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

Installation Instructions

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

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SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions which may cause 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

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

POISONOUS GAS HAZARD

Failure to follow this warning could lead to personal injury and/or death.

Poisonous gas can be created when refrigerant (R-454B) is exposed to open flames.

⚠ 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

UNIT DAMAGE HAZARD

Failure to follow this Caution could result in unit damage.

50° F Minimum Entering Water Temperature (EWT) is recommended for water applications with sufficient water flow to prevent freezing. Antifreeze solution is required for all closed-loop applications and EWT below 50°F.

Geothermal applications should have sufficient antifreeze solution to protect against extreme conditions and equipment failure. Frozen water coils are not covered under warranty. Other equivalent methods of temperature control are acceptable.

⚠ WARNING

PERSONAL INJURY HAZARD

Failure to follow this warning could lead to personal injury and/or death.

When working on equipment, always observe precautions described in the literature, tags, and labels attached to the unit. Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing, and place a fire extinguisher close to the work area.

⚠ WARNING

PERSONAL INJURY HAZARD

Failure to follow this warning could lead to personal injury and/or death.

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

⚠ WARNING

PERSONAL INJURY, DEATH AND/OR PROPERTY DAMAGE HAZARD

Failure to follow this warning could lead to personal injury and/or death and/or property damage.

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock, or other conditions that may cause death, serious personal injury and/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.

⚠ WARNING

FIRE HAZARD

Failure to follow this warning could lead to personal injury and/or death and/or property damage.

The appliance must be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance, or an operating electric heater).

Auxiliary devices that may be ignition sources must NOT be installed in the ductwork, unless the auxiliary devices are approved for use with the specific appliance or declared suitable for the refrigerant.

⚠ CAUTION

PERSONAL INJURY HAZARD

Failure to follow this caution may result in personal injury.

This appliance is not intended for use by people (including children) with reduced physical, sensory, or mental capabilities, or with lack of experience and knowledge, unless they are supervised or have been given instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

⚠ WARNING

ASPHYXIATION HAZARD

Failure to follow this warning could lead to personal injury and/or death.

Be aware that refrigerants may not contain an odor.

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must be serviced only by technicians who meet local, state, and federal proficiency requirements.

⚠ CAUTION

ENVIRONMENTAL HAZARD

Failure to follow this caution may result in environmental hazard.

All refrigerant discharged from this unit must be recovered WITHOUT exception. Technicians must follow industry accepted guidelines and all local, state, and federal statutes for the recovery and disposal of refrigerants. If a compressor is removed from this unit, refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, refrigerant lines of the compressor must be sealed after it is removed.

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

The system contains an oversized, protective, earthing (grounding) terminal that must be properly connected, otherwise personal injury or death may result.

Properly-sized fusible safety switches or HACR circuit breakers must be installed for branch circuit protection. See the unit nameplate for maximum fuse or breaker size.

The unit ground wire must never be used as a neutral wire.

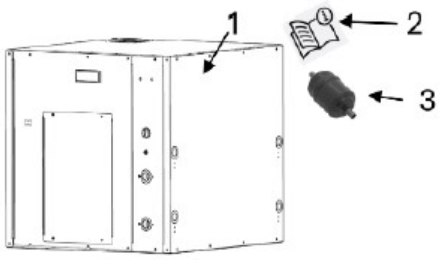
All high-voltage connections must be torqued as specified by the component's manufacturer.

⚠ 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.



1.GZA Series Water-To Air Split System
2.Installation Instructions and Owner's Manual
3.Filter drier

Fig. 1 – Standard Package

Condensing Section Location

Locate the condensing section in an area that provides sufficient room to make water and electrical connections and allows easy removal of the access panels in order for service personnel to perform maintenance or repair.

NOTE: GZA models are designed for indoor installation only.

The GZA unit 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. 2).

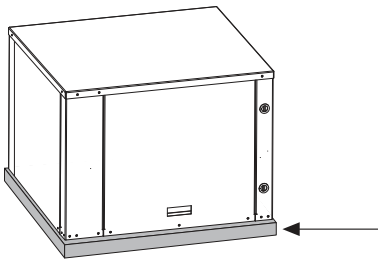


Fig. 2 – Vibration Pad Location

The vast majority of geothermal units are installed indoors and the condenser pads on the market are typically not designed for indoor equipment. Table 1 lists recommended pads (sold separately) designed for indoor equipment. ACMP pads are made of 3/4" thick high density SBR recycled rubber, which provides a high degree of vibration and sound absorption for compressor bearing units installed indoors. These pads may be trimmed as needed.

Table 1 – Recommended Mounting Pads

Unit Size	Mounting Pad	Pad Dimensions
024	ACMP2436	24" x 36"
036	ACMP2436	24" x 36"
048	ACMP2436	24" x 36"
060	ACMP2836	28" x 36"
072	ACMP2836	28" x 36"

Fan Coil or Furnace Location

Refer to the Fan Coil or Furnace Installation Manual for complete Details on indoor locations and clearances.

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.

Confirm provided filter drier is attached to bracket inside the unit to the left of the compressor. The bracket is only used for transportation and can be discarded after components are removed. See Fig. 3

Fig. 3 – Filter Drier Attached to Bracket

Location / Clearance

To maximize system performance, efficiency and reliability, and to minimize installation costs, it is always best to keep the refrigerant lines as short as possible. Every effort should be made to locate the air handler and the condensing section as close as possible to each other.

Serviceability should be a consideration and units should be placed so that installer and service technicians can access the service side of the unit with ease. The electrical box side of unit should maintain a clearance of 24" (609.6mm) minimum.

NOTE: Consider access to service parts before setting in place.

