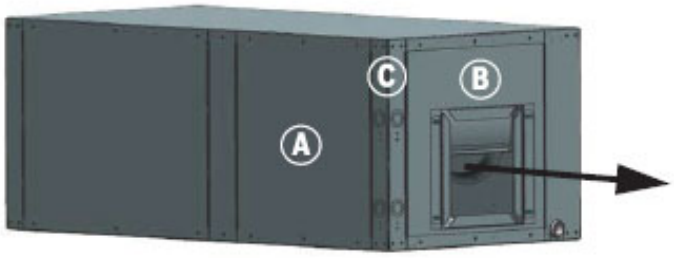

Fig. 11 – End Blow (back discharge) Orientation

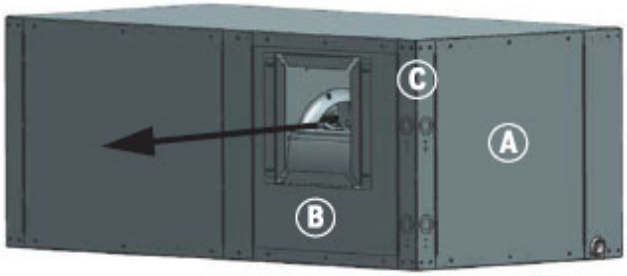

Fig. 12 – Straight Through Orientation

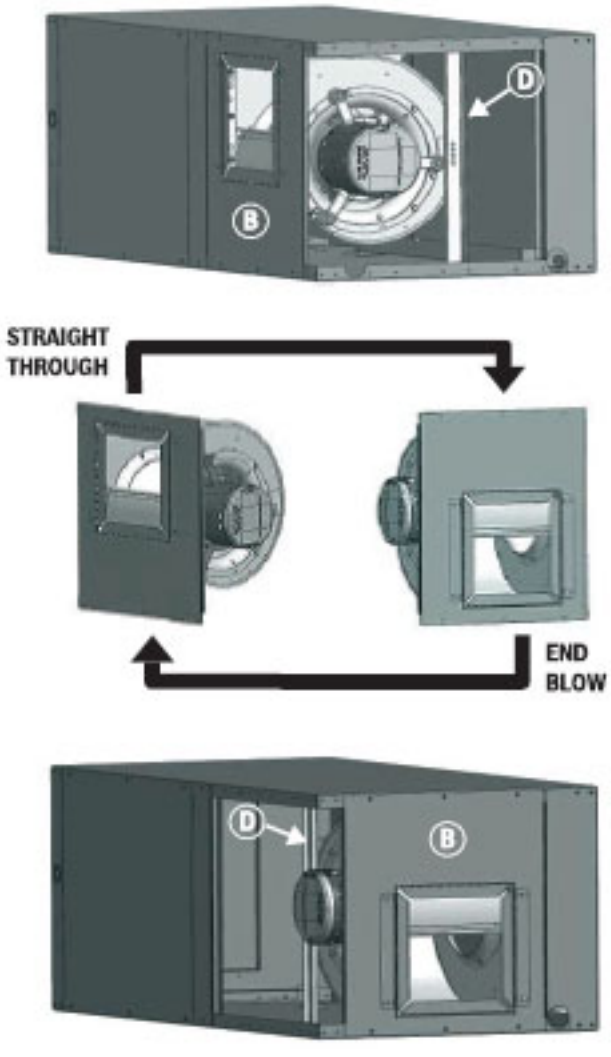

Fig. 13 – Blower Configuration

Condensate Drain

IMPORTANT: If equipped with float style condensate overflow switch, final adjustment must be made in the field.

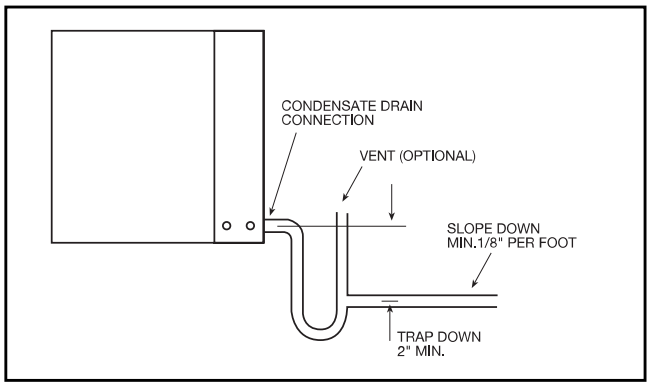

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Fig. 14 – Condensate Drain

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the unit.

IMPORTANT: This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to insure free condensate flow.

A vertical air vent is sometimes required to avoid air pockets (see Fig. 14). The length of the trap depends on the amount of positive or negative pressure on the drain pan. A second trap must not be included.

DUCT SYSTEM

A supply air outlet collar and return air duct flange are provided on all units to facilitate duct connections. Refer to the individual Product Data for physical dimensions of collar and flange.

NOTE: Supply air duct and return air duct flanges are shipped unfolded with unit.

Fold the duct flange outwards along the perforated line. Refer to unit Dimensional Drawings for physical dimensions of the collar and flange. A flexible connector is recommended for supply and return air duct connections on metal duct systems. All metal ducting should be

insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate from forming during the cooling operation.

Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper equipment operation.

Do not connect discharge ducts directly to the blower outlet.

The factory provided air filter must be removed when using a filter back return air grill. The factory filter should be left in place on a free return system.

If the unit will be installed in a new installation which includes new duct work, the installation should be designed using current ASHRAE procedures for duct sizing.

If the unit is to be connected to existing duct work, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application.

If the duct system is too small, larger duct work should be installed. Check for existing leaks and repair.

The duct system and all diffusers should be sized to handle the designed air flow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenum should be insulated. There should be no direct straight air path through the return air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive airflow is a problem, the blower speed can be changed to a lower speed to reduce airflow.

Airflow

GCA units have constant airflow motors that deliver a nominal 400 SCFM per ton. If desired, a ±15% adjustment to CFM can be made. During fan-only operation, airflow is 69^ of the tabulated value, and when passive dehumidification mode is enabled, airflow is 85% of the tabulated value. See unit Product Data sheet for airflow table.

CONSTANT AIRFLOW (ECM) MOTOR

GCA units are available with a constant airflow ECM blower motor. These motors dynamically adjust their power output to precisely match the desired airflow on a preprogrammed fan curve. See Blower Performance Table for blower performance by speed setting, and for the factory default motor setting. These motors include the following features:

1. Three Speed Settings: Units are factory set to "NORM" but can be field adjusted to "+" to increase CFM by 15% or to "-" to reduce CFM by 15%. See the constant airflow ECM motor blower performance table for complete details on available CFM for each unit size (refer to the Wire Control Connections section of this manual).
2. Low CFM Ventilation: Units circulate air at 70% of full airflow rate when there is a call for fan only.
3. Passive Dehumidification: Reduces airflow during a cooling call when dehumidification is also required. This reduces the sensible heat ratio of the cooling coil and extends cooling run time to dehumidify more effectively (refer to the Wire Control Connections section of this manual).
4. Test Mode: Operates the motor at a 70% torque setting. This setting can be used to diagnose programming problems in the motor itself (refer to the Wire Control Connections section of this manual).
5. CFM Indicator Light: indicator light blinks for each 100 CFM of air delivered.

NOTE: This blink code is approximate and should not replace test and balance.

PIPING

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs).

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in improper equipment operation.

Never use flexible hoses of a smaller inside diameter than that of the fluid connections on the unit.

GCA units are supplied with either a copper or optional cupronickel Coaxial condenser. Copper is adequate for ground water that is not high in mineral content.

NOTE: Proper testing is recommended to assure the well water quality is suitable for use with water source equipment. When in doubt, use cupronickel.

In conditions anticipating moderate scale formation or in brackish water, a cupronickel heat exchanger is recommended.

Both the supply and discharge water lines will sweat if subjected to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics.

⚠ CAUTION

EQUIPMENT DAMAGE AND/OR UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage and/or improper operation.

Never exceed the recommended water flow rates as serious damage or erosion of the water-to-refrigerant heat exchanger could occur. Improper heat exchanger water flow due to piping, valve arrangement or improper pump operation is hazardous to the unit and constitutes abuse which will void the heat exchanger and compressor warranty.

Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult Product Data for sizes.

NOTE: Teflon tape sealer should be used when connecting water piping connections to the units to insure against leaks and possible heat exchanger fouling.

NOTE: The unit is shipped with water connection O-rings. A 10-pack of O-rings (part #4026) can be ordered through Replacement Components (RC).

IMPORTANT: Do not over-tighten connections.

Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing (on open-loop systems).

No unit should be connected to the supply or return piping until the water system has been completely cleaned and flushed to remove any dirt, piping chips or other foreign material. Supply and return hoses should be connected together during this process to ensure the entire system is properly flushed. After the cleaning and flushing has taken place the unit may be connected to the water loop and should have all valves wide open.

PIPING AND PLUMBING INSTALLATION

Loop Pump Connections

Flow centers using variable speed loop pumps are recommended with these units. Variable speed pumps are more efficient and reduce operating costs, provide full advantages of water flow rate, temperature and display HE/HR.

When using variable speed flow centers with GCA units, a special wiring kit (part number 4129) is required.

Refer to the Flow Center installation manual for piping and wiring instructions. For applications using 2 GHPs and 1 flow center, refer to Table 3.

Table 3 – Requirements for Two Units Sharing One Flow Center

Flow Center Type	Pump Sharing Relay Required	Wiring Kit Required for GCA	Mode Operation
Single Speed Flow Centers	ACPSRN	(1*) 3977	Activates pump when either GHP
Variable Speed Flow Center (flow and temperature version required)	2 Double Pole / Double Throw (DPDT) Relays (field supplied)	(2) 4129	If one unit calls, the controller will provide 1st stage flow rate (set at controller menu). If both units call, the controller will provide 2nd stage flow rate.

Water Solenoid Valves

Open loop well water applications require a water solenoid valve. The purpose of the valve is to allow water to flow through the GHP only during operation. For ground water/open loop installations, solenoid valves MVBR3F and MVBR4F are recommended due to its fast opening/slow closing timing feature (see Fig. 15). This valve will open in approximately 5 seconds. Solenoid valves that are slow opening are not recommended as water in the unit's coax may freeze during start-up of a heating call. A frozen coax is not covered under warranty. MVBR3 and MVBR4F valves are also slow closing to eliminate potential water hammer.

Information on the MVBR3F and MVBR4F valves is shown below.

Fig. 15 – Solenoid Valves

Table 4 – Motorized Solenoid Valves

Part Number	Description
MVBR3F	Valve, motorized solenoid, forged brass 3/4" FPT, 24V
MVBR3F	Valve, motorized solenoid, forged brass 1" FPT, 24V

***Start up note** – The first time the water solenoid valve is operated, it may require 30 to 45 seconds to power open. This time is to charge an internal capacitor. After the initial "power up" the valve will open in 5 seconds. If the line voltage power has been turned off for service of the unit, the system will go through the same first time power up sequence.

NOTE: Refer to Fig. 19 and Fig. 20 for solenoid valve wiring.

Flow Regulator Valve

A flow regulator valve should be used to set the flow rate through the heat pump. The lowest entering fluid temperature (EWT) expected should be used to determine the flow rate per ton. 1.5 GPM per ton is acceptable for 50°F (10°C) EWT or higher. 2 GPM per ton should be used if EWT is below 50°F (10°C). (See Fig. 16 and Table 5)

Fig. 16 – Flow Regulator

Table 5 – Flow Regulators

Part Number	Flow Regulator Valves
FR2	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 2 GPM
FR3	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 3 GPM
FR4	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 4 GPM
FR5	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 5 GPM
FR6	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 6 GPM
FR7	Valve, flow regulator, 3/4” FPT x 3/4” FPT, 7 GPM

Typical Open Loop Piping

Open loop systems require a water solenoid valve to turn on the water when the heat pump compressor is energized, and to turn off the water when the compressor is off.

A slow-closing motorized valve (MVBR3F or MVBR4F) is recommended to help reduce water hammer. A flow regulator limits water flow to avoid using more water than the heat pump requires, which wastes water and increases pumping costs. A hose kit provides vibration isolation, as well as convenient fittings to install P/T (pressure/temperature) plugs for checking water temperature and pressure drop at start-up and during troubleshooting.

Fig. 17 shows the typical piping arrangement for a single solenoid valve. For single speed heat pumps and smaller two-stage heat pumps (3 tons and smaller), one valve is typical. For larger two-stage heat pumps, there is an opportunity to save a significant amount of energy (and avoid wasting water) with the use of two solenoid valves, one for first stage, and both for second stage (Fig. 18).

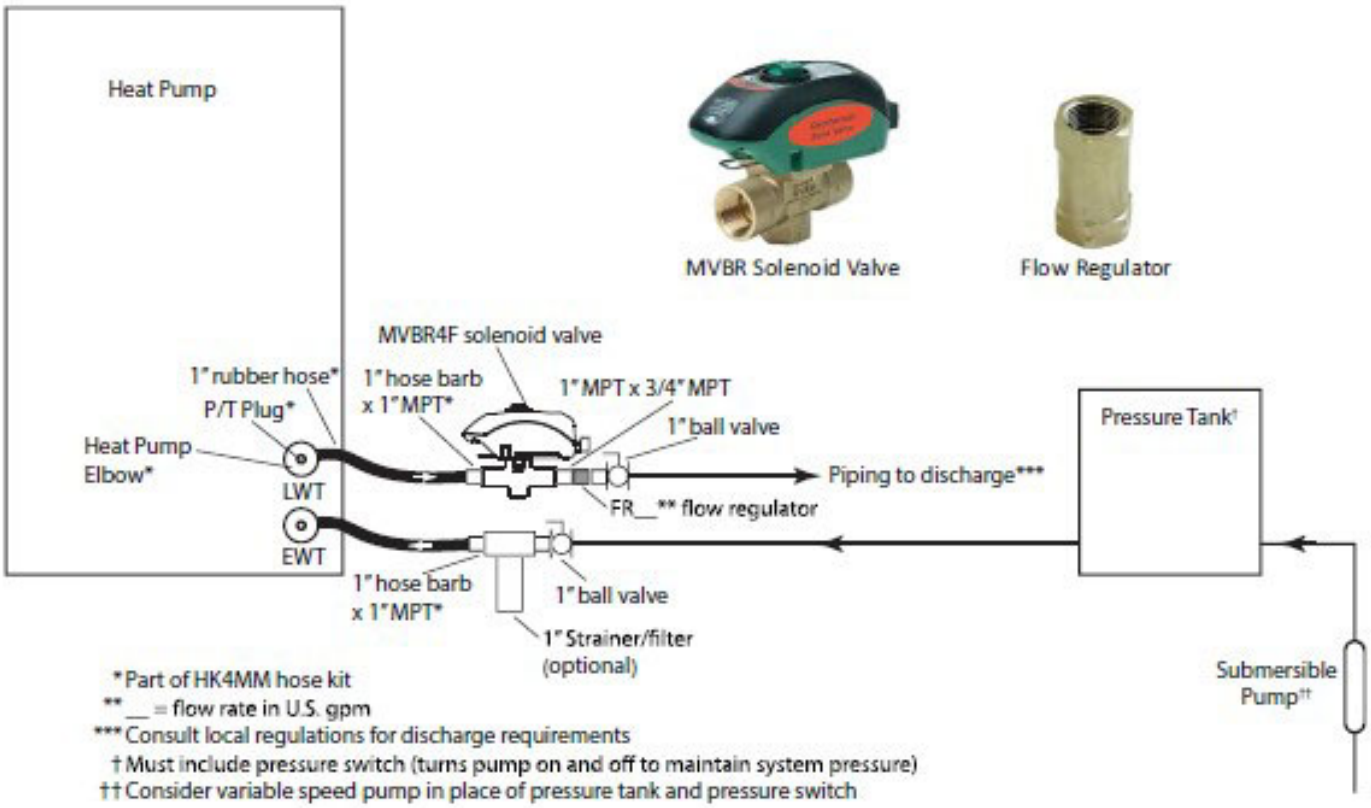
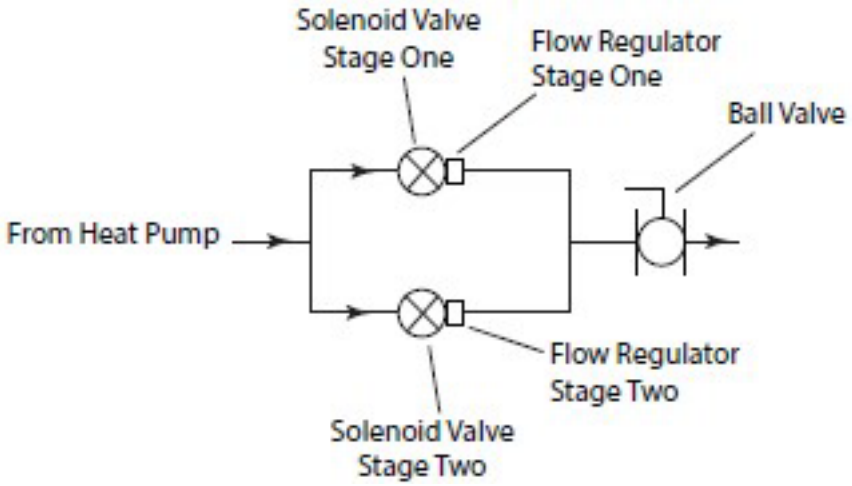


Fig. 17 – Single Solenoid Valve



NOTE: Wiring kit #4129 is recommended for easy 24 volt connection staging solenoids with compressor.

Fig. 18 – Two Solenoid Valves

Water Solenoid Valve Wiring Diagrams for Open Loop Systems

24 VAC Controls

Communicating Controls

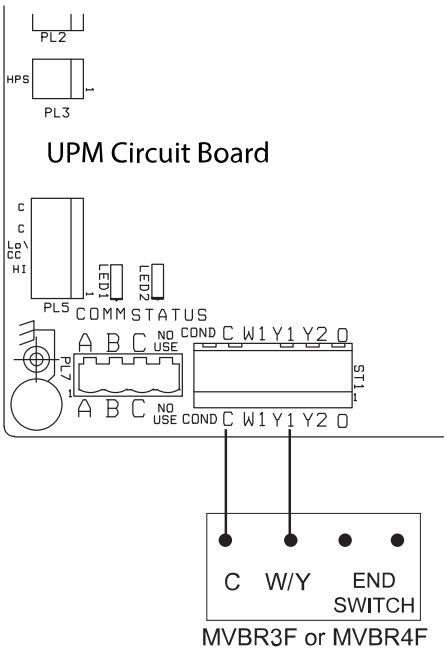
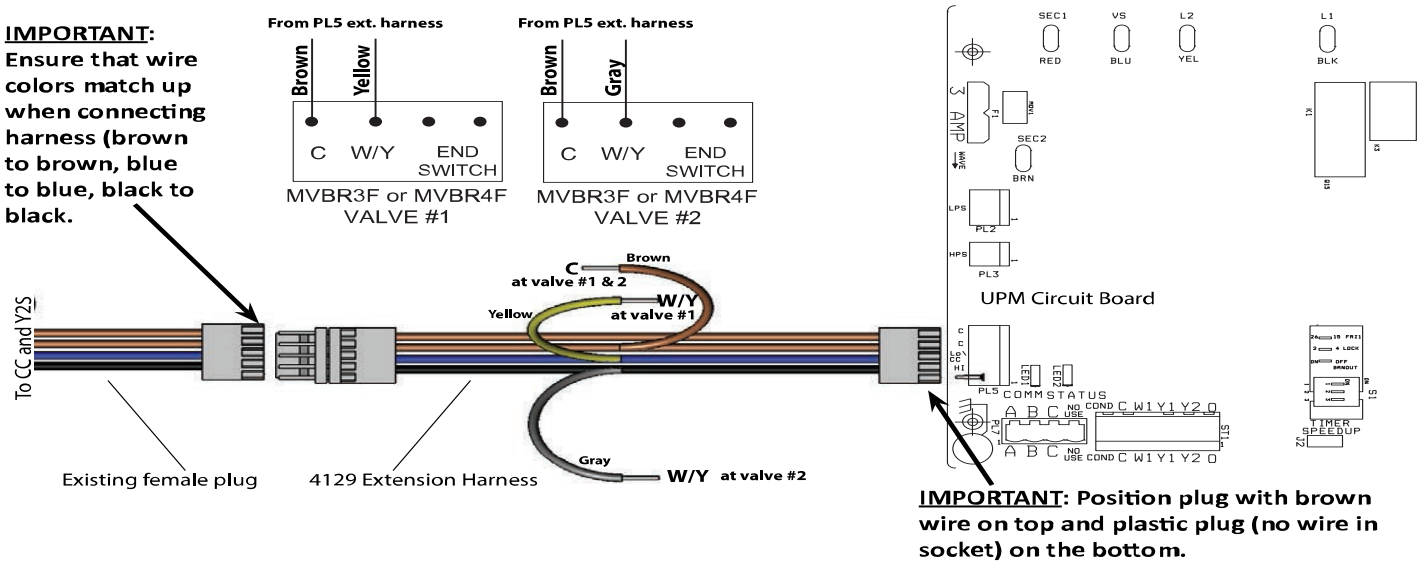


Fig. 19 – Two Solenoid Valves



NOTE: Y2 (connector ST1) is used for a utility curtailment input, and is not available for use as an output for the second valve. However, the wiring harness extension (part # 4129) used for variable speed flow centers (closed loop applications) provides a second stage connection as shown above (gray/brown wires). The wiring kit should be used for systems with two solenoid valves (yellow wire for stage 1, gray wire for stage 2, brown wire for common to both valves).