Typical Installations

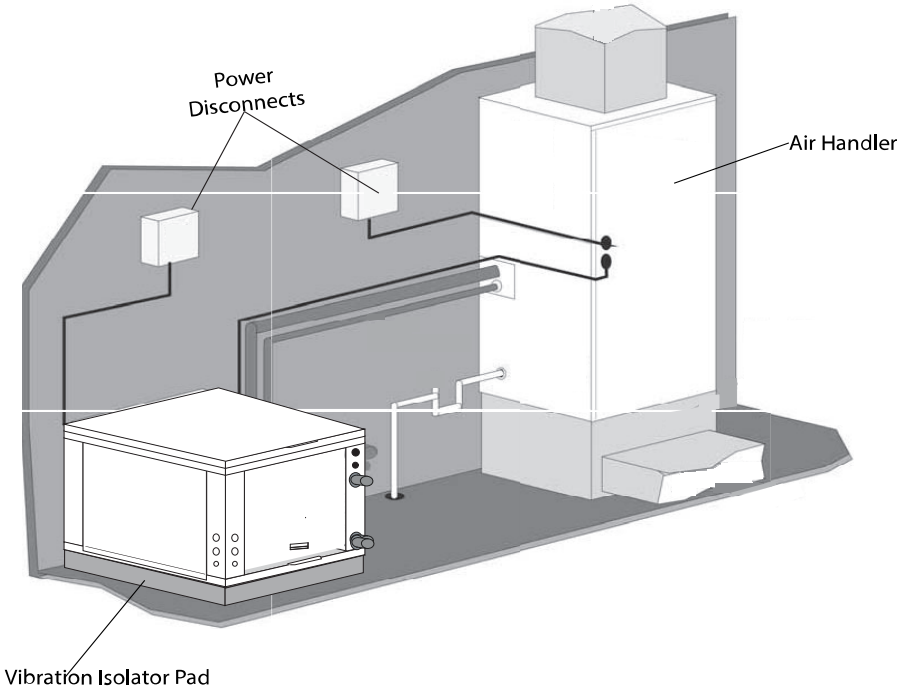


Fig. 4 – Typical Split with Air Handler Installation

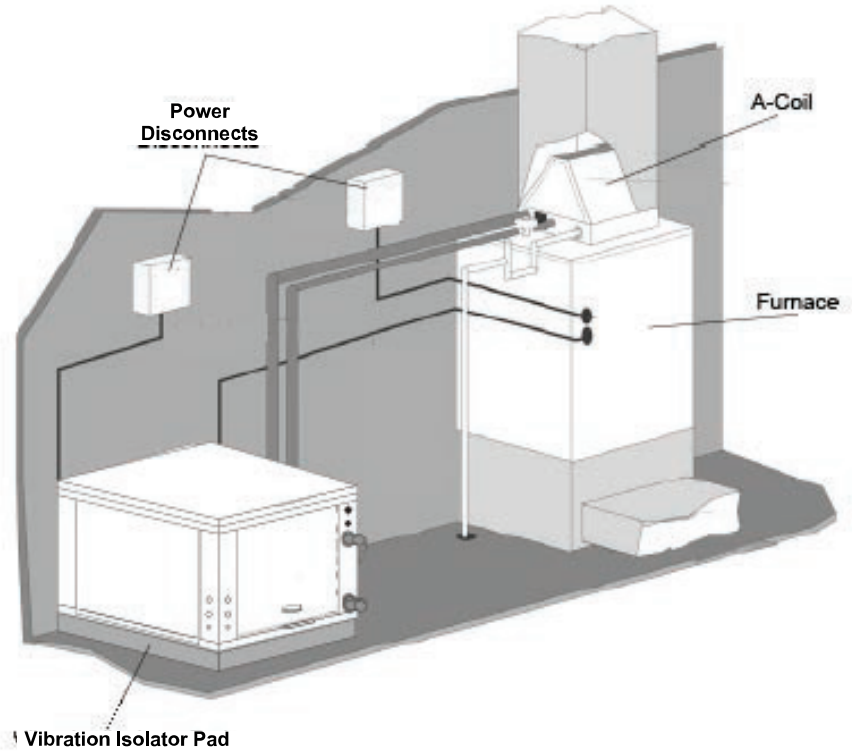


Fig. 5 – Typical Split with A-coil & Furnace Installation

INSTALLATION RECOMENDATIONS

The GZA Water-to-Air Split Condenser Heat Pump is performance certified to American Heating and Refrigeration Institute (AHRI) ISO Standard 13256-1. All GZA water-to-air split condenser heat pumps are certified to UL60335-2-40 Standard. The Water-to-Air split condenser 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.

⚠ 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

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 (see Tables 26-37).

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 2 for operating limits.

Table 2 – 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. 6)

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.

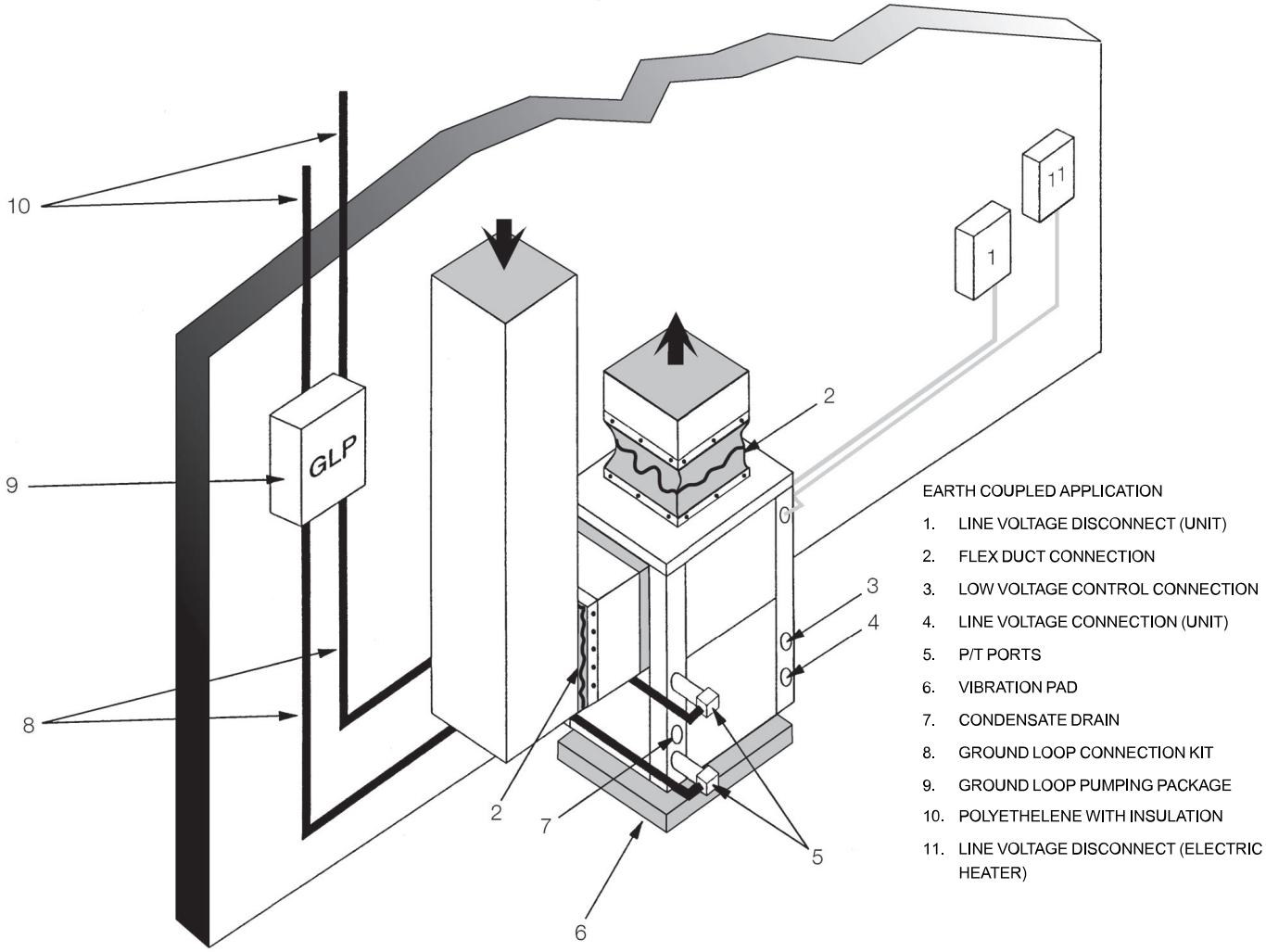


Fig. 6 – Example Geothermal System Setup

Well Water Systems

IMPORTANT: Table 3 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. 7) can be used to operate the well pump with the heat pump.

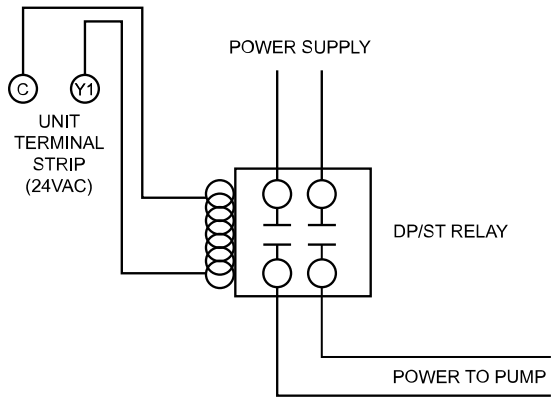


Fig. 7 – 24V DP/ST Contactor

When two or more units are supplied from one well, the pump can be wired to operate independently from either unit (see Fig. 8). An up--sized VA transformer may be required in either case.