Fig. 20 – Communicating Controls - Two Solenoid Valves

Utility Curtailment

Utility curtailment is a voluntary energy saving program offered through utility companies in some locations. Utility company will provide the equipment that allows them to cut back demand on equipment during peak demand times. A qualified HVAC technician should install the device to ensure system compatibility. Refer to Fig. 21 for typical wiring to the ODU.

To set up curtailment with user interface, enter the service screens, Setup, then select Utility Curtailment.

There will be 3 options to enable or disable the curtailment:

1. Disabled: the utility curtailment, if wired into the ODU, will be ignored.
2. *Low Stage: when utility curtailment relay opens, the unit will only operate at low-stage.
3. *Off: when utility curtailment relay opens, the unit will shut down until the utility relay closes.

* There will be a brief delay to cause the unit to stage or shut down (approximately 0.40 to 1.20 minutes can be expected).

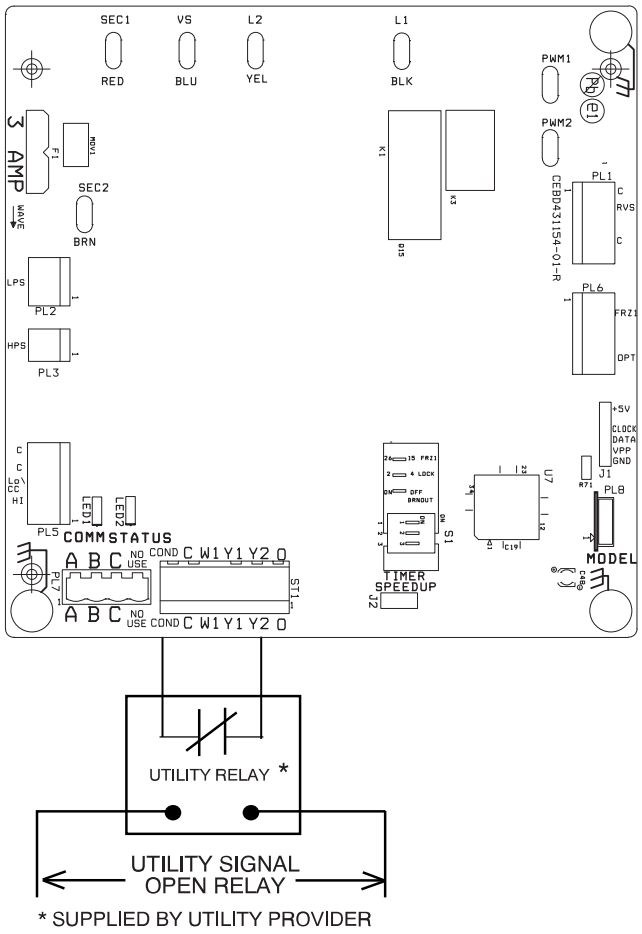


Fig. 21 – Utility Curtailment

LEAK DISSIPATION SYSTEM

WARNING

PERSONAL INJURY OR PROPERTY DAMAGE HAZARD

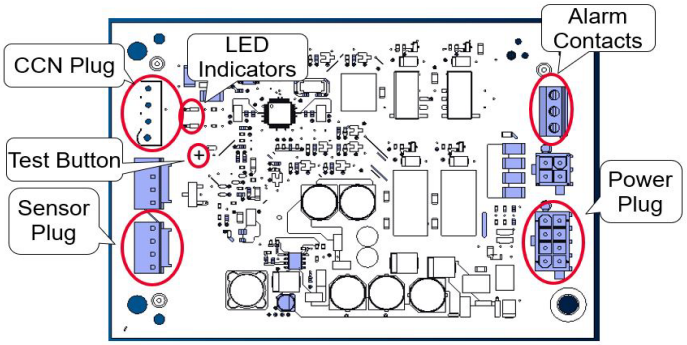
Failure to follow proper R-454B mitigation system installation instructions can result in property damage, personal injury, or death.

If any fault codes are listed, please troubleshoot to prevent system malfunction.

The 24-60 size units come equipped with a communicating factory wired R-454B leak detection and dissipation system to ensure safe operation during a leak. The system consists of a bracket, a PCB, a A2L Detection Sensor, and a drain pan clip. Failure to install this system will result in potentially hazardous conditions and improper equipment operation, and void all system warranties and liabilities.

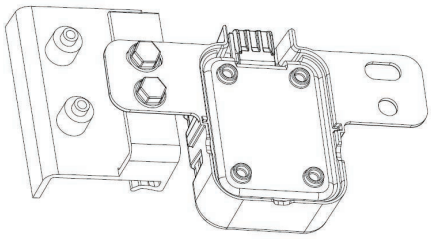
All units are shipped with the A2L Detection Sensor located in the upflow position. For size 36, the sensor will always be installed on the drain pan clip.

The leak dissipation control board will be factory installed inside of the dissipation board housing (Fig. 22).



A230455

Fig. 22 – Leak Dissipation Control Board



A2304490

Fig. 23 – Dissipation Sensor Mounted on Drain Clip

For sizes 24, and 48–60, the sensor comes factory installed on the delta plate. As described in the Installation section, for horizontal right and left, the sensor will need to be moved to the drain pan clip (Fig. 23, Follow the wire routing as shown in the applicable graphic.

WARNING

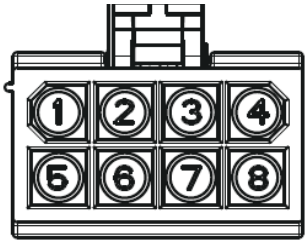
PRODUCT OPERATION / INJURY HAZARD

Failure to follow this warning could cause product damage or personal injury.

Make sure the sensor is not exposed to significant amounts of dust/dirt contamination. This could clog the sensor and prevent proper functioning. For sensor cleaning instructions, refer to service manual.

IMPORTANT: Sensor must be installed with the connector facing down or facing horizontally. Sensor should never be positioned with connector facing upward. Incorrect sensor position could result in premature failure.

The A2L Detection Sensor is attached to a wiring harness that connects the sensor to the dissipation board (Fig. 24). In upflow, the routing of the wire harness is up the right side of the unit behind the wire retainers for the cabinet insulation. At each wire retainers, the harness is attached using two wire ties.



A230457

Fig. 24 – Front View of Power Wire Harness Pin Layout

Confirm that the harness routing does not interfere with other fan coil components. Place special consideration when routing the harness around the blower. Make sure no loose harness can be pulled into the blower. When routing on the side of the unit, place the harness behind the retainers. Bundle excess harness and secure in the control box. When converting the unit to any orientation, make sure the sensor wiring harness is disconnected and the wire harness has been placed in the control box before any components are moved.

Electrical Component Box Layout

Refer to Fig. 25 and Fig. 26 for control box layout and location of the dissipation board and sensor.

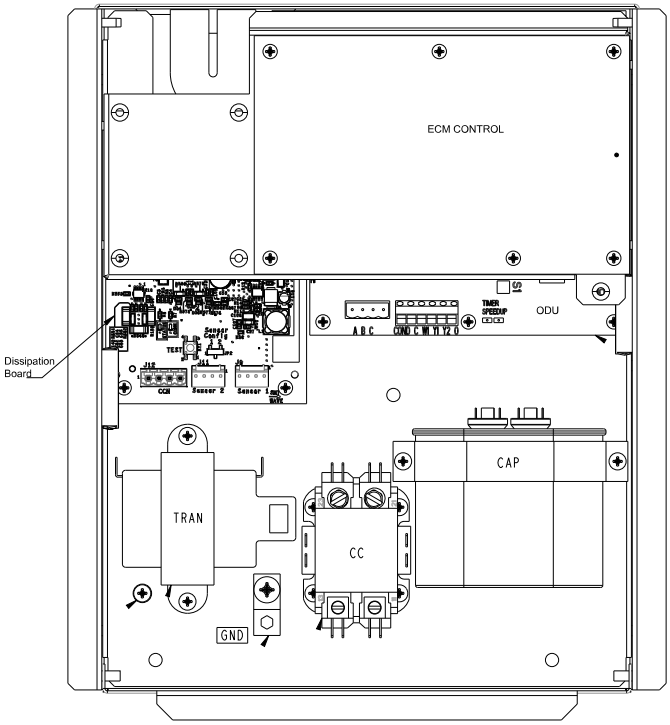


Fig. 25 – Electrical Component Box Layout with Dissipation Board Location

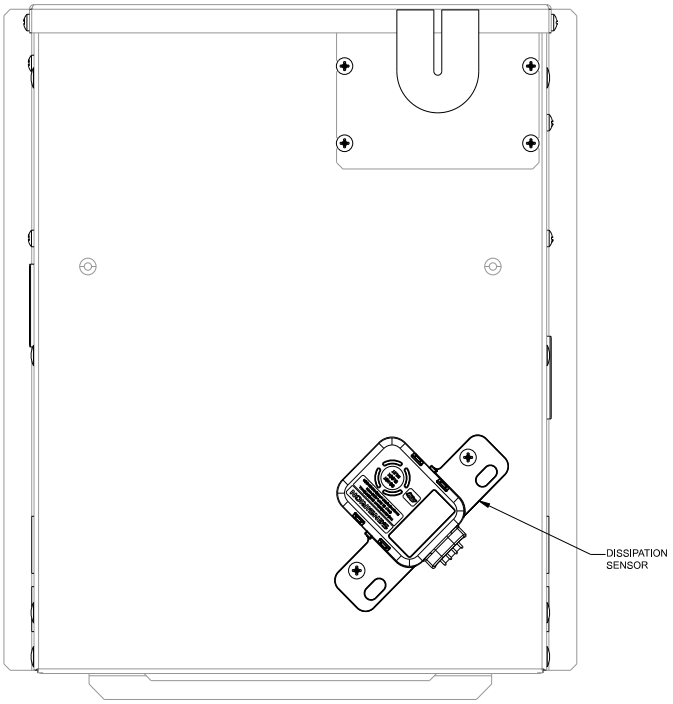


Fig. 26 – Back of Control Box with Dissipation Sensor

Leak Dissipation System Self-Test

Power on the unit and verify proper functioning of equipment.

When no leak is detected, the system operates normally. In this state, the Dissipation Board Status LED remains solid yellow and the communicating LED remains solid green. When the A2L Detection Sensor reaches a threshold of detected R-454B refrigerant, the Status LED flashes.

NOTE: Operation of the Test Mode is only possible if no faults exist on the dissipation board.

IMPORTANT: Press the Test button for roughly ONE SECOND to enter Test Mode. Pressing the Test button for a longer periods enables different functions (Table 6).

Press the Test button on the dissipation System Control board to ensure proper dissipation system operation under each test condition listed below. After pressing the Test button, system will enter Dissipation Mode for 60 seconds to help verify correct operation.

Table 6 – Dissipation Board Test Button Functions

Hold Button Time (sec)	Function
1 - 4	Dissipation Mode for 60 seconds
5 - 29	Display flash code history
30+	Flash code 6
3 rapid presses	Clear flash code history

Ensure that the unit is able to meet the minimum required dissipation mode airflows. These required minimum airflow rates during Dissipation Mode are listed in Table 7. They are based on the total system refrigerant charge quantity.

Table 7 – Required Minimum Dissipation Mode Airflows, based on Total System Refrigerant Charge Quantity

Total System Charge (lb)	Minimum Required Dissipation Airflow (CFM)	Total System Charge (lb)	Minimum Required Dissipation Airflow (CFM)
5	133	16	426
6	160	17	452
7	186	18	479
8	213	19	505
9	239	20	532
10	266	21	559
11	293	22	585
12	319	23	612
13	346	24	639
14	372	25	665
15	399		

Dissipation Troubleshooting

For all flash codes, first try power cycling the system to remove the code. Refer to Table 8.

No power

Verify the wiring to/from pins 1 and 8 on the power harness plug. Check the 24V system wiring from the transformer.

Flashing 1

Check for refrigerant leaks using an independent R-454B detector. If no leaks are present, replace the sensor.

Flashing 2

Check both ends of the sensor wire harness to ensure proper attachment. Power cycle the system to check whether the flash code has been removed. If the flash code is still present, replace the sensor.

Flashing 3

Check for refrigerant leaks using an independent R-454B detector.

Flashing 4

If the code does not clear after power cycling the system, replace the dissipation board.

Flashing 5

If the code does not clear after power cycling the system, replace the sensor.

Flashing 6

Press the test button repeatedly. Power cycle the system. If the button cannot be reset, replace the dissipation board.

Flashing 7

Verify wiring of all "Y" and "W" wires in the applicable wiring diagram.

Flashing 8

Verify wiring of all "Y" and "W" wires in the applicable wiring diagram.

Table 8 – Flash Code Chart

Yellow LED	Reason	Mode
Solid	Normal Operation	Normal Operation
Flashing 1	Sensor >= 20% LFL	Dissipation
Flashing 2	Sensor Open	Dissipation
Flashing 3	Normal Mitigation after Leak	Dissipation
Flashing 4	No Power to G Output	Dissipation with no Blower
Flashing 5	Fault with A2L Digital Sensor	Dissipation
Flashing 6	Test Button Stuck (>30 s)	Dissipation
Flashing 7	Y or W Wiring Inverted	Normal Operation
Flashing 8	Y or W Shorted	Normal Operation

Table 9 – 10K Temperature Sensor Resistance

°C	°F	OHM	°C	°F	OHM	°C	°F	OHM	°C	°F	OHM
-55	-67	963,800	-9	16	52,410	37	99	6,015	83	181	1,141
-54	-65	895,300	-8	18	49,660	38	100	5,774	84	183	1,105
-53	-63	832,100	-7	19	47,070	39	102	5,545	85	185	1,071
-52	-62	776,800	-6	21	44,630	40	104	5,326	86	187	1,038
-51	-60	719,900	-5	23	42,330	41	106	5,116	87	189	1,006
-50	-58	670,200	-4	25	40,160	42	108	4,916	88	190	975
-49	-56	624,200	-3	27	38,120	43	109	4,725	89	192	945
-48	-54	581,600	-2	28	36,190	44	111	4,542	90	194	916
-47	-53	542,200	-1	30	34,370	45	113	4,368	91	196	889
-46	-51	505,800	0	32	32,650	46	115	4,201	92	198	862
-45	-49	472,000	1	34	31,030	47	117	4,041	93	199	836
-44	-47	440,700	2	36	29,500	48	118	3,888	94	201	811
-43	-45	411,600	3	37	28,050	49	120	3,742	95	203	787
-42	-44	384,700	4	39	26,690	50	122	3,602	96	205	764
-41	-42	359,700	5	41	24,400	51	124	3,468	97	207	741
-40	-40	336,500	6	43	24,170	52	126	3,339	98	208	720
-39	-38	314,900	7	45	23,020	53	127	3,216	99	210	699
-38	-36	294,900	8	46	21,920	54	129	3,099	100	212	679
-37	-35	276,200	9	48	20,890	55	131	2,986	101	214	659
-36	-33	258,800	10	50	19,900	56	133	2,878	102	216	640
-35	-31	242,700	11	52	18,970	57	135	2,774	103	217	622
-34	-29	227,600	12	54	18,090	58	136	2,674	104	219	604
-33	-27	213,600	13	55	17,260	59	138	2,579	105	221	587
-32	-26	200,500	14	57	16,470	60	140	2,488	106	223	571
-31	-24	188,300	15	59	15,710	61	142	2,400	107	225	555
-30	-22	177,000	16	61	15,000	62	144	2,316	108	226	539
-29	-20	166,400	17	63	14,330	63	145	2,235	109	228	525
-28	-18	156,400	18	64	13,380	64	147	2,157	110	230	510
-27	-17	147,200	19	66	13,070	65	149	2,083	111	232	496
-26	-15	138,500	20	68	12,490	66	151	2,011	112	234	483
-25	-13	130,400	21	70	11,940	67	153	1,942	113	235	470
-24	-11	122,800	22	72	11,420	68	154	1,876	114	237	457
-23	-9	115,800	23	73	10,920	69	156	1,813	115	239	445
-22	-8	109,100	24	75	10,450	70	158	1,752	116	241	433
-21	-6	102,900	25	77	10,000	71	160	1,693	117	243	422
-20	-4	97,080	26	79	9,573	72	162	1,637	118	244	411
-19	-2	91,620	27	81	9,166	73	163	1,583	119	246	400
-18	0	86,500	28	82	8,778	74	165	1,531	120	248	389
-17	1	81,700	29	84	8,409	75	167	1,480	121	250	379
-16	3	77,190	30	86	8,057	76	169	1,432	122	252	370
-15	5	72,960	31	88	7,722	77	171	1,386	123	253	360
-14	7	68,980	32	90	7,402	78	172	1,341	124	255	351
-13	9	65,250	33	91	7,098	79	174	1,298	125	257	342
-12	10	61,740	34	93	6,808	80	176	1,256	126	259	333
-11	12	58,440	35	95	6,531	81	178	1,216	127	261	325
-10	14	55,330	36	97	6,267	82	180	1,178	128	262	317

OPTIONAL HEAT RECOVERY PACKAGE (HRP)

The heat recovery package is a factory installed option on GCA series heat pumps. The HRP can be used to heat potable water during unit operation using waste heat from the compressor discharge gas. In some cases the HRP can provide most or all of the hot water requirements for a typical home.

The HRP consists of three major components:

1. Double wall, vented refrigerant to water heat exchanger
2. Circulating pump
3. Control circuit

The heat exchanger is rated for use with potable water and is acceptable for use as a domestic water heating device in most building codes.

The pump circulates water between the domestic hot water tank and HRP heat exchanger in the Heat Pump. The control circuit ensures that the HRP only operates when there is available heat from the compressor and when the water is within a safe temperature range of below 140°F. When the heat pump compressor operates, the HRP will monitor the temperature of the discharge gas from the compressor. Once discharge gas is hot enough to provide useful heat to the domestic water tank, the circulating pump will be enabled, drawing water from the tank, through the HRP heat exchanger and then depositing the heated water back into the tank.

If the water temperature reaches 140_F, the circulating pump is disabled to prevent over heating of the domestic water. The HRP is provided with an on/off switch in case the end user desires that the HRP be inactivated (typically during the winter months when space heating is most important).

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

If heat recovery unit is installed in an area where freezing may occur, the unit must be drained during winter months to prevent heat exchanger damage. Heat exchanger ruptures that occur due to freezing will void the heat recovery package warranty along with the heat pump warranty

Water Tank Preparation

1. Turn off electrical or fuel supply to the water heater.
2. Attach garden hose to water tank drain connection and run other end of hose out doors or to an open drain.
3. Close cold water inlet valve to water heater tank.
4. Drain tank by opening drain valve on the bottom of the tank, then open pressure relief valve or hot water faucet.
5. Once drained the tank should be flushed with cold water until the water leaving the drain hose is clear and free of sediment.
6. Close all valves and remove the drain hose.
7. Install HRP water piping.