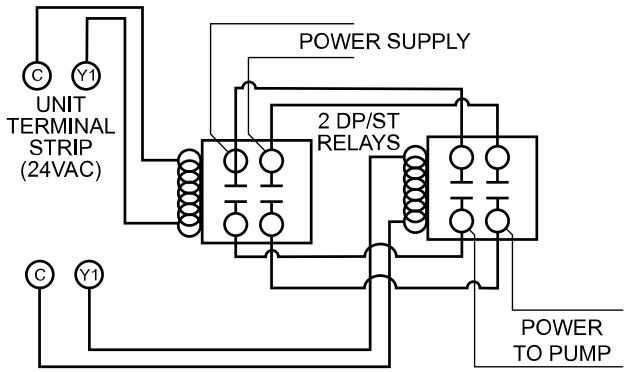


Fig. 8 – Independent Wiring

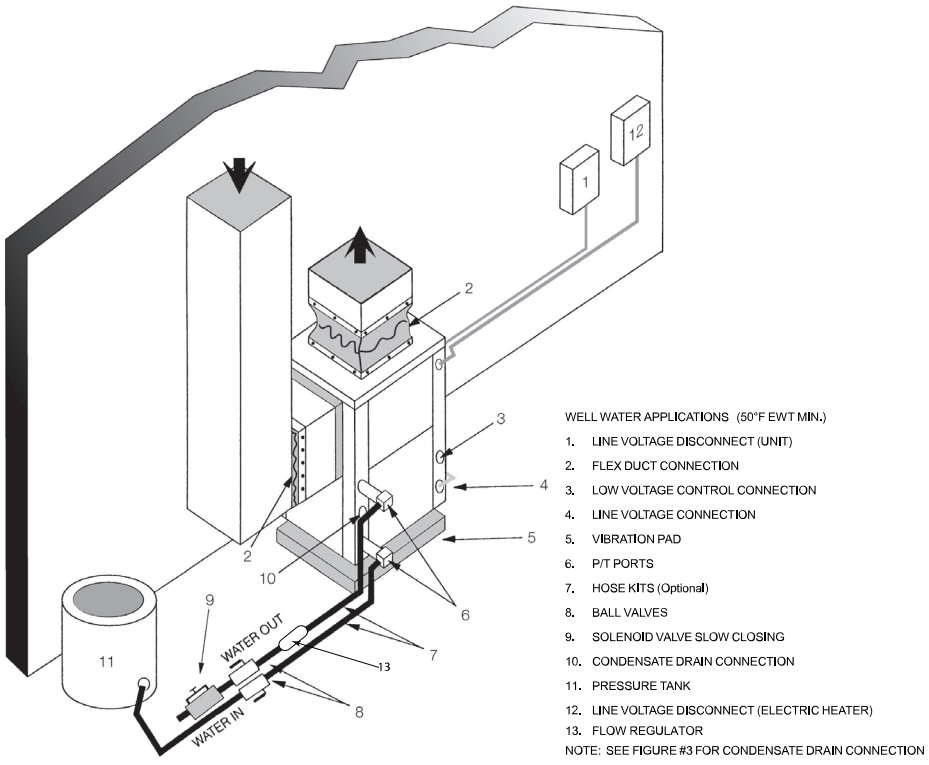


Fig. 9 – Example Well Water System Setup

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 3 – 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

MATCHED SYSTEM

The GZA geothermal splits have been tested and rated with Carrier & Bryant air handlers (fan coils) and evaporator coils (for use with furnaces).

Use air handler or cased coil from the Table 4 below and follow the Installation Instructions for those components.

Table 4 – Fan Coil / Evap AHRI Coil match-up

Geothermal Split	Fan Coil Communicating / Non-Communicating	Cased Coil
024	FE5***C36L* / FT5***C36L*	CAA**2414AM*
036	FE5***C36L* / FT5***C36L*	CAA**3617AM*
048	FE5***C48L* / FT5***C48L*	CAA**4821AM*
060	FE5***D60L* / FT5***D60L*	CAA**6024AM*

When using the GZA unit with a furnace, it is important to match the CFM output of the furnace to the requirements of the GHP. For the GZA072, the selected furnace must achieve at least 2200 CFM.

NOTE: The Infinity®/Evolution™ Connex™ System Control may not prevent the system from accepting a furnace with less airflow than required for the GZA072. This is the responsibility of the installer.

REFRIGERANT LINES

⚠ WARNING

PERSONAL INJURY / ENVIRONMENTAL HAZARD

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

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

Use all service ports and open all flow–control devices, including solenoid valves.

⚠ CAUTION

ENVIRONMENTAL HAZARD

Failure to follow this caution may result in environmental damage.

Federal regulations require that you do not vent refrigerant to the atmosphere. Recover during system repair or final unit disposal.

The installation of the copper refrigerant tubing must be done with care to obtain reliable, trouble free operation. This installation should only be performed by qualified refrigeration service and installation personnel.

Refrigerant lines should be routed and supported so as to prevent the transmission of vibrations into the building structure. 75 feet as the maximum length of interconnecting refrigerant lines in split system heat pumps. Beyond 75 feet, system losses become substantial and the total refrigerant charge required can compromise the reliability and design life of the equipment.

Refrigerant lines should be sized in accordance with those listed in Table 5. Copper tubing must be clean and free of moisture and dirt or debris. The suction and liquid lines should be insulated with at least 3/8" wall, closed-cell foam rubber insulation or equivalent.

Table 5 – Valve Sizing Chart

Unit Size	Line Type	Valve Conn. Size	Allen Wrench Size
024, 036, 048, 060, 072	Suction	3/8	5/16
	Liquid	3/4	5/16

Some points to consider are:

- Pressure drop (friction losses) in refrigerant suction lines reduces system capacity and increases power consumption by as much as 2% or more, depending on the line length, number of bends, etc. Pressure drop in liquid lines affects system performance to a lesser degree, provided that a solid column of liquid (no flash gas) is being delivered to the refrigerant metering device, and that the liquid pressure at the refrigerant metering device is sufficient to produce the required refrigerant flow.
- Oil is continually being circulated with the refrigerant so, oil return to the compressor is always a consideration in line sizing. Suction lines on split system heat pumps are also hot gas lines in the heating mode, but are treated as suction lines for sizing purposes. If the recommended suction lines sizes are used, there should be no problem with oil return.
- Vertical lines should be kept to a minimum. Vertical liquid lines will have a vertical liquid lift in either heating or cooling, and the weight of the liquid head is added to the friction loss to arrive at the total line pressure drop.
- Wherever possible, the air handler should be installed at a higher elevation than the condensing section to aid with oil return to the compressor.

Linear vs Equivalent Line Length

Linear Line Length - is the actual measured length of the line including bends. This is used to calculate the additional refrigerant charge that must be added to the system.

Equivalent Line Length - is the combination of the actual length of all the straight runs and the equivalent length of all bends valves and fittings in a particular line. The equivalent length of a bend, valve or fitting is equal to the length of a straight tube of the same diameter having the same pressure drop as the particular valve or fitting. The ASHRAE Fundamentals Handbook provides tables for determining the equivalent length of various bends, valves and fittings.

Connecting Refrigerant Lines

- Use only ACR grade copper tubing and keep ends sealed until joints are made.
- For best performance, select routing of refrigerant lines for minimum distance and least number of bends.
- Size lines in accordance with Table 6.
- Cut crimped ends off the air handler suction and liquid lines. Connect and braze lines to the air handler.

NOTE: The air handler is factory supplied with a holding charge of dry nitrogen.

- Connect and braze lines to service valves on the condensing section. The filter dryer for the refrigerant circuit is already factory installed in the correct location. No additional/external filter dryer is required.