HRP Water Piping

All hot water piping MUST be a minimum of 3/8” O.D. copper tube to a maximum distance of 15 feet. For distances beyond 15 feet, but not exceeding 60 feet, use 1/2” copper tube. Separately insulate all exposed surface of both connecting water lines with 3/8” wall closed cell insulation. Install isolation valves on supply and return to the heat recovery. (See Fig. 27)

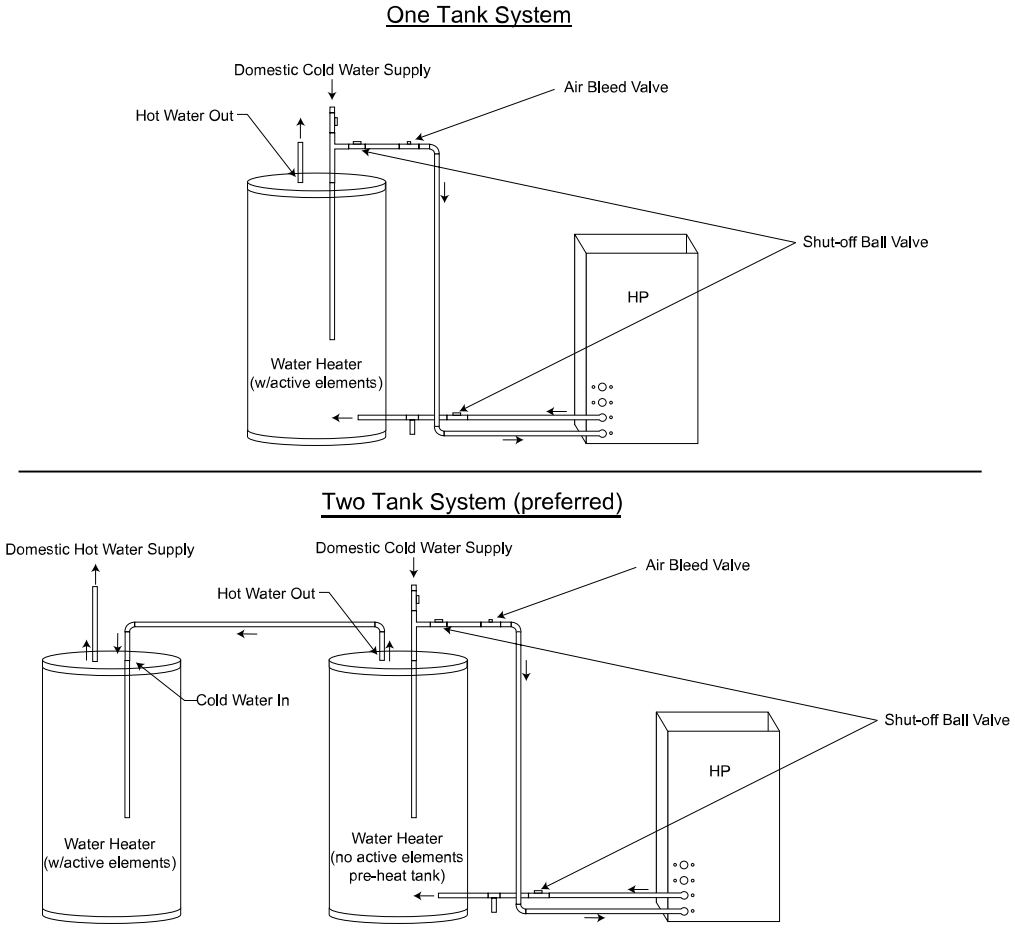


Fig. 27 – HRP Water Piping

Water Tank Refill

1. Open the cold water supply to the tank.
2. Open a hot water faucet to vent air from the system until water flows from the faucet, then close.
3. Depress the hot water tank pressure relief valve handle to ensure there is no air remaining in the tank.
4. Carefully inspect all plumbing for water leaks. Correct as required.
5. Purge all air from HRP by depressing the Schrader valve on the HR unit. Allow all air to bleed out until water appears at the valve.
6. Before restoring the power or fuel supply to the water heater, adjust the temperature setting on the tank thermostat(s) to ensure maximum utilization of heat available from the refrigeration system and to conserve the most energy.
   On tanks with thermostats and both upper and lower elements, the lower element should be turned down to 100°F, while the upper element should be adjusted to 120_F. Depending upon the specific needs of the customer, you may need to adjust the upper element differently.
   On tanks with a single thermostat, lower the thermostat setting to 120°F or the “LOW” position. After thermostat adjustments are completed, replace access cover and restore electrical or fuel supply to water heater.

IMPORTANT: Copper should be used for piping from HRP to domestic water tank(s). Use 5/8” (16mm) O.D. copper or larger. Refer to local codes for hot water piping. Insulate the water lines between the GHP and the water heater with a minimum of 3/8” (10mm) closed cell insulation.

Initial Start-up

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Make sure all valves in heat recovery water piping system are open. **NEVER OPERATE HR PUMP DRY**.

1. Turn on the heat pump. The HR pump should not run if the compressor is not running.
2. Turn HR switch to the “ON” position. The pump will operate if entering water temperature to HR is below 120°F.
3. The temperature difference between the water entering and leaving the heat recovery should be 5°F to 15°F.
4. Allow the unit to operate for 20 to 30 minutes to ensure it is functioning properly. The pump should shut off when the water temperature entering the heat recovery reaches 120°F.

FIELD INSTALLED ACCESSORIES

Auxiliary Heaters

Internally mounted auxiliary heaters are available in 5, 10, 15 and 20 Kw sizes. For installation procedures, refer to the instructions shipped with the heaters. Table 10 lists compatible heaters with GCA units.

Table 10 – Electric Heater Compatibility

Aux. Heat Size Compatibility				
GHP Model	**5 Kw**	**10 Kw**	**15 Kw**	**20 Kw**
GCA24	•	•	—	—
GCA36	•	•	•	—
GCA48	•	•	•	•
GCA60	•	•	•	•
GCA72	•	•	•	•

Flow Centers and Associated Loop Accessories

A wide variety of flow centers are available for both closed and open loop installations, along with hose kits, fittings, solenoid valves, etc. Refer to the instructions shipped with these components for further details.

SYSTEM FUNCTIONS AND SEQUENCE OF OPERATION

GCA units are designed for communicating-only controls. Communicating Sequence: The ODU board controls all functions. See Fig. 34.

Communication and Status Function Lights

A green LED (COMM light) on the ODU (see Fig. 34) indicates successful communication with the other system products. The green LED will remain OFF until communication is established. Once a valid command is received, the green LED will turn ON continuously. If no communication is received within 2 minutes, the LED will be turned OFF until the next valid communication.

Amber Status Light - An amber colored STATUS light is used to display the operation mode and fault codes as specified in the troubleshooting section. See Table 17 for codes and definitions.

NOTE: Only one code will be displayed on the ODU board (the most recent, with the highest priority).

Time Delays

Unit time delays include:

- Five minute time delay to start cooling or heating operation when there is a call from the thermostat or user interface. To bypass this feature, momentarily short and release Timer Speed-Up pins.
- Five minute compressor re-cycle delay on return from a brown-out condition.
- Two minute time delay to return to standby operation from last valid communication (with UI only).
- There is no delay between staging from low to high and from high to low capacity. The compressor will change from low to high and from high to low capacity “on the fly” to meet the demand.

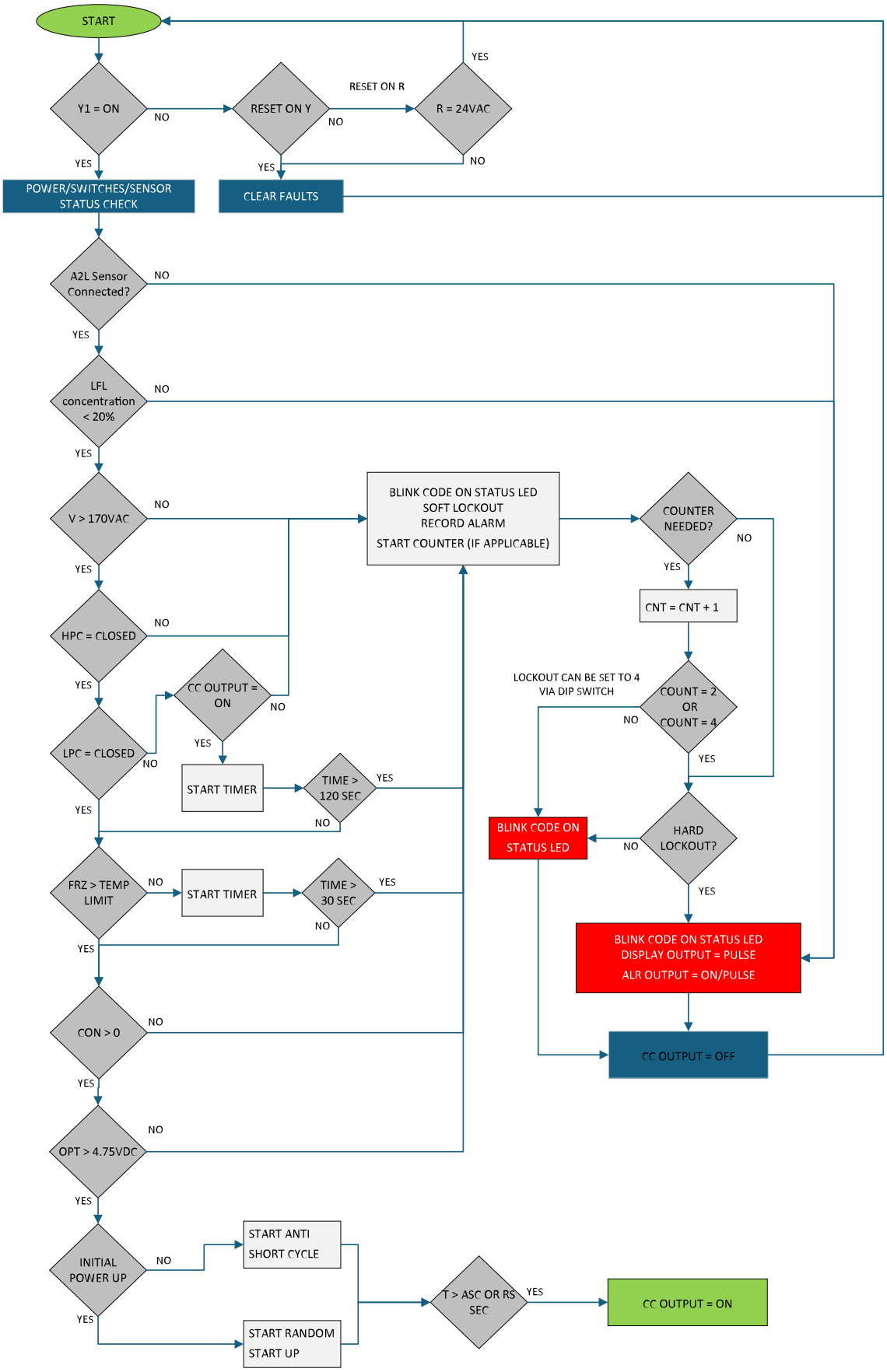


Fig. 28 – Sequence of Operation (SOO) Flow Chart

Compressor Operation

The basic scroll design has been modified with the addition of an internal unloading mechanism that opens a by-pass port in the first compression pocket, effectively reducing the displacement of the scroll. The opening and closing of the by-pass port is controlled by an internal electrically operated solenoid.

The modulated scroll uses a single step of unloading to go from full capacity to approximately 67% capacity. A single speed, high efficiency motor continues to run while the scroll modulates between the two capacity steps. Modulation is achieved by venting a portion of the gas in the first suction pocket back to the low side of the compressor, thereby reducing the effective displacement of the compressor.

Full capacity is achieved by blocking these vents, thus increasing the displacement to 100%. A DC solenoid in the compressor controlled by a rectified 24 volt AC signal in the external solenoid plug moves the slider ring that covers and uncovers these vents.

The vent covers are arranged in such a manner that the compressor operates at approximately 67% capacity when the solenoid is not energized and 100% capacity when the solenoid is energized. The loading and unloading of the two step scroll is done “on the fly” without shutting off the motor between steps.

NOTE: 67% compressor capacity translates to approximately 75% cooling or heating capacity at the indoor coil. The compressor will always start unloaded and stay unloaded for five seconds even when the thermostat is calling for high stage capacity.

Troubleshooting units for proper switching between low & high stages

Check the suction pressures at the service valves. Suction pressure should be reduced by 3-10% when switching from low to high capacity.

Compressor current should increase 20 to 45% when switching from low to high stage. The compressor solenoid when energized in high stage, should measure 24VAC across pin numbers PL5-2 HI and PL5-5 C. When the compressor is operating in low stage, the 24V DC compressor solenoid coil is de-energized. When the compressor is operating in high stage, the 24V DC solenoid coil is energized.

The solenoid plug harness that is connected to the compressor has an internal rectifier that converts the 24V AC signal to 24V DC.

DO NOT INSTALL A PLUG WITHOUT AN INTERNAL RECTIFIER.

Unloader Test Procedure

The unloader is the compressor internal mechanism, controlled by the DC solenoid, that modulates between high and low stage. If it is suspected that the unloader is not working, the following methods may be used to verify operation.

1. Operate the system and measure compressor amperage. Cycle the unloader on and off at 30 second plus intervals at the User Interface (from low to high stage and back to low stage). Wait 5 seconds after staging to high before taking a reading. The compressor amperage should go up or down at least 20 percent.
2. If the expected result is not achieved, remove the solenoid plug from the compressor and with the unit running and the User Interface or thermostat calling for high stage, test the voltage output at the plug with a DC voltmeter. The reading should be 24 volts DC.
3. If the correct DC voltage is at the control circuit molded plug, measure the compressor unloader coil resistance. The resistance should be approximately 330 or 1640 ohms depending on unloader coil supplier. If the coil resistance is infinite or is grounded, the compressor must be replaced.

Two Stage Compressor

The two stage compressor contains motor windings that provide 2-pole (3500 RPM) operation.

Compressor Internal Pressure Relief

The compressor is protected by an internal pressure relief (IPR) which relieves discharge gas into the compressor shell when differential between suction and discharge pressure exceeds 550-625 psi. The compressor is also protected by an internal overload attached to motor windings.

Compressor Control Contactor

The contactor has a 24volt coil. The electronic control board controls the operation of the contactor.

Troubleshoot Compressor

If the compressor fails to operate, Table 11 can be used to verify if there is any damage to the compressor windings causing system malfunction.

Table 11 – Winding Resistance

Compressor Ohms		
Model Size	Start Winding	Run Winding
24	1.64	1.3
36	1.52	0.88
48	1.86	0.52
60	1.63	0.39
72	1.85	0.34
Tolerance */- 7%. All resistance values must be measured with compressor at room temperature.		

SYSTEM CHECKOUT

After completing the installation, and before energizing the unit, the following system checks should be made:

1. Verify that the supply voltage to the heat pump is in accordance with the nameplate ratings.
2. Make sure that all electrical connections are tight and secure.
3. Check the electrical fusing and wiring for the correct size.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Ensure cabinet and electrical box are properly grounded

4. Verify that the low voltage wiring between the thermostat and the unit is correct.
5. Verify that the water piping is complete and correct.
6. Check that the water flow is correct, and adjust if necessary.
7. Check the blower for free rotation, and that it is secured to the shaft.
8. Verify that vibration isolation has been provided.
9. Unit is serviceable. Be certain that all access panels are secured in place.
10. Verify that blower support has been removed.
11. Verify that ductwork has been properly fastened to supply and return duct collars.
12. Make sure return air filters are positioned correctly in the filter rack.

ELECTRICAL

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position.

There may be more than 1 disconnect switch. Lock out and tag switch with a suitable warning label.

IMPORTANT: Units supplied with internal electric heat require two (2) separate power supplies:

1) Unit compressor

2) Electric Heat, blower motor and control circuit. Refer to the ELECTRIC HEATER PACKAGE OPTION section. See data plate for minimum circuit ampacities and maximum fuse/breaker sizing.

Electrical Connections

⚠ WARNING

ELECTRICAL OPERATION HAZARD

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

Before installing or servicing unit, always turn off all power to unit. There may be more than 1 disconnect switch. Turn off accessory heater power if applicable.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

If a disconnect switch is to be mounted on the unit, select a location where drill or fastener will not contact electrical or refrigerant components.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Field wires on the line side of the disconnect remain live, even when the pull-out is removed. Service and maintenance to incoming wiring can not be performed until the main disconnect switch (remote to the unit) is turned off.

NOTE: Before proceeding with electrical connections, make certain that supply voltage, frequency, and phase are as specified on unit rating plate. Be sure that electrical service provided by the utility is sufficient to handle the additional load imposed by this equipment. See unit wiring label for proper field high and low-voltage wiring. Make all electrical connections in accordance with NEC and any local codes or ordinances that may apply. Use copper wire only. The unit must have a separate branch electric circuit with a field-supplied disconnect switch located within sight from and readily accessible from the unit.

24-V Control System Connections to Bus Com Harness Field Connection

Use the field ABCD connector provided with the User Interface. Connect this plug to the factory wired female ABCD connector on the bus com harness (see Fig. 25). Use No. 18 AWG color-coded, insulated (35°C minimum) wires to make low-voltage connections between User Interface and unit. If User Interface is located more than 100 ft. from unit (as measured along the low-voltage wires), use No. 16 AWG color-coded, insulated (35°C minimum) wires or in accordance with local codes.

Connect low-voltage leads to User Interface (See Fig. 29).

NOTE: Where local codes require User Interface wiring be routed through conduit or raceways, splices can be made inside blower unit. All wiring must be NEC Class l and must be separated from incoming power leads.

Low-Voltage Circuit Fusing and Reference

The low-voltage circuit is fused by a board-mounted 3-amp. automotive fuse placed in series with transformer SEC1 and R circuit. The C circuit of transformer circuit is referenced to chassis ground through a printed circuit run at SEC2 and metal PC board mounting eyelets. Check to be sure PC Board is mounted securely using both factory installed screws.

NOTE: Mis-wiring or shorting any of the low voltage connections may cause the low voltage fuse to open but will not damage the User Interface or ECM board. Simply rewire and replace fuse to correct fault.

Ground Connections

⚠ WARNING

ELECTRICAL OPERATION HAZARD

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

The cabinet must have an uninterrupted or unbroken ground according to NEC, ANSI/NFPA 70 and local codes to minimize personal injury if an electrical fault should occur.

The ground may consist of electrical wire or metal conduit when installed in accordance with existing electrical codes.
(See Ground/Conduit Note below.)

NOTE: Use UL listed conduit and conduit connector to connect supply wire(s) to unit and obtain proper grounding. If conduit connection uses reducing washers, a separate ground wire must be used. Grounding may also be accomplished by using grounding lug provided in control box. Use of dual or multiple supply circuits will require grounding of each circuit to ground lugs provided on unit and heaters.
Refer to electrical component box layout. See Fig. 25.

⚠ CAUTION

UNIT OPERATION HAZARD

Failure to follow this caution may result in equipment damage and/or improper operation.

- Field wiring must comply with local and national electrical codes.
- Power to the unit must be within the operating voltage range indicated on the unit nameplate or on the performance data sheet.
- Operation of unit on improper line voltage or with excessive phase imbalance will be hazardous to the unit, constitutes abuse, and may void the warranty.

Properly sized fuses or HACR circuit breakers must be installed for branch circuit protection. See unit nameplate for maximum fuse or breaker size.

NOTE: Use copper wire only between disconnect switch and unit.

The unit is provided with a concentric knock-out for attaching common trade sizes of conduit, route power supply wiring through this opening.

Always connect the ground lead to the grounding lug provided in the control box and power leads to the line side of compressor contactor as indicated on the wiring diagrams.

ELECTRONIC THERMOSTAT INSTALLATION

Field Connections

This section is intended as a quick reference only and should not replace a complete review of thermostat Installation Instructions.

The GCA unit can be installed as communicating with UI communicating thermostats only.

Communicating

User Interface (UI) is designed to self-program with he GCA unit when connected to the unit bus com harness ABCD connector (refer to Fig. 29) with the ABCD male adapter included with the unit in the literature packet shipped with the unit. 4 wires are needed as the bus com harness communicates between both unit boards and the UI when connected.

NOTE: Field wiring only needs to go to ODU and connector as the boards have factory wiring between them.

NOTE: It is advisable to run extra thermostat wire during installation in the event of faulty wires, etc.

Communicating System Tips:

- The GCA units include an Outdoor Air Temperature (OAT) sensor in the literature packaging. Refer to Table 12 for System Controls that can incorporate this OAT and to the System Control instructions for wiring.
- The GCA unit must be used with System Control version 13 or newer software for communicating connections.
- Wi-Fi capability will be available with the Wi-Fi System Controls listed in Table 12.
- To enter the System Control service mode hold the service cap in the main menu for about 10 seconds until it turns green then release.
- The last 10 system faults can be found in the service screens. Flash codes on the ODU board flash only an active code with series of short and long flashes on the amber LED. A code 37 will appear on the ODU LED as 3 short flashes followed by a pause then 7 long flashes followed by another pause and repeats this series. The System Control will display text on the screen for the last 10 events.
- Exit service screens by selecting “Done”.

Table 12 – Recommended System Controls

Bryant System Controls	PART NO.*
Evolution™ Connex™ System Control - Black	SYSTXBBECC01-C
Evolution™ Connex™ System Control - White	SYSTXBBWEC01-C
OR	
Evolution™ Connex™ System Control with bundled router	SYSTXBBECW01
Network Interface Module	SYSTXBBNIM01
OR	
Evolution™ System Control	SYSTXBBECN01
Carrier System Controls	**PART NO.***
Infinity® System Control - Black	SYSTXCCITC01-C
Infinity® White System Control - White	SYSTXCCWIC01-C
OR	
Infinity® Control Wi-Fi with bundled router	SYSTXCCITW01
OR	
Infinity® Touch Control	SYSTXCCITN 01
Network Interface Module	SYSTXCCNIM01

Non-Communicating (Emergency Mode Only)

Temporary Emergency Electric Heat Mode in Event of UI Failure In the event the system UI fails after initial UI install and there is a need for heat while a replaceable UI can be obtained, these steps can be followed with a non-communicating thermostat to provide electric heat only temporarily.