⚠ CAUTION

UNIT DAMAGE HAZARD

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

- Use a brazing shield
- Wrap service valves with wet cloth or heat sink material.
- Direct flame away from the valve body.
- Valve body temperature must remain below 250°F to protect the internal rubber "O" rings and seals.
- Use nitrogen purge while brazing.

Pressurize the refrigerant lineset and air handler to 150 lbs with dry nitrogen through the ports provided on the self service valves. Check lineset and unit connections for leaks. Once system integrity is verified, evacuate lineset and air handler with a good vacuum pump to 500 microns and hold for half hour.

IMPORTANT: Pumpdown must never be used with heat pumps.

After verifying system integrity, slowly open service valve to allow refrigerant to flow through system. Unit is pre-charged for 25' of line set. Refer to Table 6, Table 7 and Table 8 to adjust and verify system charge accordingly.

Table 6 – Liquid Line Charge Per Linear Ft.

Liquid Line Size O.D.	R-454B oz per ft.
1/4	.2
5/16	.35
3/8	.5
1/2	1
5/8	1.7

Table 7 – Refrigerant Charge, Line Sizing & Capacity Multipliers

Model	R-454B Factory Charge (oz)*	Refrigerant Line O.D. Size (Based on Equivalent Line Length)									
		25 Ft.		35 Ft.		45 Ft.		50 Ft.		75 Ft.	
		LIQ.	SUC	LIQ.	SUC	LIQ.	SUC	LIQ.	SUC	LIQ.	SUC
GZA024	51	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4
GZA036	57	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4
GZA048	70	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4
GZA060	100	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4
GZA072	100	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4	3/8	3/4
CAPACITY MULTIPLIER		1.00		.995		.99		.99		.98	

Example 1:	**Example 2:**
Model GZA036 with 45 ft. of equivalent length of 3//8" O.D. Liquid Line. Total system charge = Factory charge + (45 ft - 25 ft) X .50 oz/ft. Total system charge = 86 oz + (20 ft x .60 oz/ft) = 98 oz. Additional 12 oz of R-454B refrigerant required.	Model GZA060 with 10 ft. of equivalent length of 3//8" O.D. Liquid Line. Total system charge = Factory charge + (10 ft - 25 ft) X .50 oz/ft. Total system charge =115 oz - (15 ft x .60 oz/ft) = 106 oz. Reduce charge 9 oz of R-454B refrigerant is required.

Line Set Limitations: A 20 ft. Differential is the recommended limit without special considerations. For installations with 20-40 ft. Differential, it is recommended to add a liquid line solenoid and, if the fan coil or furnace is above the GZA unit, add an inverted trap before line drop.

Table 8 – Charge Adjustments When Paired with Air Handlers or Cased Coils

Unit Size	Nameplate / Factory R-454B Charge (oz)	CAA**2414AM*	FE5***C36L* / FT5***C36L*	CAA**3617AM*	FE5***C48L* / FT5***C48L*	CAA**4821AM*	FE5***D60L* / FT5***D60L*	CAA**6024AM*
024	51	-2	0	-	-	-	-	-
036	57	-	0	4	6	-	-	-
048	70	-	-	-	0	0	-	-
060	100	-	-	-	-	-	0	0
072	100	-	-	-	-	-	0	0

Dissipation system Installation requirements

There are certain requirements that must be met to employ the use of units with R-454B Refrigerant (A2L group) depending on the charge amount per UL 60335-2-40. Use the following sections to determine installation options and requirements dependent on the A2L unit charge amount.

Table 9 – R-454B Charge Amount Requirement

R-454B Refrigerant charge	Refrigerant Leak Detection System	Additional Installation requirement
Less than or equal to 62.8oz	Not required. No further actions needed.	Not required. No further actions needed
Greater than 62.8oz	Installed Standard from factory	Required Refer to the Installation Options section

Refrigerant Leak Detection System

The refrigerant leak detection system is standard (factory-installed) for units with refrigerant charge amounts exceeding 62.8oz, and optional for units with refrigerant charge amounts equal to or below 62.8oz. The refrigerant leak detection system is comprised of three main components: the A2L refrigerant sensor, an exhaust fan and the UPM board. The A2L sensor continually samples the air and if the concentration of the refrigerant detected is higher than the preset threshold (15% LFL), it sends a signal to the UPM, which then switches OFF the compressor and turns ON the exhaust fan. The compressor remains OFF until the saturation level is below (15%LFL) and the power is cycled in order to restore normal operations. Once the A2L sensor is connected to the UPM, it must always remain connected. If communication is lost, the UPM enters a refrigerant leak hard lockout fault and energizes the alarm contact.

Table 10 – 6-in Round Airtight adhesive Duct take-off Dimensions

A	B	C	D	E
7-3/8”	4-3/8”	6”	5-7/8”	NA

Notes:
Fan motor and sensor factory installed
All venting duct to be provided by installer

To test that the communication between the sensor and board is active, the sensor can be disconnected from the UPM, which should simulate a fault. The A2L sensor for the refrigerant leak detection system must only be replaced with the part specified on the spare parts list.

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

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

When the refrigerant leak detection system is installed, the unit must be powered ON except when servicing.

Installation Options

Option 1: The unit is installed in a room larger than the required minimum room area (Amin). In this scenario, no additional installation setup is required for refrigerant leak mitigation.

The equipment must be installed in a room with a minimum floor area greater than or equal to the area listed in Table 1 based on the total refrigerant charge of the system.

With Option 1, Amin can be further reduced if the unit is installed on a stand. Table 1 shows the minimum area values at different installation heights.

Option 2: *The unit is installed in a room smaller than the required minimum room area (Amin). In this scenario, the unit must be ducted to a room larger than Amin or ducted the outdoors. The duct must not exceed 0.3 in H2O of static pressure. Refer to Table 2 for CFM requirements.

Option 3: Install unit in a machinery room as defined in ANSI/ASHRAE 15 (USA) or CSA B52 (Canada).

NOTE: * Rigid Metal or PVC must be used for dissipation ventilation ducting.

Table 11 – Amin Requirements for Option 1

	Model GZAHSR	Amin calculation without air circulation for R454B, ho is 0.6m													
		10	15	20	25	30	35	40	45	50	55	60	65	70	75
Amin (ft^2)	024	152	170	188	208	229	251	274	298	323	349	376	404	433	463
	036	247	270	293	318	344	370	398	427	457	487	519	552	586	620
	048	313	338	365	393	421	451	481	513	545	579	613	649	685	723
	060	685	723	762	801	842	883	926	969	1014	1060	1106	1154	1202	1252
		Amin calculation without air circulation for R454B, ho is 1m													
		10	15	20	25	30	35	40	45	50	55	60	65	70	75
Amin (ft^2)	024	89	95	100	105	110	115	120	125	131	136	141	146	156	167
	036	114	119	124	130	135	140	145	154	164	175	187	199	211	223
	048	129	134	139	144	152	162	173	185	196	208	221	234	247	260
	060	247	260	274	288	303	318	333	349	365	381	398	415	433	451
		Amin calculation without air circulation for R454B, ho is 2.4m													
		10	15	20	25	30	35	40	45	50	55	60	65	70	75
Amin (ft^2)	024	37	39	42	44	46	48	50	52	54	57	59	61	63	65
	036	48	50	52	54	56	58	60	63	65	67	69	71	73	75
	048	54	56	58	60	62	64	66	69	71	73	75	77	79	81
	060	79	81	84	86	88	90	92	94	96	99	101	103	105	107

Table 12 – Airflow Requirements for Option 2

	Model GZAHSR	Lineset Length													
		10	15	20	25	30	35	40	45	50	55	60	65	70	75
Qmin (m3/h)	024	29	30	32	34	35	37	39	40	42	44	45	47	49	50
	036	37	38	40	42	43	45	47	48	50	52	53	55	57	58
	048	41	43	45	46	48	50	51	53	55	56	58	60	61	63
	060	61	63	64	66	68	69	71	73	74	76	78	79	81	83
	072	61	63	64	66	68	69	71	73	74	76	78	79	81	83
Qmin (CFM)	024	20	20	20	20	25	25	25	25	25	30	30	30	30	30
	036	25	25	25	25	30	30	30	30	30	35	35	35	35	35
	048	25	30	30	30	30	30	35	35	35	35	35	40	40	40
	060	40	40	40	40	40	45	45	45	45	45	50	50	50	50
	072	40	40	40	40	40	45	45	45	45	45	50	50	50	50

NOTE: This Is Based On 3/8 Liquid Line Set

Table 13 – Mitigation Fan ESP/CFM for Factory Installed Refrigerant Leak Detection System

External Static Pressure (in wc)	CFM
0	100
0.1	90
0.15	78
0.2	63
0.25	30
0.3	20

WATER 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.

GZA units are supplied with either a copper or optional cupronickel water coax coil. 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. See Application Considerations notes on page 4.

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.

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

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

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).

Loop Pump Connections

Refer to the flow center installation manual for piping and wiring instructions.

When using a flow center containing a variable speed pump, kit #4129 is required.

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. 10 and Table 14). 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. 10 – Solenoid Valves

Table 14 – Water Solenoid Valves

Part Number	Description
MVBR3F	Valve, motorized solenoid, forged brass ¾“ FPT, 24V
MVBR3F	Valve, motorized solenoid, forged brass 1” FPT, 24V

Flow Regulator Valves

A flow regulator valve should be used in open loop / well water applications 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. 11 and Table 15)

Fig. 11 – Flow Regulator

Table 15 – 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. 12 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. 13).

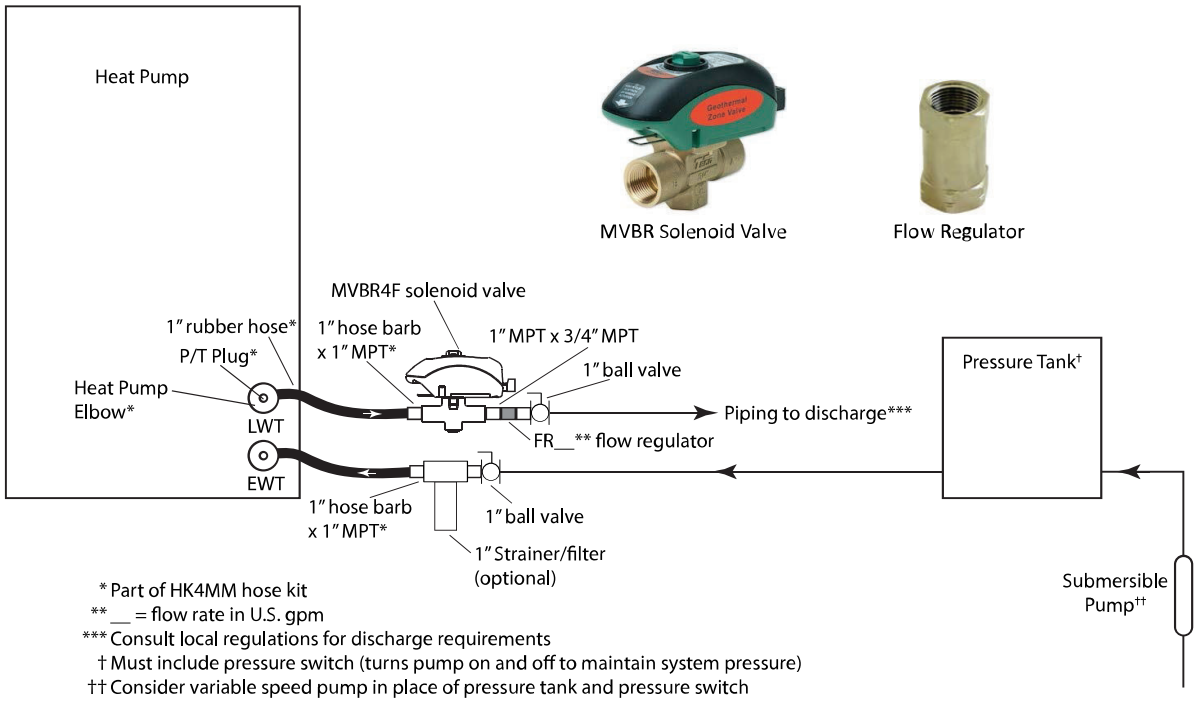
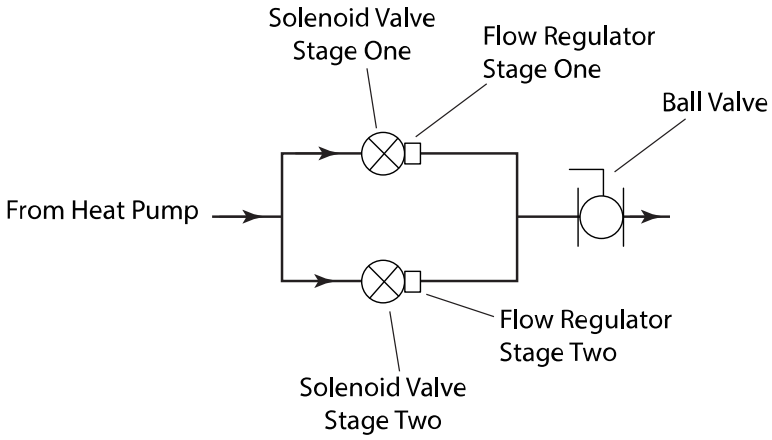


Fig. 12 – Single Solenoid Valve



NOTE: Refer to Fig. 20. Wiring kit #4129 is recommended for easy 24 volt connection staging solenoids with compressor.