The ECM board non-communicating stat connections can be wired with a non-communicating thermostat to provide emergency electric heat temporarily by connecting only C, W, G and R.

Disconnect the bus com harness ABCD connector to the ECM.

Do NOT wire the Y as the programming in the ODU will not allow cooling or heating mode.

System is not to be left in this configuration for an extended period, UI must be replaced as soon as possible.

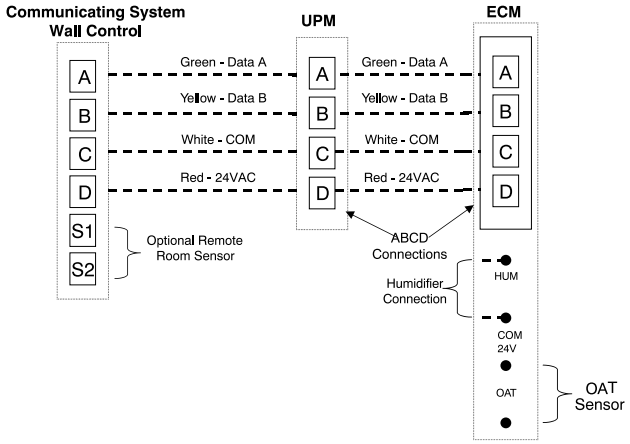


Fig. 29 – Universal Connection

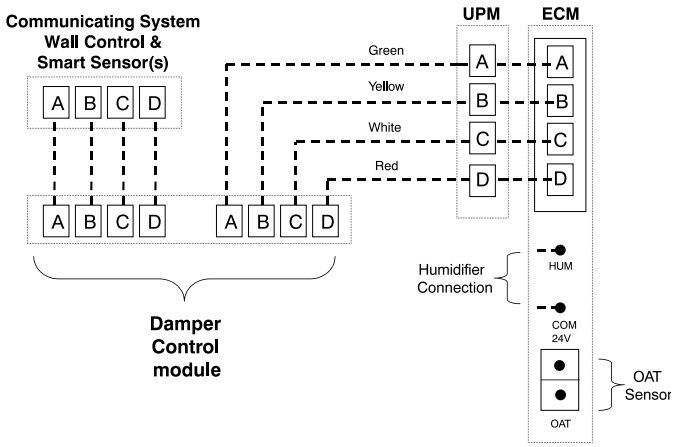


Fig. 30 – Zoning Connection for Geothermal Package Unit

CAUTION

Failure to follow this caution may result in improper operation.

The electric heat lock-out feature is included because it is required by statute for manufactured housing. This feature must not be enabled for geothermal closed loop installations except where required by law. When auxiliary heat is disabled, and the GHP does not satisfy the heating call, the GHP will continue to run, possibly non-stop for long periods of time. Longer run times on the GHP will reduce the loop temperature, lowering the capacity of the GHP. This in turn causes the GHP to continue to run in an attempt to satisfy the thermostat, which will further reduce the loop temperature. Operating the GHP (and loop) non-stop without the aid of auxiliary electric (when it’s needed) causes a negative “fly-wheel” effect. The extreme result could be freezing the loop fluid causing a unit lock-out which will require switching to emergency heat while the loop recovers (thaws).

FIELD INSTALLED COMPONENTS

Electric Heaters

Electric heater kits are designed exclusively for field installation. The electric heat banks slide seamlessly into the electric heat collar, while the electric heat control section mounts securely to the H support located above the unit's control box. GCA units are compatible only with communicating electric heat kits, which feature a two-piece, user-friendly design with a wiring harness that connects a 12-pin connector to a corresponding 12-pin mated connector within the control box assembly.

Main power wiring to the heater is separate to the compressor compartment. The cabinet design allows for easy cabinet access for power cable routing via punch outs on the corner posts. Refer to Table 13 for compatible heaters.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment Internal mount heaters used only for vertical top-discharge and horizontal
end-discharge units.
• Horizontal side-discharge units require external duct heaters.
• External duct mount heaters can be used in all configurations, if desired.damage.
Failure to follow the Installation Instructions for the Electric Heater Kits could result in equipment damage.

Table 13 – Aux. Heat Size Compatibility

Heater Series	GHP Model GCA	Aux. Heat Size Compatibility			
		5 kW	10 kW	15 kW	20 kW
Internal Mount		KWCEH 0301N05	KWCEH 0301N10	KWCEH 0301B15	KWCEH 0301B20
	024	•	•	–	–
	036	•	•	•	–
	048	•	•	•	•
	060	•	•	•	•
	072	•	•	•	•
• = Heater Compatible / – = Heater kit NOT compatible					

NOTES:
- Internal mount heaters used only for vertical top-discharge and horizontal end-discharge units.

IMPORTANT: 3rd party electric heaters may offer a design with 12-pin connection but they are not recommended and may not be recognized by the communicating controls.

Manufactured Housing

In manufactured housing applications, the Code of Federal Regulations, Title 24, Part 3280.714 requires that supplemental electric heat be locked out at outdoor temperatures above 40°F (4.4°C), except for a heat pump defrost cycle.

The User Interface with an outdoor air temperature sensor can be used to lockout supplemental heat above 40°F (4.4°C). Refer to User Interface Setup Instructions for how to set “Electric Heat Lockout” temperature.

To lock out the supplemental heat in the UI for systems with electric heat:

From MAIN screen:

1. Touch “menu”
2. Touch arrow-down
3. Touch service icon for 10 seconds until it turns green
4. Touch “setup”
5. Touch “heat source lockouts”
6.

NOTE: Supplied outdoor air temperature sensor is field-install option. Connect to ECM board. See Fig. 31.

Outdoor Air Temperature Sensor (OAT)

An optional outdoor air temperature (OAT) sensor is provided in the literature package. Install the sensor outdoors, typically on the north side of the residence away from direct sunlight. Sensor package includes an adhesive holder for the sensor. See Fig. 31 for wiring the sensor to the OAT plug. Do not connect to the optional remote sensor terminals (S1, S2) on the UI.

Humidity control uses the OAT to adjust humidity target when the OAT drops into the cold range to prevent forming of condensation on windows. It also allows the UI to display outdoor air temperature.

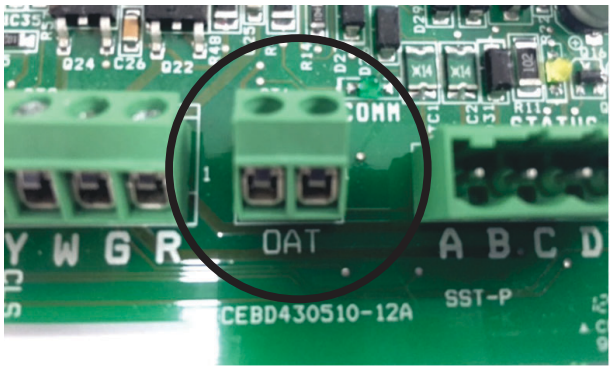


Fig. 31 – OAT Sensor Connection

Outdoor Air Thermistor

A 2-screw terminal strip is provided for connection of an outdoor temperature thermistor. The installation of an outdoor temperature sensor using the ECM board terminals is optional. OAT input can be used to supply outdoor temperature data for system level functions and for temperature display on User Interface. If an OAT is added, it will be used for system level functions.

Using two wires of field-supplied thermostat wire cable, wire one lead of thermistor to one screw terminal and the other lead to remaining screw terminal; there is no polarity to be observed. It is strongly recommended that two wires be used to connect the thermistor to eliminate noise interference in temperature reading. If there are not two spare wires available in cable, one wire may be used to connect thermistor to OAT screw terminal 1 and the other lead of the thermistor can be wired to 24VAC COM (C) wire. OAT screw terminal 1 is terminal located closest to the ABCD system communications and is marked with a small number 1 next to the terminal strip.

NOTE: Mis-wiring OAT inputs will not cause damage to either ECM board or thermistor. If the thermistor is wired incorrectly, no reading will appear at User Interface. Re-wire thermistor correctly for normal operation.

Electronic Air Cleaner Connections

When using an electronic air cleaner, use airflow sensor part no. KEAAC0101AAA. The airflow sensor turns on electronic air cleaner when blower is operating.

Humidifier Connections

The ECM board terminal marked “HUM” is provided for low voltage (24VAC) control of a humidifier. No humidistat is required as User Interface monitors indoor humidity. When commanded to operate humidifier, the ECM board will energize the “HUM” output to turn humidifier on and de-energize HUM output to turn humidifier off. Wire “HUM” and “C” terminals directly to humidifier as shown in Fig. 29 or Fig. 30.

System Shutdown Accessories

The G thermostat terminal input can be configured through the User Interface to recognize accessories that will shut the system down in response to a malfunction. The ECM board can be configured to recognize either Normally Open or Normally Closed (default) contact devices through the User Interface Set-up screens. Wire the accessory device contacts in series with the R and G thermostat connections at the ECM board. The User Interface will respond to the accessory device signal by ordering a shutdown of the system and will display SYSTEM MALFUNCTION on its screen. Refer to the User Interface Installation Instructions for more detail. See Fig. 32.

Generator

The ECM board G thermostat terminal input can be configured through the User Interface to recognize a Generator Normally Open dry-contact output to signal the system that a generator malfunction condition exists. Wire the generator output in series with the R and G thermostat connections at the ECM board. The User Interface will display GENERATOR MALFUNCTION when the G thermostat input is energized. This function requires the addition of a Generator Self Test Verifier (Part No. GSV200) which must be purchased separately. Visit www.GeneratorVerifier.com for details and ordering information. Refer to the User Interface Installation Instructions for more detail. See Fig. 33.

Ventilation Accessory

The G thermostat terminal input can be configured through the User Interface to recognize a Normally Open dry-contact output to signal the system that a Ventilation Accessory requires blower operation. Blower operation can be configured for Low, Med or High speed when the G terminal is energized. Wire the Accessory output in series with the R and G thermostat connections at the ECM board. Refer to the User Interface Installation Instructions for more detail. See Fig. 32.

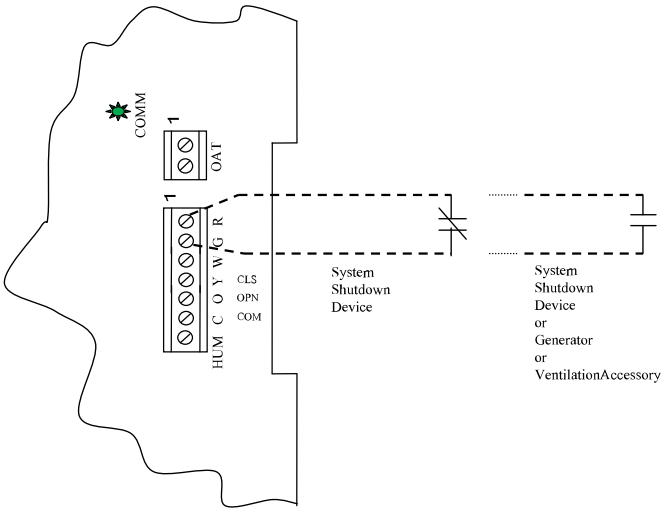


Fig. 32 – Terminal Accessory Wiring

Timer Speedup (Test Mode)

Timer Speed Up allows the unit to bypass all start timings to below 10 seconds to allow the unit to run for testing purposes. This speed up will last one cycle until unit shuts down for the next start.

Start timings include:

- Anti-short cycle time (5 minutes)
- Random start-up

On a system with a communicating control, from the main menu, enter the Service mode by holding the Service hat icon for approximately 10 seconds until it turns green. Enter the checkout screen. This allows an option to run 5 minutes low stage or 5 minutes high stage, each adjustable up to 120 minutes and stoppable at any time.

PRE-START-UP CHECKLIST

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Check with all code authorities on requirements involving condensate disposal/overflow protection criteria.

- ☐ Ensure the isolation valves are open and water control valves are wired.
- ☐ Loop/water piping is complete and flushed, (clean and purged of air).
- ☐ Verify loop water chemistry meets requirements on water chemistry table (reference table 1)
- ☐ Antifreeze is added if necessary
- ☐ Verify the freeze protection is set according to proper freeze temperature (26°F or 15°F)
- ☐ Verify the HRP system is purged and connected completely, if applicable.
- ☐ Verify HRP switch is energized, if applicable. Recommend electrically de-energize if installed and water not available.
- ☐ Remove access panels to access applicable compartments.
- ☐ Verify sufficient space is available for accessing and servicing areas such as the blower and electric heat compartment and the compressor and electrical control box compartment.
- ☐ Verify all supply voltage is in accordance with unit nameplate.
- ☐ Verify all wiring is tight and secure.
- ☐ Verify system voltage is per the system rating.
- ☐ Check that the unit blower is free to rotate and wheel is secure to shaft.
- ☐ Verify the condensate drain pan is clear and drains with proper external trap and pipe pitch.
- ☐ Ensure the system air filters are installed.
- ☐ Verify Loop pump wiring, if applicable, is in accordance with the pump installation instructions.
- ☐ Verify all system accessories and components are wired per applicable instructions and all wiring in accordance with NEC.
- ☐ The UI will override the ODU dip switch settings.

Settings should be configured in the User Interface during set up (see steps below in user interface quick set up).

- ☐ Ensure there are no wires pinched when panels are re-installed.
- ☐ Ensure all panels are in place before powering up the unit.

USER INTERFACE QUICK SET-UP

- ☐ Install only approved thermostats per the unit Product Data. Communicating geothermal units require UI software version 13 or later. Read and Understand the thermostat Installation Instructions, this start-up is not intended to replace the thermostat Installation Instructions.
- ☐ Install each component per unit Installation Instruction. Wire each accordingly.
- ☐ Enter the service and installation screens in the UI

Upon powering up the system, the user interface installation will seek out the control boards in the unit and recognize the unit model and size and communicating electric heat, if installed.Component search order:

- Indoor (ECM is the indoor if GCA model)
- Outdoor (ODU)
- SAM if applicable
- Zoning if applicable
- Any non-communicating components via selectable screens.

- ☐ Run set up to select specific features desired such as ODU switch settings (brownout, lockout and freeze protection).

SYSTEM INITIAL POWER UP AND CHECKOUT

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

Ensure cabinet and electrical box are properly grounded

- ☐ From the UI main screen select menu. Then find and select the service cap icon. Touch and hold the icon for about 10 seconds until it turns hat green then release to enter the screen that provides these options:

- Equipment summary
- Installation
- Setup
- Checkout

Select Installation to initialize equipment set up and follow screen prompts as necessary.

- ☐ Verify equipment summary is correct and complete by selecting equipment summary.
- ☐ Select Setup option to select system settings such as brownout protection, lock out settings and freeze protection. Set up air flow settings in the Setup option. Follow on screen prompts for airflow options.
- ☐ Airflow verification test can be achieved from the installation and service screen after full installation.

Cooling Airflows:

- Quiet: lowest airflow (~300CFM pr ton)
- Comfort: Default (varied on temp/humidity)
- Efficiency: (1 and 2) (fixed and no dehum)
- Max: (~400 CFM pr ton) (no dehum)

Heating Airflows:

- Comfort: Default (varied on temp/humidity)
- Efficiency: (1 and 2) (fixed and no dehum)
- Max: (~400 CFM pr ton) (no dehum)

Check out mode can now be accessed to check out cooling or heating modes for up to 120 minutes and can be stopped at any time. Start in high stage cooling for 1st 10 minutes of operation.

HRP feature should be turn off during unit performance checks.

- ☐ Verify high cool
- ☐ Verify low cool
- ☐ Verify high heat
- ☐ Verify low heat
- ☐ Verify Electric Heat Operation in emergency and auxiliary heat mode if applicable
- ☐ Conduct System Verification per the section below and the start-up checklist.
- ☐ Set up the thermostat for normal operation, set up customer preferences for programming
- ☐ Make sure company logo and contact info has been added to UI.
- ☐ Explain thermostat operation and maintenance to the homeowner.

SYSTEM VERIFICATION

The unit is shipped with a Unit Start-up Checklist in the literature package. Complete the Start-up Checklist as you check the items below, and save it in the customer's file at your dealership.

☐ HRP feature should be turned off during unit performance checks.

☐ Start in high stage cooling for 1st 10 minutes of operation.

☐ Allow the unit to operate for minimum of 5 minutes between system changes to stabilize before checking system performance.

NOTE: It is not recommended to access the refrigerant system at start up on package units. Access should only be necessary as last resort in troubleshooting to prevent unnecessary charge issues.

☐ Check the water flow and operating conditions.

NOTE: Tables typically show 3 GPM rates for each unit size. Rates are described from top to bottom listed as:

- Top listed GPM: minimum suggested for open loop.
- Middle listed GPM: minimum suggested for closed loop.
- Bottom listed GPM: Suggested rate for closed loop.

☐ Verify the unit is operating within 10% of the Heat of Extraction (HE)/Heat of Rejection (HR) published in the unit Product Data Performance tables. Access Product Data on HVAC Partners.

a. HE/HR= GPM x TD x Fluid Factor (500 for water, 485 for antifreeze).

b. Utilize Ht. Abs Btu/hr in heating mode for capacity.

c. Utilize Ht. Rej Btu/hr in cooling mode for capacity.

Main Control Boards

The GCA unit is designed as a package unit containing similar components as those found in an outdoor refrigeration split system and also those found in an indoor fan coil system. This unit has an electrical box (E-box) that contains both of the main control boards of this package unit and more.

The Outdoor Unit Board (ODU) is the board that provides the system protection and compressor operation control (see Fig. 34).

The electronically commutated module (ECM) is the board that controls the blower motor (see Fig. 38).

The newly designed hinged electrical panel allows for easy access to internal components during servicing. By simply removing the screws and opening the panel, technicians can conveniently reach components behind the electrical box, such as the reversing valve. The electrical box is also designed for flexibility—6 screws on the top and bottom can be removed, and with the wiring routed through one side, the box can be carefully swung in the direction of the wiring bundle to access components behind it if necessary. While all sides of the cabinet are accessible, if the unit is positioned where access to all sides is challenging, the removal of the box can provide additional convenience

The transformer is a 75va transformer which should provide ample power for accessories. Size loads properly so they do not exceed capability of the transformer.

The transformer allows 208/230V selection with the factory default of 230V. The transformer has a 5amp circuit breaker internally built in for class 2 rating. See Fig. 33.

The circuit board has a 3 amp fuse that should identify any issues before the 5 amp circuit breaker trips. In an unlikely event of the transformer 5 amp circuit breaker tripping, it has a manual reset.

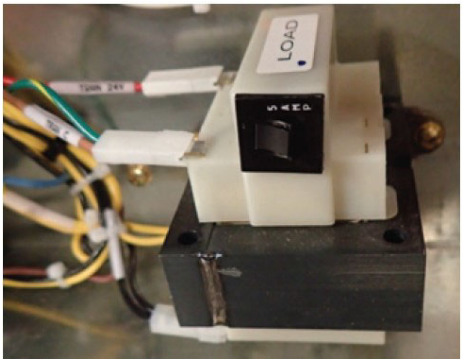
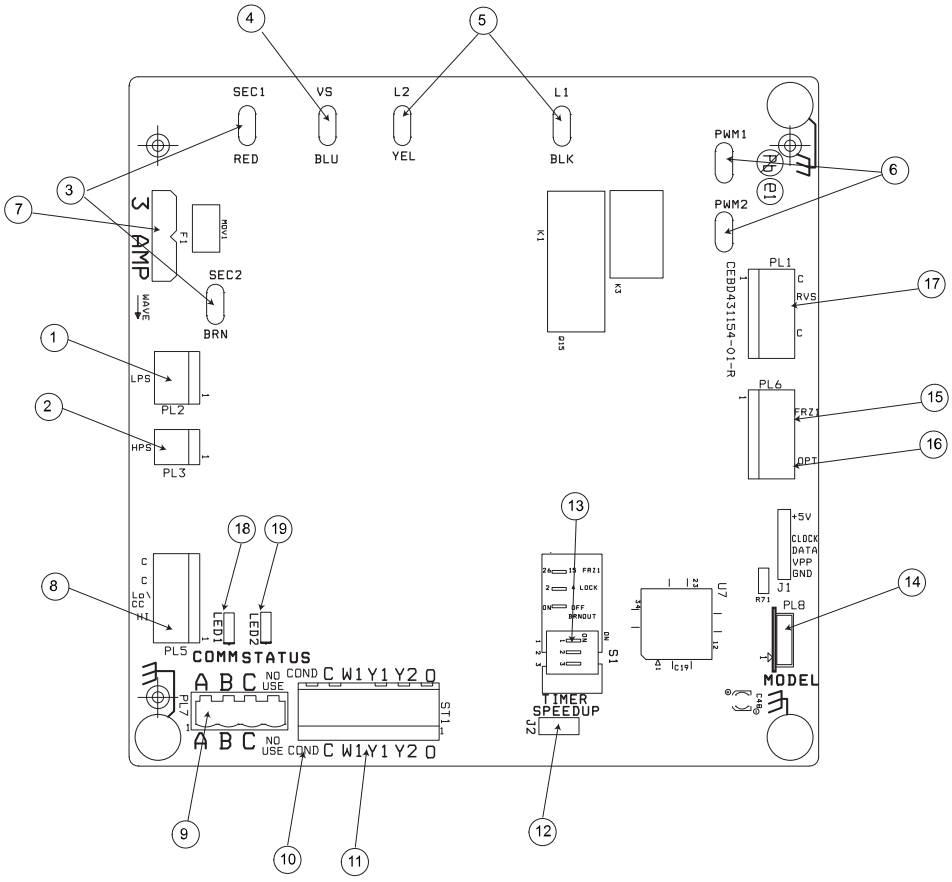


Fig. 33 – Transformer

ODU Board



LEGEND

1. **PL2 LPS**: Low pressure switch
2. **PL3 HPS**: High pressure switch
3. **SEC1 and SEC2**: Transformer
4. **VS**: Start circuit high voltage
5. **L2 and L1**: Contactor and high voltage
6. **PWMI and PWM2**: N/A
7. **F1**: 3 amp fuse
8. **PL5**: Compressor plug
9. **PL7**: ABCD Comm stat connection
10. Jumper between COND and Y1
11. **C W 1 Y 1 Y2 0**: Standard tstat connection
12. **J2 Speed Up Timer**: Test jumper (not operable for GCA communicating models)
13. **S1**: DIP switches
14. **PL8 Model**: Model plug connection
15. **PL6 FRZ1**: Water coil freeze sensor
16. **PL6 OPT**: Condensate overflow
17. **PL1 RVS**: Reversing valve plug
18. **LED1 COMM**: Comm status light
19. **LED2 STATUS**: status and fault code light

Fig. 34 – Outdoor Unit Board (ODU)

The ODU Board includes the following features:

- **LOW PRESSURE SWITCH**: The low pressure switch safety is designed to shut down the compressor in the event of loss of charge. Cut in 60 +/- 15 psig and cut out 40 +/- psig.
- **HIGH PRESSURE SWITCH**: The high pressure switch safety is designed to shut down the compressor if it exceeds limits. Cut in 420 +/- 15 psig and cut out 600 +/- psig.
- **ANTI-SHORT CYCLE TIMER**: 5 minute delay on break timer to prevent compressor short cycling.
- **RANDOM START**: Each board has a unique random start delay ranging from 30 to 270 seconds on initial power up to reduce the chance of multiple unit simultaneously starting at the same time after power up or after a power interruption, thus avoiding creating large electrical spike.
- **SLOW PRESSURE BYPASS TIMER**: If the compressor is running and the low pressure switch opens, the board will keep the compressor ON for 120 seconds. After 2 minutes if the low pressure switch remains open, the board will shut down the compressor and enter a soft lockout. The compressor will not be energized until the low pressure switch closes and the anti-short cycle time delay expires. If the low pressure switch opens 2-4 times in 1 hour, the unit will enter a 4 hour lockout period.

  P**ressure Switch Protection**: The geothermal unit is equipped with high- and low-pressure switches. If the control senses the opening of a high- or low-pressure switch, it will respond as follows:

  1. De-energize the compressor contactor.
  2. Display the appropriate fault code (see Table 15).
  3. After a 15 minute delay, if there is a call for cooling or heating and LPS or HPS is reset, the compressor contactor is energized.
  4. If the open switch closes anytime after the 15 minute delay, then resume operation with a call for cooling or heating.
  5. If LPS or HPS trips 2-4 consecutive cycles per the dip switch lockout setting or UI setting (Communicating only), the unit operation is locked out for 4 hours.
  6. In the event of a high-pressure switch trip or high-pressure lockout, check the refrigerant charge, and the coax coil (in cooling) for water issues, or indoor airflow in heating.
  7. In the event of a low-pressure switch trip or low-pressure lockout, check the refrigerant charge and indoor airflow (cooling) and coax coil water pressure and flow in heating.
- **CONTROL FAULT**: If the geothermal unit control board has failed, the control will flash the appropriate fault code (see Table 18). The control board should be replaced.
- **ODU DIP SWITCH SETTINGS**: The ODU has 3 features controlled on the dip switch.

  1. 1. Freeze Protection Limit for the Freeze one water coil.
  2. Lockout Settings (Soft Lockouts)
  3. Brownout (High voltage protection)

DIP SWITCH		DIP Switch Position	
		ON	OFF (default)
SW1	Freeze Protection Limit	15°F	26°F
SW2	Number of trips to lockout (HPS/LPS)	4	2
SW3	Brownout	Brownout protection is disabled	Brownout protection is active

NOTE: The settings are recommended to be adjusted in the System Control screens and ODU dip switch settings left at default positions.

- **WATER COIL FREEZE SENSOR**: The water coil is protected by a thermistor located between the condensing water coil (coax) and the thermal expansion valve (see Fig. 35).
  The setting is default at 26°F (-3.33°C) but can be changed for units with ample anti-freeze to have a lower setting of 15°F (-9.44°C) with the dip switch selection or UI setting.
  If the unit is employing an open loop system (no anti-freeze protection), the freeze limit trip for the UI will only allow selection of 26°F (-3.33°C) in order to shut down the unit at the appropriate leaving water temperature and protect the heat pump from freezing.
  If the refrigerant temperature drops below or remains at freezing limit trip for 30 seconds, the ODU will shut down the compressor and the board will flash fault code 86 (FRZ1 lockout). Fault code 86 will remain until the condition is corrected and also requires a manual reset low voltage circuit. After a manual reset and there is a call for heating, the unit will be re-energized automatically ONLY when the freeze sensor temperature is 7°F (-13.9°C) above set point (SW1).
  Fault code 57 is FRZ1 sensor fault, which means the sensor is invalid, meaning the sensor could be open or faulty. If the sensor is invalid or out of the range (the range is from -50°F to 150°F (-45.6°C to 65.6°C), the compressor will be de-energized and display the freeze sensor fault code (57).When the sensor goes back into range, freeze sensor fault code will clear and the system will start up automatically if a demand exists.
  For troubleshooting the Water Coil Freeze Sensor, refer to Table 17.

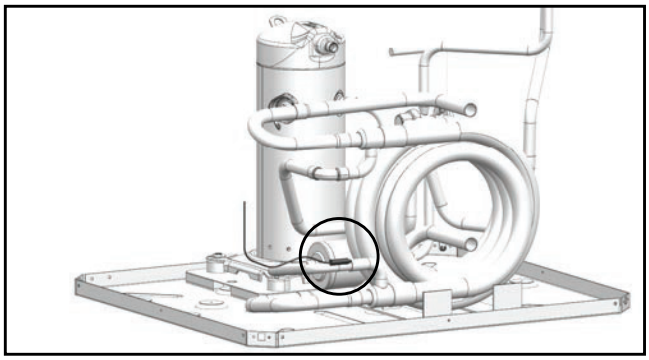


Fig. 35 – Freeze Protection Sensor Location

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

If unit is employing a fresh water system (no antifreeze protection), it is extremely important to have the Freeze1 set to the default 26°F (-3.33°C).

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Freeze sensor will not guard against the loss of water. A flow switch is recommended to prevent the unit from running if water flow is lost or reduced.

- **CONDENSATE OVERFLOW PROTECTION SENSOR**:
  Located in the drain pan of the unit and connected to the “PL6" terminal on pins 4 & 5 on the ODU board. See Fig. 36.

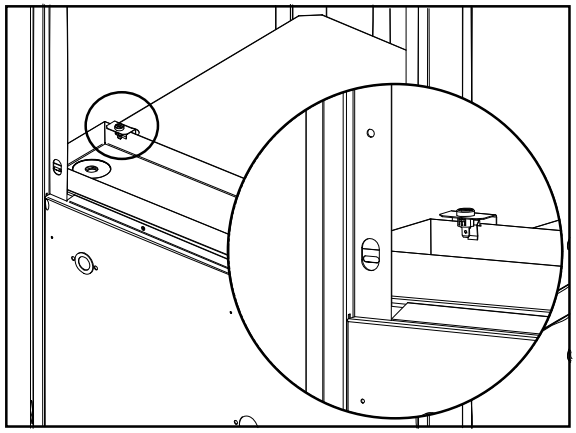


Fig. 36 – Condensate Overflow Protection Sensor Location

- **LOCKOUTS**: If system protection faults occur, the unit will shut down the compressor and fault codes will be shown on the ODU board and the UI screen.
  There are two types of lockouts:
  Soft lockouts - This is a selectable dips witch position to allow 2 or 4 unit trips before going to hard lockout.
  Hard lockouts - Will require a manual reset. This applies to all unit trips unless otherwise noted. In order to exit the hard lockout early for servicing, the low voltage power to the unit would need to be reset and the fault conditions corrected.

NOTE: The blower motor will remain active during a lockout condition.

- **BROWNOUT PROTECTION**: The compressor will be shut down if the incoming voltage falls below 170 VAC for 4 seconds and fault code will display on ODU LED and System Control (if applicable). The compressor will remain off until the voltage is above 173 VAC for at least 4 seconds and the anti-short cycle timer times out.
  Defeat the Brownout - The high voltage brownout feature can be defeated in the event of nuisance trips due to severe noisy power conditions. The ODU dip switch has brownout ON as default, to defeat the brown out protection, the selection can be changed to OFF. All efforts should be exhausted to correct any electrical deficiencies before defeating this safety feature to eliminate possible equipment damage.
- **230V LINE (POWER DISCONNECT) DETECTION**: If there is no 230V at the compressor contactor(s) when the indoor unit is powered and cooling or heating demand exists, the appropriate fault code is displayed. Verify the disconnect is closed and 230V wiring is connected to the unit.
- **COMPRESSOR VOLTAGE SENSING**: The control board input terminals labeled VS and L2 (see Fig. 37) are used to detect compressor voltage status and alert the user of potential problems. The control continuously monitors the high voltage on the run capacitor of the compressor motor. Voltage should be present any time the compressor contactor is energized and voltage should not be present when the contactor is de-energized.
- **CONTACTOR SHORTED DETECTION**: If there is compressor voltage sensed when there is no demand for compressor operation, the contactor may be stuck closed or there may be a wiring error. The control will flash the appropriate fault code.
  If the control senses the compressor voltage after start-up and is then absent for 10 consecutive seconds while cooling or heating demand exists, the thermal protector is open.
  The control de-energizes the compressor contactor for 15 minutes. The control Status LED will flash the appropriate code shown in Table 17. After 15 minutes, with a call for low or high stage cooling or heating, the compressor contactor is energized. If the call for cooling or heating continues, the control will energize the compressor contactor every 15 minutes. If the thermal protector closes, (at the next 15 minute interval check) the unit will resume operation. If the thermal protector trips for three consecutive cycles, then unit operation is locked out for 4 hours and the appropriate fault code is displayed.

- **NO 230V AT COMPRESSOR CONTACTOR**: If the compressor voltage is not sensed when the compressor should be starting, the appropriate contactor may be stuck open or there is a wiring error. The control will flash the appropriate fault code. Check the contactor and control box wiring. Refer to Table 14 and Fig. 37.

Table 14 – ODU Voltage Detection

ODU Voltage Detection	Fault Code
Brownout L1 and L2	46
Compressor voltage sensing VS and L1	74
230V line power disconnect detection on L1 and L2	4
Contactor shorted detection VS and L1	73
24V transformer SEC 1 and SEC 2	No faults

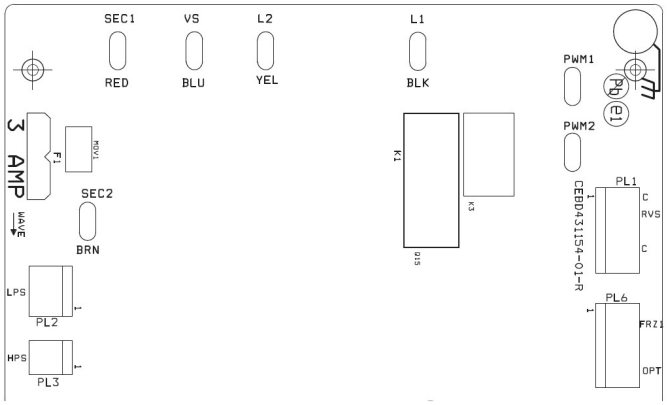
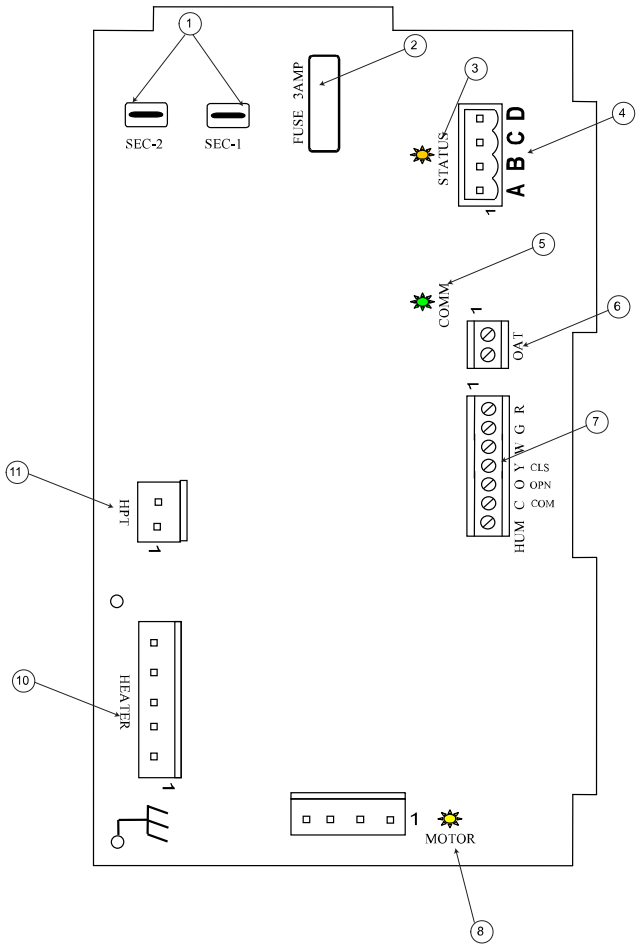


Fig. 37 – ODU Board L1, L2, VS, SEC1 and SEC 2 Locations

ECM BOARD



1. SEC 1 and SEC 2
2. Transformer power
3. Status LED light
4. ABCD communicating thermostat terminal plug connection
5. COMM light
6. OAT - Outdoor Air Temp Sensor
7. Non communicating tstat emergency only connections
8. Motor power indicator light
9. N/A
10. Heater Connection for field supply electric heat
11. HPT

Fig. 38 – Detail of ECM Printed Circuit Board Connections

NOTE: CFM LED indication is an approximation. Utilize conventional Test and Balance equipment for accurate airflow measurement.

- CFM count indicator blinks to indicate approximate airflow in CFM and may flicker when the unit is off.
- Each blink of the LED represent approximately 100 CFM of air delivery so if the LED blinks 12 times, pauses, blinks 12 times, etc. the blower is delivering approximately 1200 CFM.
- An annual checkup is recommended by a qualified refrigeration mechanic.
- Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended. This data should be compared to the information on the unit's data plate and the data taken at the original start up of the equipment.
- Periodic lockouts are commonly caused by water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur, call a mechanic immediately and have them check for the following:
  - Water flow problems
  - Water temperature problems

  Unit capacity and water flow charts should be used for system checks.

Using the Owner's Manual furnished with unit, the installing technician should explain system operation to the consumer with particular emphasis on indoor fan coil operation sounds and filter maintenance.

ECM Sequence of Operation

The GCA is designed for installation with a communicating User Interface. This blower will not respond to commands provided by a common thermostat except under certain emergency situations described in Blower Start Up and Troubleshooting section of this document.

The User Interface uses temperature; humidity and other data supplied from system components to control heating or cooling system for optimum comfort. The blower will be commanded by User Interface to supply airflow. The blower will operate at requested airflow for most modes.

The nominal requested airflow will be 350 cfm per ton of nominal cooling capacity as defined by unit size. Actual airflow request will be adjusted from nominal using indoor and outdoor temperature and indoor humidity data to optimize the system operation for occupant comfort and system efficiency. Refer to User Interface literature for further System Control details.

Airflow during electric heater operation must be greater than a minimum level for safe operation. If User Interface instructs blower to turn on electric heat and the requested airflow is less than the minimum value required for safe operation of installed heater, the ECM board will override requested value with the value shown in Table 22, Blower Performance.

AUXILIARY HEAT LOCKOUT

The following applies to GCA package units with backup electric resistance heat.

When using the GCA communicating units, the "Lockout" feature for electric heat is not enabled on the Infinity/Evolution System Control. The auxiliary electric heaters will be energized as needed to maintain system set point. The System Control is "in charge" of the comfort and the staging. Staging is not to be controlled by a one time set-up selection or by a temporary manual override. When the GHP is no longer able to satisfy the thermostat in first or second stage heating, operation will automatically switch from the GHP to electric heat, which will remain in operation until the thermostat is satisfied. Although some customers want control of that changeover point based on a set outdoor air temperature, this can negatively affect the comfort and performance of the GHP.

- If the changeover temperature would be set too high, then the GHP would not be providing the customer with the best efficiency due to extended operation (run hours) of the electric heat resulting in higher energy costs than the customer anticipated.
- If the changeover temperature would be set too low, then the GHP would operate in conditions outside its design condition resulting in poor performance. For example, if the GHP and loop are sized to provide all the heating requirements down to 15_F prior to auxiliary heat (electric heat operation), then operating the GHP at outdoor temperatures lower than 15_F would result in continuous run times, reducing the loop temperature lower than its design condition. The lower loop temperature then results in lower capacity for the GHP, causing it to keep running in an attempt to satisfy the thermostat. The loop will continue to drop in temperature, causing further reduction in capacity and efficiency.
  This results in a negative "fly wheel" effect that is inescapable unless auxiliary heat is used or the outdoor temperature increases.
- In an open loop/well water application where the changeover temperature would be set too low and auxiliary heat was locked-out, the unit would not be able to maintain the heating set point and comfort would be compromised.
- The System Control takes the guesswork out of determining the change-over set point and ensures that comfort and performance are not compromised.

Emerging From Setback

Some key operational features to consider are below:

In setback (heating) mode:

- When coming out of setback, the system will always first engage the GHP in first stage heat, then second stage heat, then auxiliary backup (electric resistance).
- The system uses intelligent recovery.
- Backup heat is not engaged until it has been determined by the control that second stage heat is not satisfying the thermostat.

If the homeowner manually bumps up the heating set point several degrees:

- The system will always first engage the GHP in first stage heat, then second stage heat, then auxiliary backup (electric resistance).
- backup heat is not engaged until it has been determined by the control that second stage heat is not satisfying the thermostat.
- The duration of this attempt varies based on the rate of temperature rise and the difference in set point, but is typically less than 30 minutes. The reason behind this is that the system thinks that if the homeowner increases the set point from, for example 70°F to 74°F, the extra heat is wanted now.

System Flushing and Filling

Once the piping is complete, units require final purging and loop charging. A flush cart pump of at least 1.5 hp is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop. Flush the loop in both directions with a high volume of water at a high velocity. Follow the steps below to properly flush the loop:

1. Verify power is off.
2. Fill loop with water from hose through flush cart before using flush cart pump to ensure an even fill. Do not allow the water level in the flush cart tank to drop below the pump inlet line to prevent air from filling the line.
3. Maintain a fluid level in the tank above the return tee to avoid air entering back into the fluid.
4. Shutting off the return valve that connects into the flush cart reservoir will allow 50 psig surges to help purge air pockets. This maintains the pump at 50 psig.
5. To purge, keep the pump at 50 psig until maximum pumping pressure is reached.
6. Open the return valve to send a pressure surge through the loop to purge any air pockets in the piping system.
7. A noticeable drop in fluid level will be seen in the flush cart tank. This is the only indication of air in the loop.

NOTE: If air is purged from the system while using a 10 in. PVC flush tank, the level drop will only be 1 to 2 in. since liquids are incompressible. If the level drops more than this, flushing should continue since air is still being compressed in the loop. If level is less than 1 to 2 in., reverse the flow.

8. Repeat this procedure until all air is purged.
9. Restore power.

Antifreeze may be added before, during or after the flushing process. However, depending on when it is added in the process, it can be wasted. Refer to the Antifreeze section on page 55 for more detail.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the warmer months. This fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for several minutes to condition the loop to a homogeneous temperature.

When complete, perform a final flush and pressurize the loop to a static pressure of 40 to 50 psig for winter months or 15 to 20 psig for summer months.

After pressurization, be sure to remove the plug from the end of the loop pump motor(s) to allow trapped air to be discharged and to ensure the motor housing has been flooded. Be sure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger. Compare the results to the data in Fig. 39 and Fig. 40.

System Flow

FLOW VERIFICATION

The GCA WSHP units ordered without a factory flow switch as standard. It is recommend to field installed a flow switch or special order a flow switch as factory installed to prevent the compressor from operating without loop flow.