Fig. 13 – Two Solenoid Valves

HEAT RECOVERY PACKAGE (HRP) SETUP

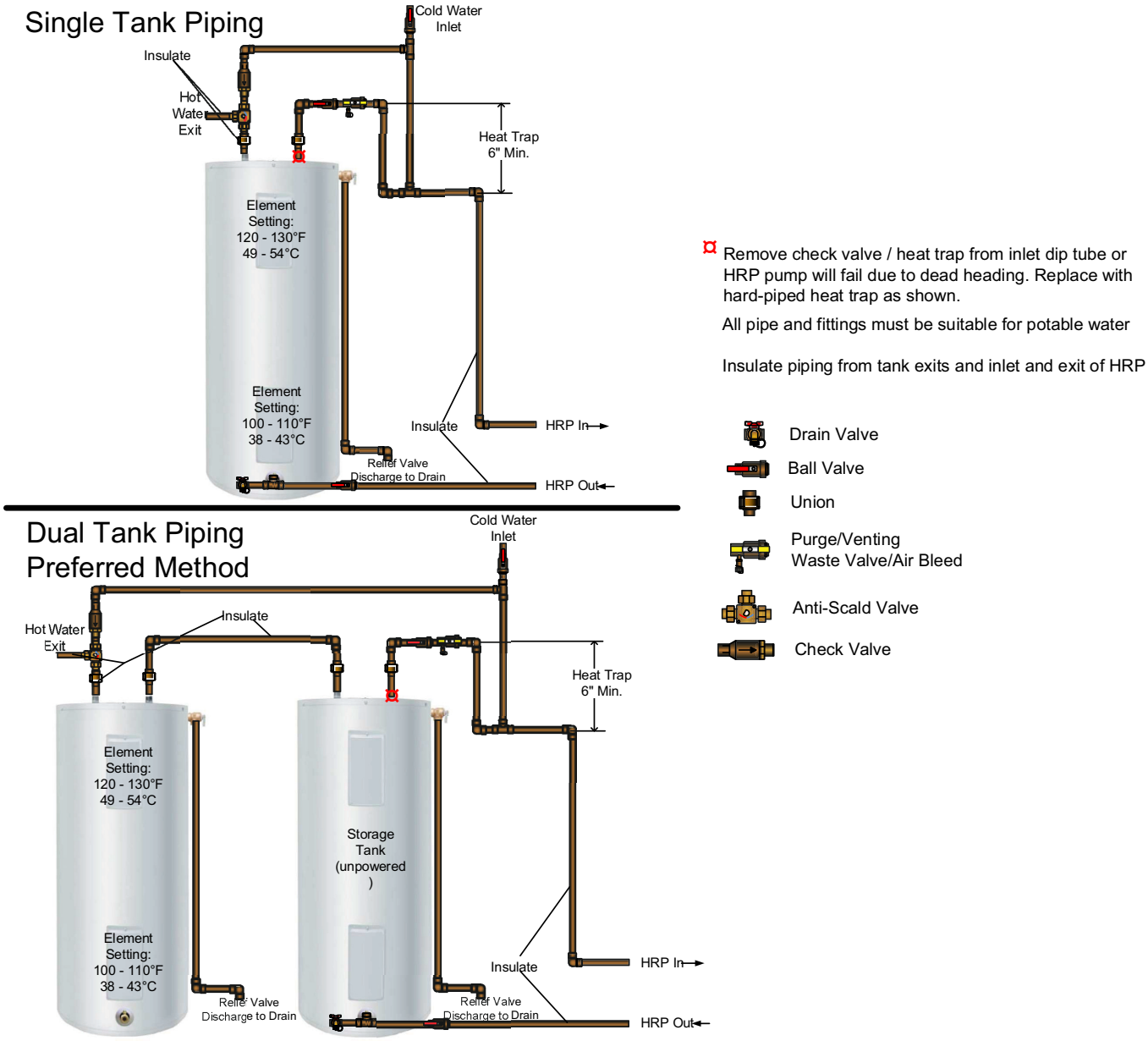
Water Tank Preparation

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 HR water piping.

IMPORTANT: All piping from HRP to domestic water tank must be copper.

All hot water piping MUST be a minimum of 3/8" O.D. copper tubing 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.

Refer to local codes for other requirements. Remove the check valve/heat trap valve on the cold inlet dip tube of the heating tank, or the storage tank for dual tank application. Removing this valve will prevent damage to the HRP circulator. It is recommended to hard pipe a heat trap in lieu of this valve for additional energy savings. Install an air bleed, venting waste valve (or other fitting that allows air purge for initial install) on the HRP piping at the highest point. Use a 50 - 80 gallon water heater, or two 50-gallon water heaters connected in series (preferred method) as shown. (See Fig. 14)



Heat pump not shown..

Fig. 14 – HRP Water Piping

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 GZA unit can be installed as communicating with UI communicating thermostats.

Communicating

User Interface (UI) is designed to self-program with the GZA unit when connected to the ABCD connector on the ODU board. Only two (2) wires are needed from the UI for the AB connections since the GZA unit has a transformer for the 24v (see Fig. 15 and Fig. 16).

NOTE: It is always a good idea to run extra thermostat wires during installation in the event of faulty wires, etc.

Communicating System Tips:

- The GZA units include an Outdoor Air Temperature (OAT) sensor in the literature packaging.
- The GZA unit should be used with the latest System Control software to have the most functionality.
- 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”.

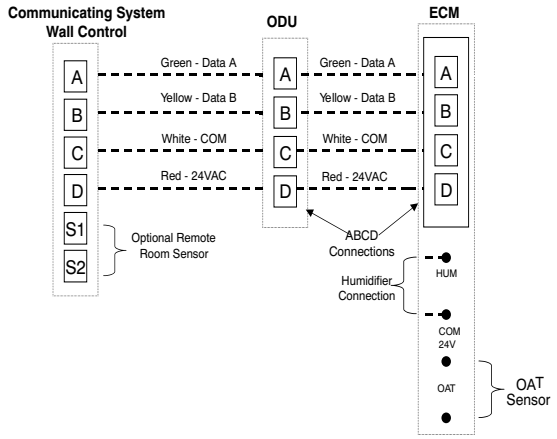


Fig. 15 – Universal Two-Wire Connection

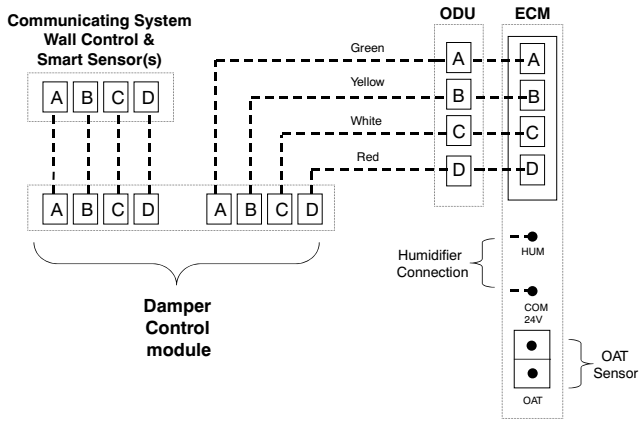


Fig. 16 – Zoning Connection for Communicating Indoor Unit with 2-Stage Communicating split geothermal unit

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.

⚠ 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.

Refer to electrical component box layout. See Fig. 17.

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.

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.

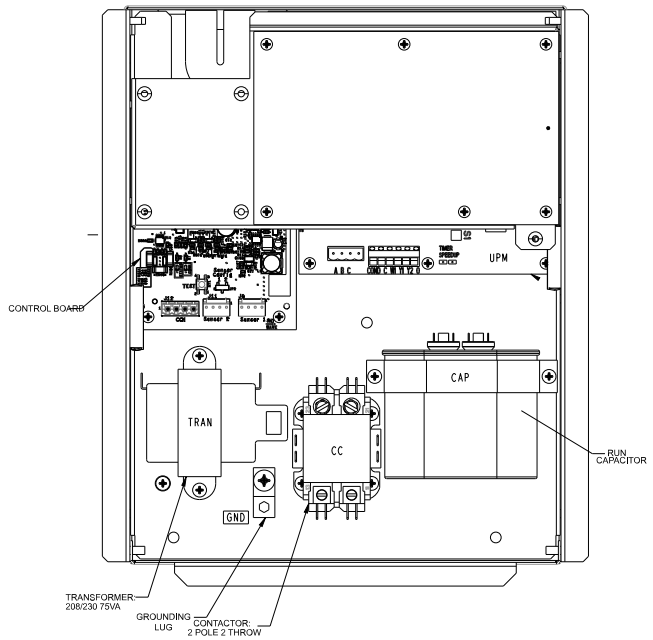


Fig. 17 – Electrical Component Box Layout

The electrical box is designed to allow servicing behind the box relatively easily to access reversing valve, etc. The 2-3 screws on the bottom of the electrical box could be removed and with wiring all out one side of the box carefully swing box in direction of the wiring bundle to allow access to components behind the box if necessary. Remember that all sides of the cabinet are accessible but in event the unit is placed where all sides make this difficult, removal of the box may help.

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.

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.

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. 18 for typical wiring to the ODU.

Systems using communicating user interface controls will set up the control by entering the service screens, Setup and 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).