IMPORTANT: It is recommended to have a flow switch to prevent the unit from running if water flow is lost.

FLOW REGULATION

Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built into the valve. By measuring the pressure drop through the unit heat exchanger, the flow rate can be determined. Adjust the water control valve until the desired flow rate is achieved. Since the pressure constantly varies, two pressure gauges may be needed in some applications. See Fig. 39 and Fig. 40 for waterside pressure drop.

An alternate method of flow regulation is to install an automatic flow control valve. These valves feature a removable cartridge that controls the maximum flow through the valve assembly. Verify that the water flow control cartridge matches the application flow requirement.

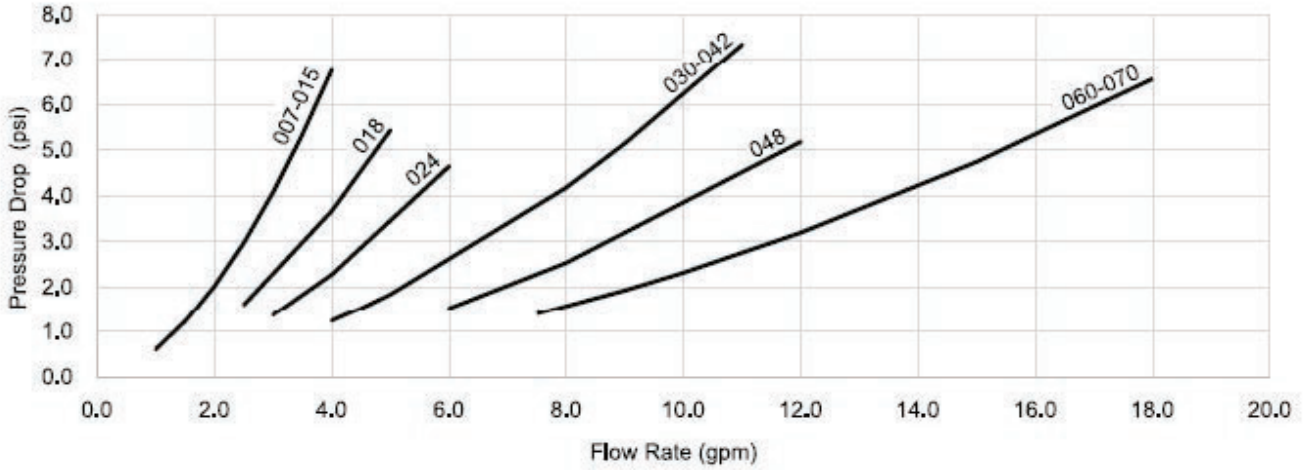


Fig. 39 – Water Pressure Drop Curve for Units Without 2-Way Valve

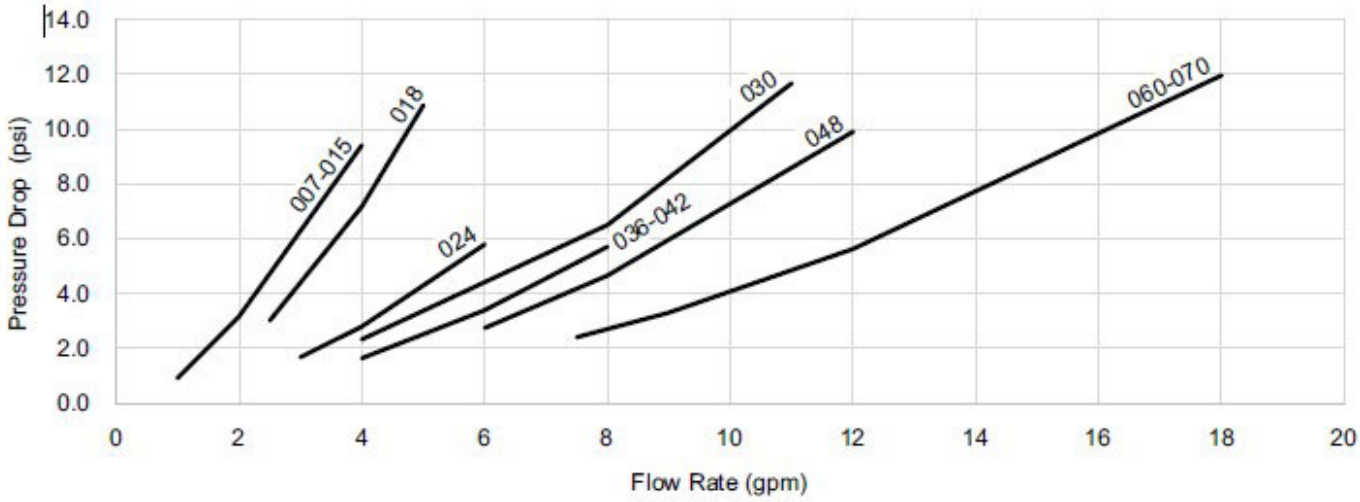


Fig. 40 – Water Pressure Drop Curve for Units With 2-Way Valve

Antifreeze

In areas where leaving water temperatures drop below 40°F or where piping will be routed through areas subject to freezing, antifreeze is needed.

Alcohols and glycols are commonly used as antifreeze agents. Freeze protection should be maintained to 15°F below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is 30°F, the leaving loop temperature would be 22 to 25°F. Therefore, the freeze protection should be at 15°F (30°F – 15°F = 15°F).

NOTE: All alcohols should be pre-mixed and pumped from a reservoir outside of the building or introduced under water level to prevent fuming.

Calculate the total volume of fluid in the piping system. (See Table 15.) Use the percentage by volume in Table 16 to determine the amount of antifreeze to use. Antifreeze concentration should be checked from a well-mixed sample using a hydrometer to measure specific gravity.

Table 15 – Approximate Fluid Volume (gal.) per 100 Ft. of Pipe

PIPE	DIAMETER (in.)	VOLUME (gal.)
Copper	1	4.1
	1.25	6.4
	1.5	9.2
Rubber Hose	1	3.9
Polyethylene	3/4 IPS SDR11	2.8
	1 IPS SDR11	4.5
	1-1/4 IPS SDR11	8.0
	1/2 IPS SDR11	10.9
	2 IPS SDR11	18.0
	1-1/4 IPS SCH40	8.3
	1-1/2 IPS SCH40	10.9
	2 IPS SCH 40	17.0

NOTES:
Volume of heat exchanger is approximately 1.0 gallon.
LEGEND
IPS — Internal Pipe Size
SCH — Schedule
SDR — Standard Dimensional Ratio

Table 16 – Antifreeze Percentages by Volume

ANTIFREEZE	MINIMUM TEMPERATURE FOR FREEZE PROTECTION (°F)			
	10	15	20	25
Methanol (%)	25	21	16	10
100% USP Food Grade Propylene Glycol (%)	38	30	22	15
Ethanol (%)	29	25	20	14

Start-up

Use the procedure outlined below to initiate proper unit start-up.

Operating Limits

ENVIRONMENT

This equipment is designed for indoor installation only. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life. NOTE: Two factors determine the operating limits of a unit: entering-air temperature and water temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation.

Power Supply

A voltage variation of ± 10% of nameplate utilization voltage is acceptable.

Unit Starting Conditions

Depending on the model, units should start and operate with entering water temperature temperatures between 20 and 110°F and entering air temperatures between 45 and 95°F. Water flow rates should be between 1.5 and 3.0 GPM/nominal cooling ton.

NOTE: These operating limits are not normal or continuous operating conditions. Assume that such a start-up is for the purpose of bringing the building space up to occupancy temperature. See Table 1 for operating limits.

MAINTENANCE

1. Filter changes or cleanings are required at regular intervals. The time period between filter changes will depend upon type of environment the equipment is used in.
   In a single family home, that is not under construction, changing or cleaning the filter every 60 days is sufficient. In other applications such as motels, where daily vacuuming produces a large amount of lint, filter changes may need to be as frequent as biweekly.

NOTE: Horizontal units containing two filters are taped together at the factory to facilitate removal. This should be done by end user as new filters are installed.

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Equipment should never be used during construction due to likelihood of wall board dust accumulation in the air coil of the equipment which permanently affects the performance and may shorten the life of the equipment.

2. An annual "checkup" is recommended by a licensed refrigeration mechanic. Recording the performance measurements of volts, amps, and water temperature differences (both heating and cooling) is recommended.
   This data should be compared to the information on the unit's data plate and the data taken at the original start-up of the equipment.
3. Lubrication of the blower motor is not required, however may be performed on some motors to extend motor life. Use SAE-20 non-detergent electric motor oil.
4. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
5. Periodic lockouts are commonly caused by air or water flow problems. The lockout (shutdown) of the unit is a normal protective measure in the design of the equipment. If continual lockouts occur, call a mechanic immediately and have them check for the following:
   – Water flow problems
   – Water temperature problems
   – Air flow problems
   – Air temperature problems.
   Use of the pressure and temperature charts for the unit may be required to properly determine the cause.

Servicing And Repair

Checks to the area

Prior to beginning work on systems containing A2L mildly flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system the following precautions shall be completed prior to conducting work on the system.

Work procedure

Work shall be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is being performed.

General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with R-454B refrigerant, i.e. non-sparking, adequately sealed or intrinsically safe.

Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

No ignition sources

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Ventilated area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

Checks to the refrigeration equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt, consult service and support for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- The ventilation machinery and outlets are operating adequately and are not obstructed;
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- That no live electrical components and wiring are exposed while charging, recovering or purging the system;
- That there is continuity of earth bonding.

Repairs to sealed components

Sealed electrical components shall be replaced.

Repair to intrinsically safe components

Intrinsically safe components must be replaced.

Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.). Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL gas (25% maximum) is confirmed.
- Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

NOTE Examples of leak detection fluids are

- bubble method,
- fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

Removal and evacuation

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- safely remove refrigerant following local and national regulations;
- evacuate;
- purge the circuit with inert gas (optional for A2L);
- evacuate (optional for A2L);
- continuously flush or purge with inert gas when using flame to open circuit; and
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system. Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

TROUBLESHOOTING

IMPORTANT: The following Troubleshooting tables are designed to help identify possible causes and solutions for problems. There could be more than one cause/solution to a problem that can be applied. Check each cause and adopt "process of elimination" and/or verification of each before making a conclusion.

Table 17 and Table 18 show the status codes flashed by the amber status light. The codes are flashed by a series of short and long flashes of the status light. The short flashes indicate the first digit in the status code followed by long flashes indicating the second digit of the error code. The short flash is 0.25 seconds on and the long flash is 1.0 seconds on. Time between flashes is 0.25 seconds. Time between short flash and first long flash is 1.0 seconds. Time between code repeating is 2.5 seconds with LED off.

Table 17 – ODU Fault Code Table

OPERATION	FAULT	FLASH CODE	POSSIBLE CAUSE AND ACTION
Standby	18 -30 VAC power is present	ON, no flash	Normal Operation
Low Stage		1, pause	Normal Operation
High Stage		2, pause	Normal Operation
Brownout Protection is Disabled		5, pause	User made selection, see instructions for details
Brownout Protection is Active		6, pause	Default, user can disable see instructions for details
	System Communication Failure	16	Communication with User Interface lost. Check wiring to and from User Interface
	Invalid Model Plug	25	Control does not detect a model plug or detects an invalid model plug. Unit will not operate without correct model plug.
	High Pressure Switch	31*	High Pressure Switch Trip. Check Refrigerant Charge, Water Flow and Temperature too high in cooling, and airflow restrictions in heating.
	Low Pressure Switch	32*	Low Pressure Switch Trip. Check Refrigerant Charge, TXV operation and airflow restrictions.
	Internal Board Failure	45	ODU board has failed. Replace Board and transfer model plug to replacement board.
	Brownout on 230V	46	Line voltage <170V for at least 4 seconds. Compressor and blower not allowed until voltage >173V. Verify line voltage. This feature can be disabled, see instructions for details.
	No 230V to unit	47	There is no 230V at the contactor when indoor unit is powered and cooling/heating demand exists. Verify the disconnect is closed and 230V wiring is connect- ed to the unit.
	Freeze Sensor Fault	57	Freeze sensor is invalid or out of range. Check for open sensor, wire disconnected, sensor not connect- ed properly or abnormal sensor temp ranges.
	Compressor Thermal Cutout in Low Stage	71*	Compressor operation detected then disappears while low stage demand exist. Possible causes are internal compressor overload trip or start relay and capacitor held in circuit too long (if installed).
	Compressor Thermal Cutout in High Stage	72*	Compressor operation detected then disappears while high stage demand exist. Possible causes are internal compressor overload trip or start relay and capacitor held in circuit too long (if installed).
	Voltage at Standby (contactor shorted)	73	Compressor voltage sensed when no demand for compressor operation exists. Contactor may be stuck closed or there is a wiring error.
	No Voltage to Compressor (No voltage at start-up)	74	Compressor voltage not sensed when compressor should be starting. Contactor may be stuck open or there may be a wiring error.
	Thermal Lockout in Low Stage for 4 Hours	81	Thermal cutout occurs in 3 consecutive low/high stage cycles. Low stage locked out for 4 hours or until 24V power recycled.
	Thermal Lockout in High Stage for 4 Hours	82	Thermal cutout occurs in 3 consecutive high/low stage cycles. High stage locked out for 4 hours or until 24V power recycled.
	Low Pressure Lockout	83	Low Pressure Switch (LPS) trips 2 or 4 times in an hour. Unit operation is locked out for 4 hours or until 24V power recycled.
	High Pressure Lockout	84	High Pressure Switch (HPS) trips 2 or 4 times in an hour. Unit operation is locked out for 4 hours or until 24V power recycled.
	Condensate Overflow	85	Water in the condensate pan exceeds certain level. The compressor is re-energized when water issue clears. Add another section to check the jumper between COND and Y1 terminals on ODU board
	Freeze Sensor Lockout	86	Refrigerant temperature drops below or remains at freeze limit trip for 30 seconds, the unit enters into a permanent lockout and needs a manual reset. Water coil freeze sensor below limit, verify proper loop water temp and pressures. Verify sensor accuracy using tables in instructions and verifying it is properly attached to coil. Verify antifreeze quantity if applicable and the freeze protection limit dip switch settings appropriate on the ODU board.

*Sequence: Compressor contactor is de-energized. If demand still exists, control will energize compressor contactor after 15 minute delay. If fault is cleared, unit will resume operation. If fault exists, blower shuts off, and error code continues to flash. Control will attempt re-start every 15 minutes. Cycling low voltage defeats the 15 minute delay.

Table 18 – ECM Fault Code Table

Operation	Fault	Flash Code	Possible Cause and Action
Standby	-	Continuously on	
	No Low Voltage or Control Failed	Continuously off	
	System Communication Fault	16	System communications are not successful for a period exceeding two minutes. Check system wiring to be sure the User Interface is powered and connections are made A to A, B to B, etc. and wiring is not shorted.
	Invalid Model/Motor Selection	25	Motor size and fan coil size do not match. Motor must be replaced with proper size motor. When a replacement ECM control is in- stalled, enter correct model size from a list of valid sizes in UI.
	Invalid Heater Size	26	No resistor is found or heater resistor value read is invalid. - Check wiring harness connections. - Check for a resistance value greater than 5000 ohms. - Check for proper wiring of resistor assembly. - Make sure heater size installed is an approved size for outdoor unit and fan coil sizes installed.
	Invalid Outdoor Unit Size	27	Outdoor unit size is invalid. Check communications wiring to be sure User Interface has established communications with outdoor unit or select proper size from valid size list provided at User Interface.
	Heater output not sensed when energized	36	ECM control energizes either heater stage and does not detect the 24-Vac signal on output. Check for 24VAC on heater stage outputs. Fan coil control or sensing circuit may be bad.
	Heater output sensed On when not energized	37	ECM control detects a 24-Vac signal on either heater stage output and it is not supplying signal. - Stop all system operations at User Interface and check heater stage 24-Vac outputs. - Disconnect electric heater at plug/receptacle 2 and check heater wiring for faults.
	Blower Motor Fault	41	Motor does not run: - Check to be sure that the blower wheel is not rubbing the housing. - Check motor to be sure that the motor shaft is not seized. - Check motor windings.
	Motor Communication Fault	44	Motor does not communicate with ECM control. - Check the motor wiring harness for proper connection to control and motor receptacles. - Check motor wiring harness to be sure all wiring complies with wiring diagram description - Check 12-Vdc low-voltage supply to motor at Pins 1 (+) and 2 (-) of motor header connection to fan coil control.
	Control Board Fault	45	ECM control has failed internal start-up tests and must be replaced.
	Brown Out Condition	46	The secondary voltage of the transformer falls below 15VAC for a period exceeding four seconds. The brownout condition is cleared when secondary voltage rises above 17VAC.
	Heat Pump Temperature Sensor Fault	52	HPT sensor is shorted or open. Check for faults in wiring connecting sensor to HPT terminal. Check resistance of thermistor for a short or open condition.
	Outdoor Air Temperature Sensor Fault	53	OAT sensor is shorted or open. Check for faults in wiring connecting sensor to OAT terminal. Check resistance of thermistor for a short or open condition.

ECM BOARD TROUBLESHOOTING

LED Description:

LEDs built into ECM board provide installer or service person information concerning operation and/or fault condition of the ECM board and ECM motor. This information is also available at system user interface in text with basic troubleshooting instructions. Careful use of information displayed will reduce the need for extensive manual troubleshooting.

The amber LED located at bottom center of control adjacent to motor harness plug is motor status LED and it is labeled MOTOR.

A second amber LED located in upper right center of control adjacent to System Communications connector (A,B,C,D) is the System Status LED and it is labeled STATUS. The green LED labeled COMM is also located adjacent to System Communications connector, below STATUS LED, and is used as an indicator of system communications status. Status Codes will be displayed on the STATUS LED using the following protocol:

1. The number of short flashes indicates first digit of code.
2. The number of long flashes indicates second digit of code.
3. A short flash is 0.25 seconds on. A long flash is 1 second on.
4. The time between flashes is 0.25 seconds.
5. The time between last short flash and first long flash is 1 second.
6. The LED will be off for 2.5 seconds before repeating code.

ECM Blower Start-up and Troubleshooting

NOTE: Always check high and low voltage supply to the GCA components. Check the integrity of the plug receptacle connections and blower wiring harness prior to assuming a component failure.

Emergency Heating and Cooling Modes

ECM board can provide emergency heating or cooling using a common heat/cool thermostat in the event that there are no system communications, fault is in User Interface and no replacement is immediately available.

To activate these modes, the thermostat and outdoor unit must be wired as a common heating/cooling system to ECM board RGWYOC terminals.

NOTE: These emergency modes do not provide the level of comfort and efficiency expected by the consumer and should only be activated when User Interface cannot be replaced immediately.

ECM Board Start-up and System Communications Troubleshooting

On power up, green COMM LED will be turned off until successful system communications are established (this should happen within 10 seconds). Once communications with user interface are successful, COMM LED will be lit and held on. At the same time, amber STATUS LED will be lit and held continuously on until a request for operating mode is received. The STATUS LED will be on any time blower is in idle mode. If, at any time, communications are not successful for a period exceeding 2 minutes, ECM board will display Status Code 16, System Communication Fault, on amber STATUS LED. No further blower troubleshooting information will be available at user interface until communications are re--established.

If COMM LED does not light within proper time period and Status Code is not displayed:

1. Check system transformer high and low voltage to be sure the system is powered.
2. Check fuse on ECM board to be sure it is not blown. If fuse is open, check system wiring before replacing it to be sure a short does not cause a failure of replacement fuse.

If COMM LED does not light within proper time period and Status Code is displayed:

Check system wiring to be sure user interface is powered and connections are made A to A, B to B, etc. and wiring is not shorted. Mis-wiring or shorting of the ABCD communications wiring will not allow successful communications.

NOTE: Shorting or mis-wiring low voltage system wiring will not cause damage to ECM board or user interface but may cause low voltage fuse to open.

ECM Board Status (Fault) Codes

Blower faults indicated by flashing codes on the amber system STATUS LED can be resolved using troubleshooting information provided below. Codes are listed in order of their priority, highest to lowest. Though multiple faults can exist at any time, only the highest priority code will be displayed on STATUS LED. Clearing the indicated fault when multiple faults exist will cause the next highest priority Status Code to be flashed. All existing faults, as well as a fault history, can be viewed at user interface.

STATUS CODE 45, CONTROL BOARD TEST FAULT:

ECM board has failed internal start--up tests and must be replaced.

No other service procedure will correct.

STATUS CODE 37, HEATER OUTPUT SENSED "ON" WHEN NOT ENERGIZED:

ECM board is provided with circuitry to detect presence of a 24VAC signal on Electric Heater stage 1 and stage 2 outputs. If ECM board detects a 24VAC signal on either heater stage output and it is not supplying signal, Status Code 37 will be displayed on STATUS LED. ECM board will turn off output and command blower motor to supply an airflow determined to be safe for current operation mode with electric heaters energized.