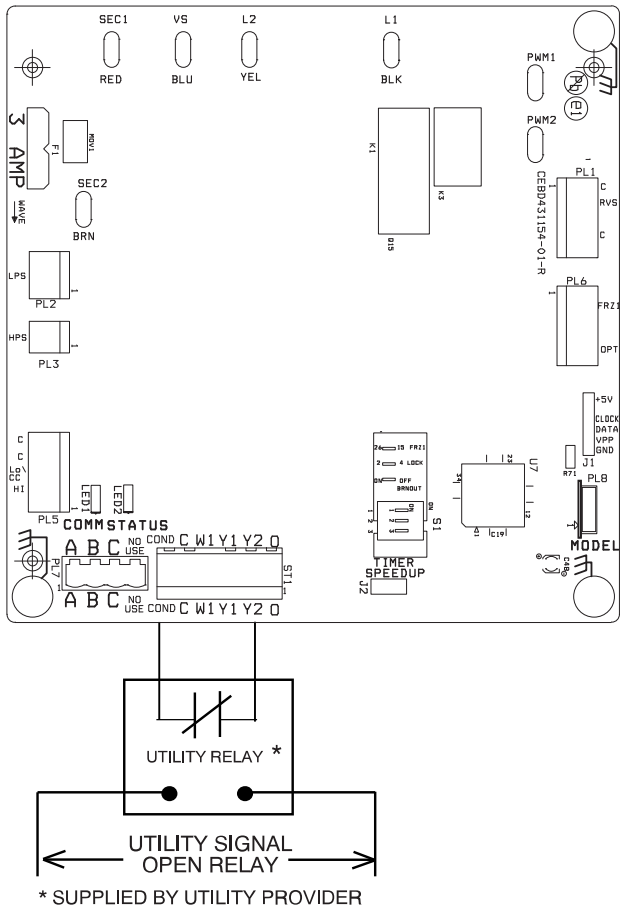
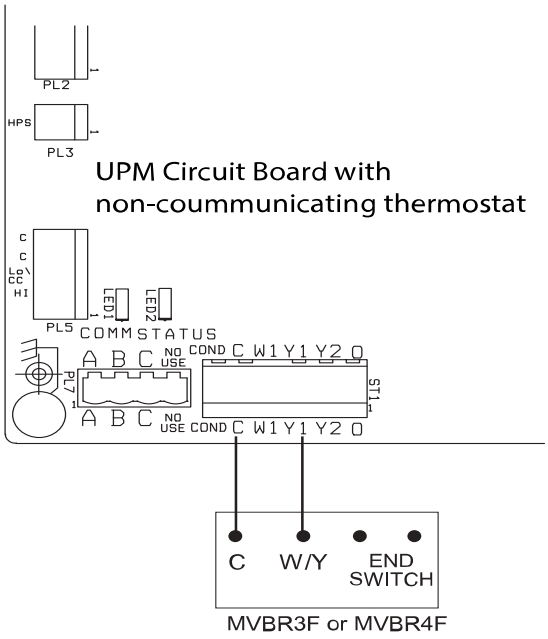


Fig. 18 – Utility Curtailment Wiring

Energy Tracking

The Energy Tracking feature is available when unit is used with the Infinity®/Evolution™ Connex™ System Control. Energy Tracking has the ability to monitor and estimate the energy consumption of the unit and displays the data on the wall control.

The Energy Tracking Kit (KHAGT0101KIT) includes a sensor and wiring harness. The kit must be installed on the geothermal unit for energy tracking functionality. See kit for field-installation instructions.



NOTE: Optional wiring if wiring kit #4129 is not used with non-communicating thermostat. See Fig. 20 for optional End Switch wiring.

Fig. 19 – Solenoid Valve Wiring

Communicating controls notes:

1. The end-switch of the MVBR3F or MVBR4F may be wired to the compressor contactor (as shown in optional wiring Fig. 20). This could be helpful with some applications where long delays between equipment starts are expected, and entering water flow rate is borderline low. Long delays will cause these valves to open slowly due to the required time to fully energize the valve electronics. If the end-switch takes longer than 60 seconds to make, not energizing the compressor contactor, the equipment will error with code 47 (No 230V to unit). MVBR3F or MVBR4F are designed to fully open before 60 seconds.
2. Using the optional wiring with the end-switch is field installed only, and is for ODU boards with PN: HK38EA050. This board can be purchased through RC if a different version of ODU is factory installed. Some applications require the end-switch to be wired with HK38EA050 version board. This wiring method with other versions (such as HK38EA041) of ODU board will result in error code 47.
3. 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).

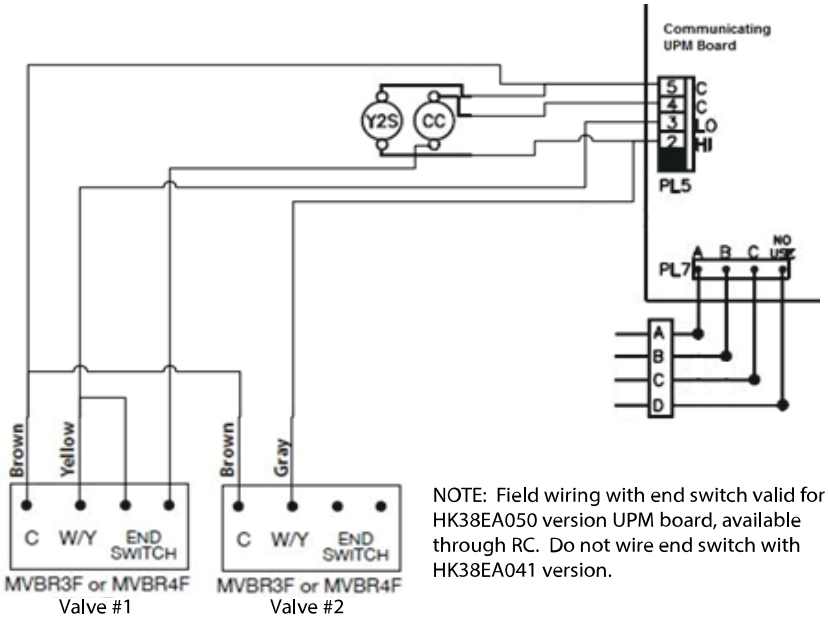


Fig. 20 – Low Voltage Wiring of Field Installed MVBR3F/ MVBR4F Valve(s)

Transformer Sizing

Each MVBR3F/MVBR4F valve may use up to 11.5 VA. Verify heat pump installation manual to ensure that heat pump transformer is large enough for heat pump controls, water solenoid valve(s), and any other accessories. Other water solenoid valves may have higher VA requirements than the MVBR3F and MVBR4F valves

FACTORY INSTALLED FEATURES

A number of factory installed options are available on the GZA Series of Heat Pumps. The following details the purpose, function and components of each option.

Heat Recovery Package (HRP) (optional)

The heat recovery package is a factory installed option on GZA 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).

The circulating pump is enabled when compressor discharge temperature reaches 120°F (48.9°C).

The circulating pump is disabled if an overload condition exists (over 1.35 amps).

The HRP cannot be used when the unit is installed outdoors due to freezing potential.

⚠ 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.

⚠ CAUTION

UNIT DAMAGE AND/OR OPERATION HAZARD

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

Do not apply additional controlled devices to the control circuit power supply without consulting the factory. Doing so may void equipment warranties.