To find the fault:

1. Stop all system operations at User Interface and check heater stage 24VAC outputs.
2. Disconnect electric heater at plug/receptacle 2 and check heater wiring for faults. See Status Code 37 for more information.

STATUS CODE 44, MOTOR COMMUNICATION FAULT:

The MOTOR LED is connected to the blower motor communication line and works with the ECM board microprocessor and STATUS LED to provide blower operation and troubleshooting information. When motor is commanded to operate, the MOTOR LED will be turned on and will flash each time instructions are sent to the motor.

When the motor is commanded to stop, the MOTOR LED will be turned off. The MOTOR LED will not flash to indicate communications when it is turned off.

ECM board is constantly communicating with the motor, even when the motor and MOTOR LED are off. If motor does not acknowledge receipt of communications, the control will display Status Code 44 on STATUS LED and continue to try to communicate with the motor. If motor acknowledges communication, Status Code will be cleared.

If MOTOR LED is lit and flashing and motor does not run:

1. Check the STATUS LED. If STATUS LED is indicating a Status 44 code, check the motor wiring harness for proper connection to control and motor receptacles.
2. Check motor wiring harness to be sure all wiring complies with wiring diagram description, makes a complete circuit from connector to connector and is not shorted.
3. Check 12 Vdc low voltage supply to motor at pins 1 (+) and 2 (-) of motor header connection to ECM board.

If all checks are normal, ECM board is good and Control Module on motor may need replacement. Check motor and Motor Control Module following the instructions in Section C. ECM Motor Troubleshooting.

Shorted or mis-wiring of the low voltage motor harness wiring will not cause damage to ECM board or to motor Control Module.

If the MOTOR LED is off, STATUS LED is indicating a Status Code 44 and motor is running:

Disconnect the motor harness at the ECM board. If motor continues to run, ECM board is good and Control Module on motor may need replacement.

STATUS CODE 25, INVALID MOTOR / MODEL SELECTION:

On initial start-up, ECM board shall poll motor for its size data and check blower size data stored in ECM board memory.

1. If motor size or ECM board data doesn't match, Status Code 25 will be displayed on STATUS LED.
2. If model size data is missing (as is the case when a replacement ECM board is installed), system User Interface will prompt installer to enter correct model size from a list of valid sizes.
3. If motor size is incorrect for model size, motor must be replaced with proper size motor. ECM board will not respond to operation requests until this fault condition is resolved.

STATUS CODE 27, INVALID OUTDOOR UNIT SIZE:

On initial power-up, ECM board will write into memory ODU information as provided by User Interface in a fully communicating system.

1. If ODU board data is invalid, Status Code 27 will be displayed on STATUS LED.
2. User Interface will prompt the installer to choose system size from a list of valid sizes for application with blower.
3. Check communications wiring to be sure User Interface has established communications with outdoor unit or select proper size from valid size list provided at User Interface.
4. Check motor and motor Control Module following the instructions in Section C. ECM Motor Troubleshooting.

STATUS CODE 26, INVALID HEATER SIZE:

On initial power--up, ECM board will write into memory electric heater size as read from heater. The heater is provided with Identifier Resistor (IDR). Heater size must be valid for combination of indoor and outdoor components installed. ECM board will read IDR value connected to pins 5 and 8 of heater harness connector. If no resistor is found, system User Interface will prompt installer to verify that no heater is installed. Verifying that this is correct will establish that blower is operating without an electric heater accessory. Upon choosing negative option, installer will be prompted to select heater size installed from a list of valid heater sizes for blower and ODU data size installed. If heater ID resistor value read is invalid, Status Code 26 will be displayed on STATUS LED. If heater installed is equipped with a resistor connected to pins 5 and 8 of heater harness connector and Status Code 26 is displayed on STATUS LED:

1. Check wiring harness connections to be sure connections are secure.
2. If symptoms persist, disconnect wiring harness at ECM board heater header and check for a resistance value greater than 5000 ohms.
3. Check for proper wiring of resistor assembly.
4. Make sure heater size installed is an approved size for outdoor unit and blower sizes installed.

NOTE: ECM board will not operate electric heater until this Status Code is resolved. If the heater size is set through the User Interface, the heater will be operated as a single stage heater. If staging is desired, the IDR value must be read in by the ECM board.

STATUS CODE 36, HEATER OUTPUT NOT SENSED WHEN ENERGIZED:

ECM board is provided with circuitry to detect presence of a 24VAC signal on Electric Heater stage 1 and stage 2 outputs. If ECM board energizes either heater stage and does not detect the 24VAC signal on output, Status Code 36 will be displayed on the STATUS LED ECM board will continue to energize heater output(s) and adjust blower operation to a safe airflow level for energized electric heat stage(s).

To find the fault:

Check for 24VAC on heater stage outputs. ECM board or sensing circuit may be bad.

NOTE: It may be useful as an electric heater troubleshooting procedure to disconnect the system communications to force Status Code 16 enabling of emergency heat mode. It is difficult to know which heater output is energized or not energized in normal operation. When blower is operated in emergency heat mode using electric heaters, both outputs are energized and de--energized together. Terminal strip inputs to control can then be connected R to W to turn on both electric heat outputs. Heater output sensing circuits can then be checked to resolve Status Code 36 or 37 problems.

STATUS CODE 41, BLOWER MOTOR FAULT:

If MOTOR LED is lit and flashing and motor does not run:

1. Check STATUS LED. If STATUS LED is indicating Status Code 41, motor control has detected that the motor will not come up to speed within 30 seconds of being commanded to run or that the motor has been slowed to below 250 rpm for more than 10 seconds after coming up to speed. Motor wiring harness and ECM board are operating properly, do not replace.
2. Check to be sure that the blower wheel is not rubbing the housing.
3. Check motor to be sure that the motor shaft is not seized (motor Control Module must be removed and electronics disconnected from windings to perform this check properly).
4. Check motor windings section following instructions in Section C. ECM Motor Troubleshooting.

If all these checks are normal, the motor Control Module may need replacement.

STATUS CODE 16, SYSTEM COMMUNICATION FAULT:

On initial power-up and at any time system communications are not successful for a period exceeding 2 minutes following successful communications, the ECM board will only allow emergency heating or cooling operation using a common thermostat, wired to both ODU and ECM boards non-communicating thermostat connections RGWYO and will display Status code 16 on the amber STATUS LED (see Emergency Heating and Cooling Modes). No further blower troubleshooting information will be available at the User Interface until communications are reestablished.

Check system wiring to be sure the User Interface is powered and connections are made A to A, B to B, etc. and wiring is not shorted. Mis--wiring or shorting of the ABCD communications wiring will not allow successful communications. Correcting wiring faults will clear the code and reestablish communications.

Shorting or mis-wiring the low voltage system wiring will not cause damage to ECM board or to User Interface but may cause the low voltage fuse to open.

STATUS CODE 46, BROWNOUT CONDITION:

If the secondary voltage of the transformer falls below 15VAC for a period exceeding 4 seconds, Status Code 46 will be displayed on STATUS LED. If system includes a non--communicating outdoor air conditioner or heat pump, the User Interface will command the blower to turn off Y output controlling compressor.

When secondary voltage rises above 17VAC for more than 4 seconds, the brownout condition is cleared and normal system operation will resume subject to any minimum compressor off delay function which may be in effect. Brownout does not affect blower or electric heater operation.

STATUS CODE 53, OUTDOOR AIR TEMPERATURE SENSOR FAULT:

If an OAT sensor is found at power--up, input is constantly checked to be within a valid temperature range. If sensor is found to be open or shorted at any time after initial validation, Status Code 53 will be displayed at amber STATUS LED.

Check for faults in wiring connecting sensor to OAT terminals. Using an Ohmmeter, check resistance of thermistor for a short or open condition. If thermistor is shorted or open, replace it to return the system to normal operation. If fault is in the wiring connections, correcting the fault will clear the code and return the system to normal operation.

NOTE: If fault condition is an open thermistor or a wiring problem that appears to be an open thermistor and the power to the ECM board is cycled off, the fault code will be cleared on the next power--up but the fault will remain and system operation will not be as expected. This is because on power-up, the ECM board cannot discern the difference between an open sensor or if a sensor

is not installed.

ECM MOTOR TROUBLESHOOTING

The ECM motor used in this product consists of two parts: the Control Module and the motor winding section. Do not assume motor or module is defective if it will not start. Use the designed-in LED information aids and follow troubleshooting steps described below before replacing motor Control Module or entire motor. Motor Control Module is available as a replacement part.

VERIFY MOTOR WINDING SECTION:

⚠ WARNING

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or possible equipment damage.

After disconnecting power from the ECM motor, wait at least 5 minutes before removing the control section. Internal capacitors require time to discharge.

Before proceeding to replace a motor Control Module:

1. Check motor winding section to be sure it is functional.
2. Remove motor Control Module section and unplug winding plug. Motor shaft should turn freely, resistance between any two motor leads should be similar and resistance between any motor lead and unpainted motor end should exceed 100,000 ohms.
3. Failing any of these tests, entire ECM motor must be replaced.
4. Passing all of the tests, motor Control Module alone can be replaced.

MOTOR TURNS SLOWLY:

1. Low static pressure loading of blower while access panel is removed will cause blower to run slowly. Particularly at low airflow requests. This is normal, do not assume a fault exists.
2. Recheck airflow and system static pressure using user interface service screens with access panel in place.

NOTE: Blower motor faults will not cause a lockout of blower operation. ECM board will attempt to run the blower motor as long as user interface maintains a demand for airflow. ECM board will not operate electric heaters while a fault condition exists. The ECM board communicates with the motor at least once every 5 seconds, even when the motor is idle. If, during operation, the ECM board does not communicate with the motor for more than 25 seconds, the motor will shut itself down and wait for communications to be re-established.

Using Motor LED in Troubleshooting

The MOTOR LED is connected to the blower motor communication line and works with the ECM board microprocessor and the STATUS LED to provide blower operation and troubleshooting information. When the motor is commanded to operate, the MOTOR LED will be turned on and will flash each time instructions are sent to the motor. When the motor is commanded to stop, the MOTOR LED will be turned off.

If the MOTOR LED is lit, flashing and the motor is running or if the MOTOR LED is off and the motor is stopped, operation is normal and no motor fault exists.

If the MOTOR LED is lit, flashing and the motor does not run, or if the MOTOR LED is off and the motor is running, check the STATUS LED for the Status Code. Refer to the troubleshooting instructions for the indicated Status Code in Section E, blower Troubleshooting.

Systems Communication Failure

If communication with the compressor control is lost with the Communicating System Control, the control will flash the appropriate fault code (see Table 18) to the rest of the communicating system, including the System Control and the indoor geothermal unit.

Model Plug

Each control board contains a model plug. The model plug is used to identify the type and size of unit to the control.

The correct model plug must be installed for the system to operate properly (see Table 19).

Table 19 – Model Plug Information

Type	Model Number	Tonnage	Model Orientation	Model Plug Number	PIN RESISTANCE (K – ohms)	
					Pins 1-4	Pins 2-3
Pkg R-454B	GCA	24	V	HK70EZ021	11K	39K
	GCA	24	H	HK70EZ022	11K	51K
	GCA	36	V/H	HK70EZ023	11K	52K
	GCA	48	V/H	HK70EZ024	11K	75K
	GCA	60	V/H	HK70EZ025	11K	91K
	GCA	72	V	HK70EZ026	11K	120K
	GCA	72	H	HK70EZ027	11K	150K

On new units, the model and serial numbers are input into the board's memory at the factory. If a model plug is lost or missing at initial installation, the unit will operate according to the information input at the factory and the appropriate error code will flash temporarily.

NOTE: RCD replacement boards contain no model and serial information. If the factory control board fails, the model plug must be transferred from the original board to the replacement board for the unit to operate.

NOTE: The model plug takes priority over factory model information input at the factory. If the model plug is removed after initial power up, the unit will operate according to the last valid model plug installed, and flash the appropriate fault code temporarily.

Troubleshooting the Model Plug

If the unit is being identified incorrectly by model or size, verify the plug resistance per Table 19. If resistance value verifies the plug is good, ensure the plug is dry and condensate free.

NOTE: Dielectric grease (field supplied) can be used on model plug pins if condensate has been noted after drying the plug.

Service Tool

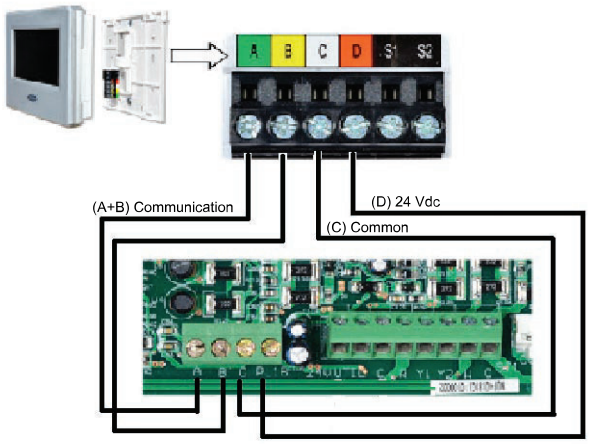


Fig. 41 – Service Tool Connection

When working on the outdoor unit of a package system, the technician would usually need to repeatedly walk between the indoor System Control and the unit outside. To save time, the communicating controls offer a service tool feature.

By wiring the service tool into the ODU board, the technician can have a System Control capable of running the system right at the outdoor unit.

To use a service tool, connect the A and B communication bus wires from this second communicating control to the terminals marked A and B on the terminal strip located in the bottom left corner of the ODU board (see Fig. 41). But instead of connecting the wires on the service tool to the terminals marked C and D, connect the C and D wires from the service tool to the 24V and C on ST1 as shown in Fig. 41.

When the service tool is connected and powered up, the communicating controls inside the home will “go to sleep” and let the service tool take control of the system. In this manner, the service technician can run the diagnostic checkouts right at the outdoor unit using the service tool.

After the checkouts are completed and it is no longer necessary to use the service tool, remove it from the communicating controls and the indoor communicating controls will regain control in about two minutes.

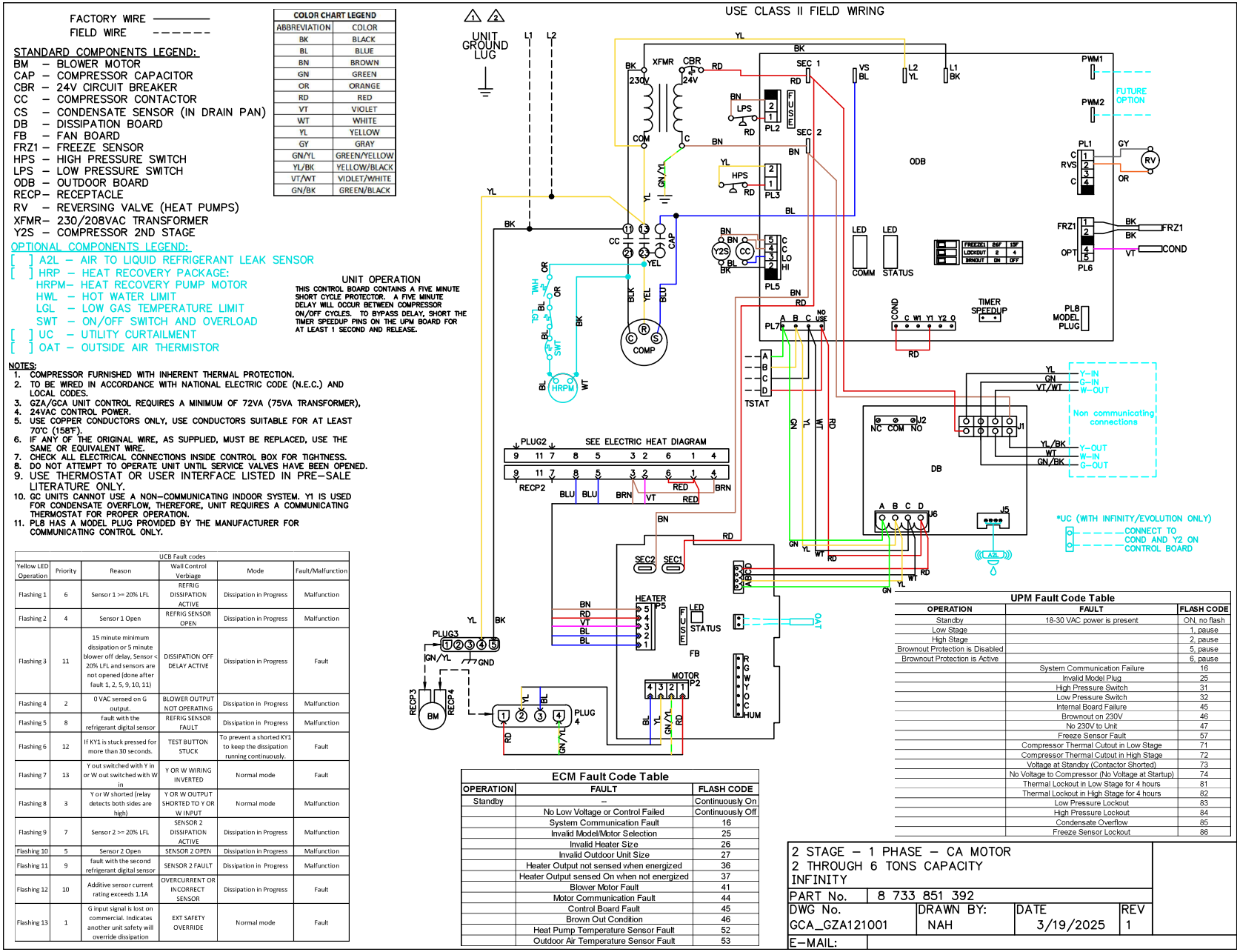
⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

Failure to follow this caution may result in unit damage and/or improper equipment operation.

Connect 24 across COND and COMMON on ST1 thermostat connections. Ensure condensate overflow wires remain connected for proper protection.

WIRING DIAGRAM



UCB Fault codes

Yellow LED Operation	Priority	Reason	Wall Control Verbiage	Mode	Fault/Malfunction
Flashing 1	6	Sensor 1 >= 20% LFL	REFRIG DISSIPATION ACTIVE	Dissipation in Progress	Malfunction
Flashing 2	4	Sensor 1 Open	REFRIG SENSOR OPEN	Dissipation in Progress	Malfunction
Flashing 3	11	15 minute minimum dissipation or 5 minute blower off delay, Sensor < 20% LFL and sensors are not opened (done after fault 1, 2, 5, 9, 10, 11)	DISSIPATION OFF DELAY ACTIVE	Dissipation in Progress	Fault
Flashing 4	2	0 VAC sensed on G output.	BLOWER OUTPUT NOT OPERATING	Dissipation in Progress	Malfunction
Flashing 5	8	fault with the refrigerant digital sensor	REFRIG SENSOR FAULT	Dissipation in Progress	Malfunction
Flashing 6	12	If KY1 is stuck pressed for more than 30 seconds.	TEST BUTTON STUCK	To prevent a shorted KY1 to keep the dissipation running continuously.	Fault
Flashing 7	13	Y out switched with Y in or W out switched with W in	Y OR W WIRING INVERTED	Normal mode	Fault
Flashing 8	3	Y or W shorted (relay detects both sides are high)	Y OR W OUTPUT SHORTED TO Y OR W INPUT	Normal mode	Malfunction
Flashing 9	7	Sensor 2 >= 20% LFL	SENSOR 2 DISSIPATION ACTIVE	Dissipation in Progress	Malfunction
Flashing 10	5	Sensor 2 Open	SENSOR 2 OPEN	Dissipation in Progress	Malfunction
Flashing 11	9	fault with the second refrigerant digital sensor	SENSOR 2 FAULT	Dissipation in Progress	Malfunction
Flashing 12	10	Additive sensor current rating exceeds 1.1A	OVERCURRENT OR INCORRECT SENSOR	Dissipation in Progress	Fault
Flashing 13	1	G input signal is lost on commercial. Indicates another unit safety will override dissipation	EXT SAFETY OVERRIDE	Normal mode	Fault

ECM Fault Code Table

OPERATION	FAULT	FLASH CODE
Standby	–	Continuously On
	No Low Voltage or Control Failed	Continuously Off
	System Communication Fault	16
	Invalid Model/Motor Selection	25
	Invalid Heater Size	26
	Invalid Outdoor Unit Size	27
	Heater Output not sensed when energized	36
	Heater Output sensed On when not energized	37
	Blower Motor Fault	41
	Motor Communication Fault	44
	Control Board Fault	45
	Brown Out Condition	46
	Heat Pump Temperature Sensor Fault	52
	Outdoor Air Temperature Sensor Fault	53

UPM Fault Code Table

OPERATION	FAULT	FLASH CODE
Standby	18-30 VAC power is present	ON, no flash
Low Stage		1, pause
High Stage		2, pause
Brownout Protection is Disabled		5, pause
Brownout Protection is Active		6, pause
	System Communication Failure	16
	Invalid Model Plug	25
	High Pressure Switch	31
	Low Pressure Switch	32
	Internal Board Failure	45
	Brownout on 230V	46
	No 230V to Unit	47
	Freeze Sensor Fault	57
	Compressor Thermal Cutout in Low Stage	71
	Compressor Thermal Cutout in High Stage	72
	Voltage at Standby (Contactor Shorted)	73
	No Voltage to Compressor (No Voltage at Startup)	74
	Thermal Lockout in Low Stage for 4 hours	81
	Thermal Lockout in High Stage for 4 hours	82
	Low Pressure Lockout	83
	High Pressure Lockout	84
	Condensate Overflow	85
	Freeze Sensor Lockout	86

2 STAGE – 1 PHASE – CA MOTOR 2 THROUGH 6 TONS CAPACITY INFINITY			
PART No.	8 733 851 392		
DWG No. GCA_GZA121001	DRAWN BY: NAH	DATE 3/19/2025	REV 1
E–MAIL:			

Fig. 42 – 2 - 6 Tons

Table 20 – Water Side Pressure Drop Table

Model	Water Flow Rate (GPM)	30°	40°	50°	60°	70°	80°	90°	100°	110°
GCA24	3.0	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0
	4.5	2.7	2.6	2.4	2.3	2.2	2.2	2.1	2.0	2.0
	6.0	4.4	4.2	4.0	3.8	3.7	3.5	3.4	3.3	3.2
	8.0	7.2	6.9	6.6	6.3	6.1	5.8	5.7	5.5	5.3
GCA36	4.5	1.0	0.9	0.9	0.8	0.8	0.8	0.8	0.7	0.7
	6.8	1.9	1.8	1.8	1.7	1.6	1.6	1.5	1.5	1.4
	9.0	3.2	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.4
	12.0	5.2	5.0	4.8	4.6	4.4	4.2	4.1	4.0	3.9
GCA48	6.0	1.4	1.3	1.2	1.2	1.2	1.1	1.1	1.0	1.0
	9.0	2.7	2.6	2.5	2.4	2.3	2.3	2.2	2.1	2.1
	12.0	4.5	4.3	4.2	4.0	3.9	3.8	3.6	3.5	3.5
	16.0	7.2	7.1	6.9	6.7	6.5	6.2	6.1	5.9	5.7
GCA60	7.5	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9	0.9
	11.3	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.8
	15.0	4.1	3.9	3.7	3.6	3.5	3.3	3.2	3.2	3.1
	20.0	6.6	6.4	6.2	5.9	5.7	5.5	5.4	5.2	5.1
GCA72	9.0	1.7	1.6	1.5	1.5	1.4	1.4	1.3	1.3	1.3
	13.5	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6	2.5
	18.0	5.5	5.3	5.1	4.9	4.7	4.6	4.5	4.3	4.2
	24.0	9.2	8.8	8.5	8.1	7.9	7.7	7.4	7.2	7.1

NOTES:
All values based upon pure water at 70° F.
current 20230525
PD (psi) = [(Wtr Flow (gpm)^1.8) * k const] / 2.31
PD (psi) = (Wtr Flow (gpm) / CV)^2 * Specific Gravity

Table 21 – Air Temperature Rise/fall And Refrigerant Pressure Ranges

Model	Enter Fluid Temp (°F)	Water Flow (GPM)	Cooling				Heating			
			Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Drop °F	Air Temp Rise °F
GCA24 Full Load	30	3					60-70	241-261	8-9	15-19
		6					67-77	246-266	4-5	16-20
	40	3	114-131	180-198	20-23	18-22	72-82	251-271	10-11	17-21
		6	113-130	153-171	9-12	19-23	80-90	257-277	5-6	19-23
	50	3	116-133	209-227	19-22	18-22	85-95	262-282	11-12	20-24
		6	114-131	180-198	9-12	18-22	95-105	270-290	6-7	21-25
	60	3	117-134	240-258	19-22	18-22	99-109	274-294	13-14	22-26
		6	116-133	210-228	9-12	18-22	112-122	285-305	7-8	24-28
	70	3	119-136	274-292	19-22	18-22	115-125	287-307	15-16	25-29
		6	117-134	244-262	9-12	18-22	131-141	301-321	8-9	28-32
	80	3	120-137	312-330	19-22	17-21	133-143	302-322	17-18	28-32
		6	119-136	281-299	9-12	18-22	152-162	319-339	9-10	31-35
	90	3	122-139	354-372	18-21	17-21	152-162	318-338	19-20	31-35
		6	121-138	322-340	9-12	17-21	176-186	339-359	11-12	35-39
	100	3	124-141	400-418	18-21	17-21				
		6	122-139	368-386	9-12	17-21				
GCA24 Part Load	30	3					88-98	252-272	7-8	17-21
		6					88-98	252-272	3-4	17-21
	40	3	132-149	181-199	14-17	20-24	96-106	258-278	7-8	18-22
		6	131-148	170-188	7-10	20-24	102-112	263-283	3-4	20-24
	50	3	134-151	210-228	14-17	20-24	110-120	268-288	8-9	21-25
		6	132-149	185-203	7-10	20-24	118-128	276-296	4-5	22-26
	60	3	136-153	245-263	13-16	19-23	125-135	281-301	9-10	24-28
		6	134-151	215-233	6-9	20-24	135-145	288-308	5-6	25-29
	70	3	138-155	278-296	13-16	19-23	142-152	295-315	11-12	27-31
		6	137-154	248-266	6-9	19-23	156-166	341-361	5-6	29-33
	80	3	139-156	305-323	13-16	19-23	162-172	308-328	12-13	30-34
		6	139-156	284-302	6-9	19-23	178-188	344-364	6-7	32-36
	90	3	141-158	343-361	12-15	18-22	183-193	333-353	13-14	34-38
		6	140-157	325-343	6-9	19-23	203-213	362-382	7-8	36-40
	100	3	143-160	386-404	11-14	18-22				
		6	142-159	369-387	5-8	18-22				
GCA36 Full Load	30	4.5					58-68	259-279	9-10	18-22
		9					65-75	266-286	5-6	19-23
	40	4.5	109-125	182-206	20-23	20-24	69-79	271-291	11-12	21-25
		9	108-124	157-181	10-13	20-24	78-88	279-299	6-7	22-26
	50	4.5	111-127	210-234	20-23	19-23	82-92	284-304	12-13	23-27
		9	109-125	184-208	10-13	20-24	93-103	295-315	7-8	25-29
	60	4.5	112-128	242-266	20-23	19-23	96-106	299-319	14-15	26-30
		9	111-127	215-239	9-12	19-23	110-120	313-333	8-9	29-33
	70	4.5	114-130	277-301	19-22	19-23	112-122	316-336	16-17	29-33
		9	113-129	249-273	9-12	19-23	129-139	334-354	9-10	33-37
	80	4.5	115-131	316-340	19-22	18-22	129-139	334-354	18-19	33-37
		9	114-130	288-312	9-12	19-23	150-160	356-376	10-11	37-41
	90	4.5	117-133	358-382	19-22	18-22	148-158	355-375	21-22	36-40
		9	116-132	330-354	9-12	18-22	174-184	382-402	11-12	41-45
	100	4.5	119-135	404-428	18-21	18-22				
		9	118-134	377-401	9-12	18-22				

Table 21 – Air Temperature Rise/fall And Refrigerant Pressure Ranges (Continued)

Model	Enter Fluid Temp (°F)	Water Flow (GPM)	Cooling				Heating			
			Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Drop °F	Air Temp Rise °F
GCA36 Part Load	30	4.5					80-90	261-281	6-7	17-21
		9					86-96	266-286	3-4	18-22
	40	4.5	128-144	177-201	14-17	20-24	95-105	274-294	7-8	20-24
		9	128-144	171-195	7-10	20-24	102-112	281-301	4-5	21-25
	50	4.5	130-146	204-228	14-17	20-24	111-121	289-309	9-10	23-27
		9	129-145	185-209	6-9	20-24	120-130	297-317	5-6	25-29
	60	4.5	131-147	233-257	13-16	19-23	129-139	306-326	10-11	27-31
		9	130-146	214-238	6-9	20-24	140-150	316-336	5-6	29-33
	70	4.5	133-149	266-290	13-16	19-23	148-158	324-344	12-13	30-34
		9	132-148	247-271	6-9	19-23	163-173	336-356	6-7	33-37
	80	4.5	135-151	303-327	12-15	19-23	170-180	343-363	14-15	34-38
		9	134-150	284-308	6-9	19-23	188-198	359-379	7-8	37-41
	90	4.5	136-152	342-366	12-15	18-22	194-204	365-385	15-16	38-42
		9	136-152	325-349	6-9	18-22	216-226	383-403	8-9	41-45
	100	4.5	138-154	385-409	11-14	18-22				
		9	138-154	370-394	5-8	18-22				
GCA48 Full Load	30	6					50-70	241-261	8-9	17-21
		12					57-77	247-267	4-5	18-22
	40	6	108-124	175-195	20-23	20-24	61-81	251-271	10-11	19-23
		12	106-122	156-176	10-13	20-24	69-89	259-279	5-6	21-25
	50	6	110-126	202-222	20-23	20-24	74-94	263-283	11-12	22-26
		12	108-124	179-199	9-12	20-24	84-104	273-293	6-7	24-28
	60	6	111-127	232-252	19-22	19-23	88-108	277-297	13-14	25-29
		12	110-126	209-229	9-12	20-24	100-120	289-309	7-8	27-31
	70	6	113-129	266-286	19-22	19-23	103-123	292-312	15-16	28-32
		12	112-128	242-262	9-12	19-23	119-139	306-326	8-9	31-35
	80	6	115-131	304-324	19-22	19-23	121-141	308-328	17-18	31-35
		12	114-130	279-299	9-12	19-23	140-160	326-346	9-10	35-39
	90	6	116-132	346-366	18-21	18-22	139-159	326-346	19-20	35-39
		12	115-131	321-341	9-12	18-22	163-183	348-368	11-12	39-43
	100	6	118-134	391-411	18-21	18-22				
		12	117-133	366-386	9-12	18-22				
GCA48 Part Load	30	6					74-94	247-267	6-7	16-20
		12					79-99	251-271	3-4	17-21
	40	6	130-146	172-192	13-16	19-23	87-107	258-278	7-8	18-22
		12	130-146	168-188	6-9	19-23	94-114	264-284	4-5	20-24
	50	6	131-147	199-219	13-16	19-23	102-122	271-291	8-9	21-25
		12	130-146	181-201	6-9	19-23	110-130	278-298	4-5	23-27
	60	6	132-148	228-248	13-16	19-23	118-138	285-305	10-11	24-28
		12	131-147	211-231	6-9	19-23	129-149	294-314	5-6	26-30
	70	6	133-149	261-281	12-15	18-22	136-156	301-321	11-12	28-32
		12	132-148	243-263	6-9	19-23	149-169	313-333	6-7	30-34
	80	6	135-151	296-316	12-15	18-22	156-176	318-338	13-14	31-35
		12	134-150	279-299	6-9	18-22	172-192	333-353	7-8	34-38
	90	6	137-153	334-354	11-14	18-22	177-197	338-358	14-15	35-39
		12	136-152	318-338	5-8	18-22	198-218	356-376	8-9	39-43
	100	6	139-155	376-396	11-14	17-21				
		12	138-154	361-381	5-8	17-21				

Table 21 – Air Temperature Rise/fall And Refrigerant Pressure Ranges (Continued)

Model	Enter Fluid Temp (°F)	Water Flow (GPM)	Cooling				Heating			
			Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Drop °F	Air Temp Rise °F
GCA60 Full Load	30	7.5					53-69	225-282	8-10	19-23
		15					60-76	231-289	5-6	20-25
	40	7.5	104-129	170-209	19-25	21-25	64-82	234-296	10-11	22-26
		15	103-127	149-185	9-12	21-25	72-91	242-305	5-6	24-29
	50	7.5	105-131	195-241	18-24	20-24	75-96	245-311	12-13	25-30
		15	104-129	172-215	9-12	20-25	86-108	255-323	6-7	26-32
	60	7.5	106-133	223-276	18-24	19-24	89-112	257-328	13-15	27-33
		15	105-130	199-249	9-13	20-24	101-126	269-342	7-8	30-36
	70	7.5	107-134	253-314	18-24	20-24	103-130	270-346	15-17	31-37
		15	106-132	229-286	9-13	20-24	119-147	286-364	9-10	34-41
	80	7.5	108-136	288-356	18-24	19-23	119-148	286-366	17-20	34-41
		15	108-134	264-327	9-12	19-23	138-169	304-387	9-11	38-45
	90	7.5	110-138	326-402	17-23	19-23	137-169	301-387	19-22	37-45
		15	109-136	302-372	9-12	19-23	160-194	325-412	11-13	42-50
	100	7.5	111-140	368-451	17-22	18-22				
		15	111-138	344-421	9-12	18-22				
GCA60 Part Load	30	7.5					76-92	227-284	5-7	17-21
		15					82-98	231-289	3-4	17-22
	40	7.5	126-151	164-203	13-19	20-24	88-106	235-297	7-8	19-23
		15	125-149	147-183	6-9	20-24	95-114	240-303	4-5	20-25
	50	7.5	126-152	186-232	12-18	20-24	101-122	245-311	8-9	22-27
		15	126-151	169-212	6-9	19-24	109-131	251-319	4-5	23-29
	60	7.5	127-154	212-265	12-18	19-24	116-139	256-327	9-11	24-30
		15	127-152	194-244	6-10	19-23	126-151	265-338	5-6	26-32
	70	7.5	129-156	240-301	12-18	19-23	136-163	272-348	11-13	28-34
		15	128-154	223-280	5-10	19-23	145-173	280-358	6-7	30-37
	80	7.5	130-158	271-339	11-17	18-22	151-180	285-365	12-15	31-38
		15	130-156	255-318	6-9	19-23	167-198	299-382	6-8	34-41
	90	7.5	133-161	327-403	10-16	18-22	176-208	307-393	14-17	36-44
		15	132-159	290-360	5-8	18-22	190-224	321-408	7-9	39-47
	100	7.5	134-163	345-428	10-15	17-21				
		15	134-161	329-406	5-8	18-22				
GCA72 Full Load	30	9					53-69	230-287	8-10	21-25
		18					60-76	237-295	4-5	22-27
	40	9	100-126	171-211	18-22	21-26	64-82	241-303	10-11	24-28
		18	99-124	150-188	8-13	21-26	71-90	249-312	5-6	25-30
	50	9	101-128	194-242	18-22	20-25	75-96	253-319	11-12	27-32
		18	100-126	173-218	9-12	21-26	85-107	263-331	6-7	29-35
	60	9	103-130	221-277	17-22	20-24	89-112	266-337	13-15	30-36
		18	101-128	199-251	8-13	21-25	100-125	279-352	7-8	33-39
	70	9	104-132	252-314	17-22	20-25	103-130	281-357	14-16	33-39
		18	103-130	229-288	8-12	20-25	118-146	298-376	8-9	36-43
	80	9	105-133	286-356	17-21	20-24	119-148	299-379	16-19	37-44
		18	104-132	263-329	8-11	19-24	138-169	319-402	9-11	41-48
	90	9	107-136	324-402	17-21	19-23	137-169	317-403	18-21	41-49
		18	106-134	301-373	8-11	19-23	160-194	343-430	10-12	45-53
	100	9	108-138	366-450	16-21	19-23				
		18	108-137	343-422	8-11	19-23				

Table 21 – Air Temperature Rise/fall And Refrigerant Pressure Ranges (Continued)

Model	Enter Fluid Temp (°F)	Water Flow (GPM)	Cooling				Heating			
			Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Drop °F	Air Temp Rise °F
GCA72 Part Load	Enter Fluid Temp (°F)	Water Flow (GPM)	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Rise °F	Air Temp Drop °F	Suction Pressure (PSIG)	Discharge Pressure (PSIG)	Water Temp Drop °F	Air Temp Rise °F
	30	9					74-90	233-290	5-7	18-22
		18					80-96	237-295	3-4	19-24
	40	9	121-147	169-209	13-17	20-25	87-105	242-304	7-8	21-25
		18	120-145	152-190	6-10	20-25	94-113	248-311	4-5	22-27
	50	9	122-149	190-238	13-17	19-24	101-122	254-320	8-9	24-29
		18	121-147	173-218	6-9	19-24	109-131	261-329	4-5	25-31
	60	9	123-150	215-271	12-17	19-23	116-139	266-337	9-11	26-32
		18	122-149	199-251	5-10	20-24	126-151	275-348	5-6	29-35
	70	9	124-152	244-306	12-16	19-24	133-160	280-356	11-13	30-36
		18	124-151	228-287	5-10	19-24	146-174	291-369	6-7	32-39
	80	9	126-154	276-346	11-16	19-23	152-181	296-376	12-15	33-40
		18	125-153	260-326	6-9	18-23	168-199	310-393	6-8	36-43
	90	9	127-156	310-388	11-15	18-22	173-205	313-399	13-16	37-45
		18	127-155	297-369	5-8	18-22	192-226	330-417	7-9	40-48
	100	9	129-159	350-434	10-15	18-22				
		18	129-158	337-416	5-8	18-22				

Table 22 – Blower Performance

Model	Model GCA	Fan Speed	Default factory motor setting	CFM											
				0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
Vertical	24	A -		680	680	680	680	680	680	680	680				
		A Norm (Full)	X	800	800	800	800	800	800	800	800				
		A +		920	920	920	920	920	920	920	920				
		A -		553	553	553	553	553	553	553	553				
		A Norm (Part)	X	650	650	650	650	650	650	650	650				
		A +		748	748	748	748	748	748	748	748				
	36	A -		1105	1105	1105	1105	1105	1105	1105	1105	1105	1105		
		A Norm (Full)	X	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300		
		A +		1495	1495	1495	1495	1495	1495	1495	1495	1495	1495		
		A -		829	829	829	829	829	829	829	829	829	829		
		A Norm (Part)	X	975	975	975	975	975	975	975	975	975	975		
		A +		1121	1121	1121	1121	1121	1121	1121	1121	1121	1121		
	48	A -		1445	1445	1445	1445	1445	1445	1445	1445	1445	1445		
		A Norm (Full)	X	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700		
		A +		1955	1955	1955	1955	1955	1955	1955	1955	1955	1955		
		A -		1105	1105	1105	1105	1105	1105	1105	1105	1105	1105		
		A Norm (Part)	X	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300		
		A +		1495	1495	1495	1495	1495	1495	1495	1495	1495	1495		
	60	A -		1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
		A Norm (Full)	X	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
		A +		2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
		A -		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360
		A Norm (Part)	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
		A +		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840
	72	A -		1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828
		A Norm (Full)	X	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150
		A +		2473	2473	2473	2473	2473	2473	2473	2473	2473	2473	2473	2473
		A -		1530	1530	1530	1530	1530	1530	1530	1530	1530	1530	1530	1530
		A Norm (Part)	X	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
		A +		2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070

Table 22 – Blower Performance (Continued)

Model	Model GCA	Fan Speed	Default factory motor setting	CFM											
				0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
Horizontal	24	A -		808	680	680	680	680	680	680	680				
		A Norm (Full)	X	950	800	800	800	800	800	800	800				
		A +		1093	920	920	920	920	920	920	920				
		A -		680	553	553	553	553	553	553	553				
		A Norm (Part)	X	800	650	650	650	650	650	650	650				
		A +		920	748	748	748	748	748	748	748				
	36	A -		1105	1105	1105	1105	1105	1105	1105	1105	1105	1105		
		A Norm (Full)	X	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300		
		A +		1495	1495	1495	1495	1495	1495	1495	1495	1495	1495		
		A -		829	829	829	829	829	829	829	829	829	829		
		A Norm (Part)	X	975	975	975	975	975	975	975	975	975	975		
		A +		1121	1121	1121	1121	1121	1121	1121	1121	1121	1121		
	48	A -		1445	1445	1445	1445	1445	1445	1445	1445	1445	1445		
		A Norm (Full)	X	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700		
		A +		1955	1955	1955	1955	1955	1955	1955	1955	1955	1955		
		A -		1105	1105	1105	1105	1105	1105	1105	1105	1105	1105		
		A Norm (Part)	X	1300	1300	1300	1300	1300	1300	1300	1300	1300	1300		
		A +		1495	1495	1495	1495	1495	1495	1495	1495	1495	1495		
	60	A -		1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700	1700
		A Norm (Full)	X	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
		A +		2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
		A -		1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360
		A Norm (Part)	X	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600	1600
		A +		1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840	1840
	72	A -		1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828	1828
		A Norm (Full)	X	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150	2150
		A +		2473	2473	2473	2473	2473	2473	2473	2473	2473	2473	2473	2473
		A -		1530	1530	1530	1530	1530	1530	1530	1530	1530	1530	1530	1530
		A Norm (Part)	X	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
		A +		2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070	2070