FIELD INSTALLED ACCESSORIES

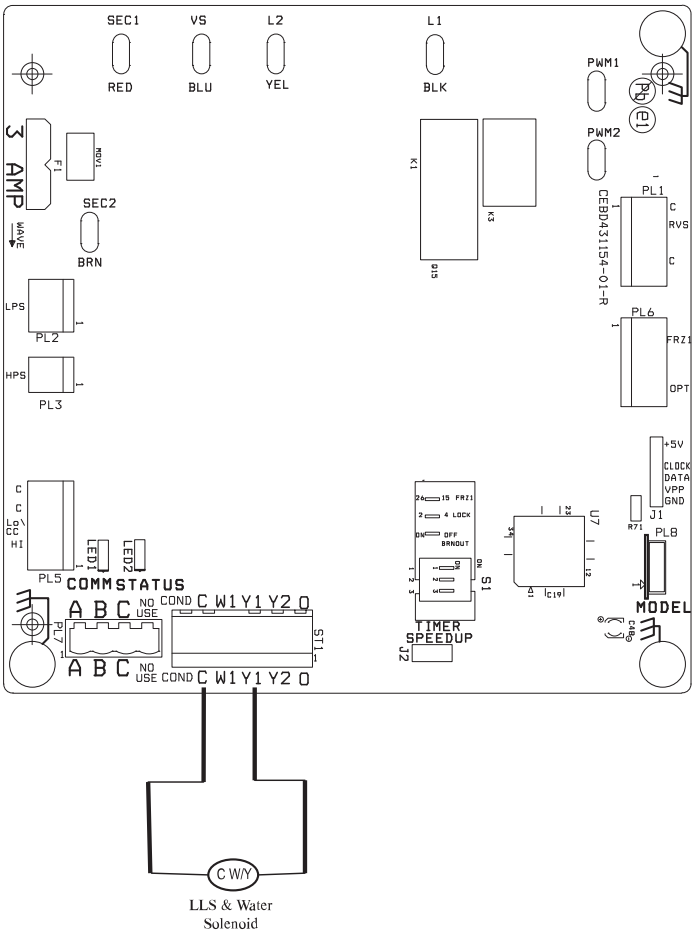
Liquid Line Solenoid Accessory

Experience and good design practice dictate 75 feet as the maximum practical length for interconnecting refrigerant lines in split system heat pumps without special considerations. Beyond 75 feet, system losses become substantial and the total refrigerant charge required can compromise the reliability and design life of the equipment.

Local codes or installation may suggest a liquid line solenoid, installation of long line solenoid should adhere to valve installation instructions.

Accessory Liquid Solenoid with Communicating System Control: When using the System Control, the liquid-line solenoid output is provided at the Y1 connection. Connect the solenoid as shown in Fig. 21. This is a 24VAC output that is energized whenever the compressor is energized. In compressor OFF mode, it closes to prevent refrigerant migration into the unit through the liquid-line.

Systems with Accessory Liquid Solenoid Using a Non-Communicating Thermostat:
The liquid solenoid is connected to the Y1 and C terminal connections (see Fig. 21) and assumes that both Y2 and Y1 are energized by the thermostat during call for high stage operation.
In compressor OFF mode, the liquid solenoid closes to prevent refrigerant migration into the unit through the liquid-line. The terminal connections for Y1 and C will have LLS and the stat wires sharing the same connection points.



NOTE: Optional wiring if wiring kit #4129 is not used.

Fig. 21 – LLS ad Water Solenoid Connections

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. 22 for wiring the sensor to the OAT plug on the fan coil or furnace unit control board. 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, and allows dual-fuel and electric heat lockout features to work properly.

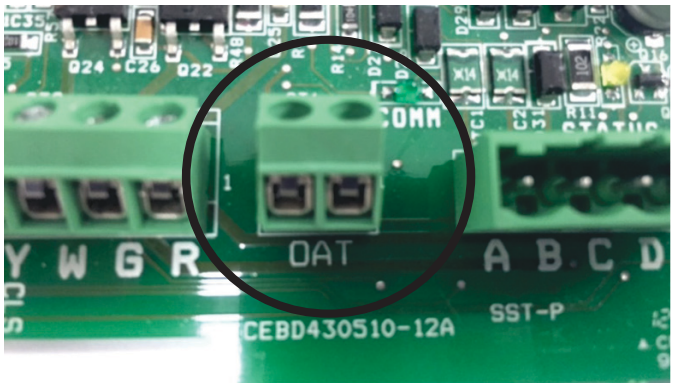


Fig. 22 – OAT Sensor Connection on ECM / Fan Board

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 HRP switch is energized, if applicable. Recommend de-energize if installed and water not available.
- ☐Verify the HRP system is purged and connected completely, if applicable.
- ☐Verify the freeze protection is set according to proper freeze temperature (26°F or 15°F)
- ☐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.
- ☐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.
- ☐Ensure no wiring is pinched when panels are re-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.
- ☐If non-communicating thermostat ensure the ODU dip switch settings are configured accordingly for Freeze Protection, Lockout trip setting and Brownout). ODU dip switch settings can be configured in the User Interface during set up (see steps below in user interface quick setup).
- ☐Ensure all panels are in place before powering up the unit.
- ☐Always check incoming line voltage, power supply and secondary control voltage for adequacy. Transformer primaries are dual tapped for 208 and 230 volts. Connect the appropriate tap to ensure a minimum of 18 volts secondary control voltage. 24 volts is ideal for best operation.
- ☐The following guidelines are recommended for wiring between a thermostat and the unit: 18 GA up to 60 ft (18.3m), 16 GA up to 100 ft. (30.5m), and 14 GA up to 140 ft. (42.7m).

UNIT START-UP

If the unit utilizes the Communicating User Interface, reference information in the User Interface Quick Setup section.

Non-communicating thermostats:

- ☐Set the thermostat to the highest setting.
- ☐Set the thermostat system switch to “COOL”, and the fan switch to the “AUTO” position. The reversing valve solenoid should energize. The compressor and fan should not run.
- ☐Reduce the thermostat setting approximately 5 degrees below room temperature.
- ☐Verify the heat of rejection is within 10% of the product data for conditions the unit is started under in cooling mode.
- ☐Turn the thermostat system switch to the “OFF” position. The unit should stop running and the reversing valve should de-energize.
- ☐Leave the unit off for approximately five (5) minutes to allow for system equalization.
- ☐Turn the thermostat to the lowest setting.
- ☐Set the thermostat switch to “HEAT”.
- ☐Increase the thermostat setting approximately five (5) degrees above room temperature.
- ☐Verify the unit heat of extraction is within 10% of the unit product data information when started in the heating mode of operation.
- ☐Set the thermostat to maintain desired space temperature.
- ☐Check for vibrations, leaks, etc.
- ☐It is suggested that a start up / commissioning form be completed for each new installation. This document should be kept at both the job site and with the project folder of the installing contractor if needed to refer back to.

User Interface Quick Set-Up

Install only approved thermostats per the unit Product Data. The latest version of UI software should be used, as functionality and bug fixes are continually updated. . 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:

- Outdoor (ODU)
- A2L Board
- SAM if applicable
- Zoning if applicable

Any non-com components via selectable screens.

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

UI 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 low heat

☐Verify high 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

☐Check for vibration, leaks, etc.

☐Make sure company logo and contact info has been added to UI.

☐Explain thermostat operation and maintenance to the homeowner.

System Verification (Communicating)

☐The unit is shipped with a Unit Start-up Checklist in the literature package. Allow the unit to operate for minimum of 5 minutes between system changes to stabilize before checking system performance.

NOTE: Access to the refrigeration system should only be necessary as last resort in troubleshooting to prevent unnecessary charge issues.

☐Check the water flow and operating conditions. Reference the Product Data.

☐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.

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.
  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.

☐Record all data on the Startup Checklist included in the unit Packet. Save the checklist in the customer file at your dealership.

Solenoid Valve Start-Up

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.

The 24 VAC connections to the water solenoid valve should be made on the "C" and "W/Y" terminals. The power from the unit controls is identified as "C" and "Y1". The same terminals are used if wiring in a liquid line solenoid. (See Fig. 21)

Initial Start-Up of HRP

⚠ 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 140°F and compressor discharge temperature is 120°F or above.
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 140°F.

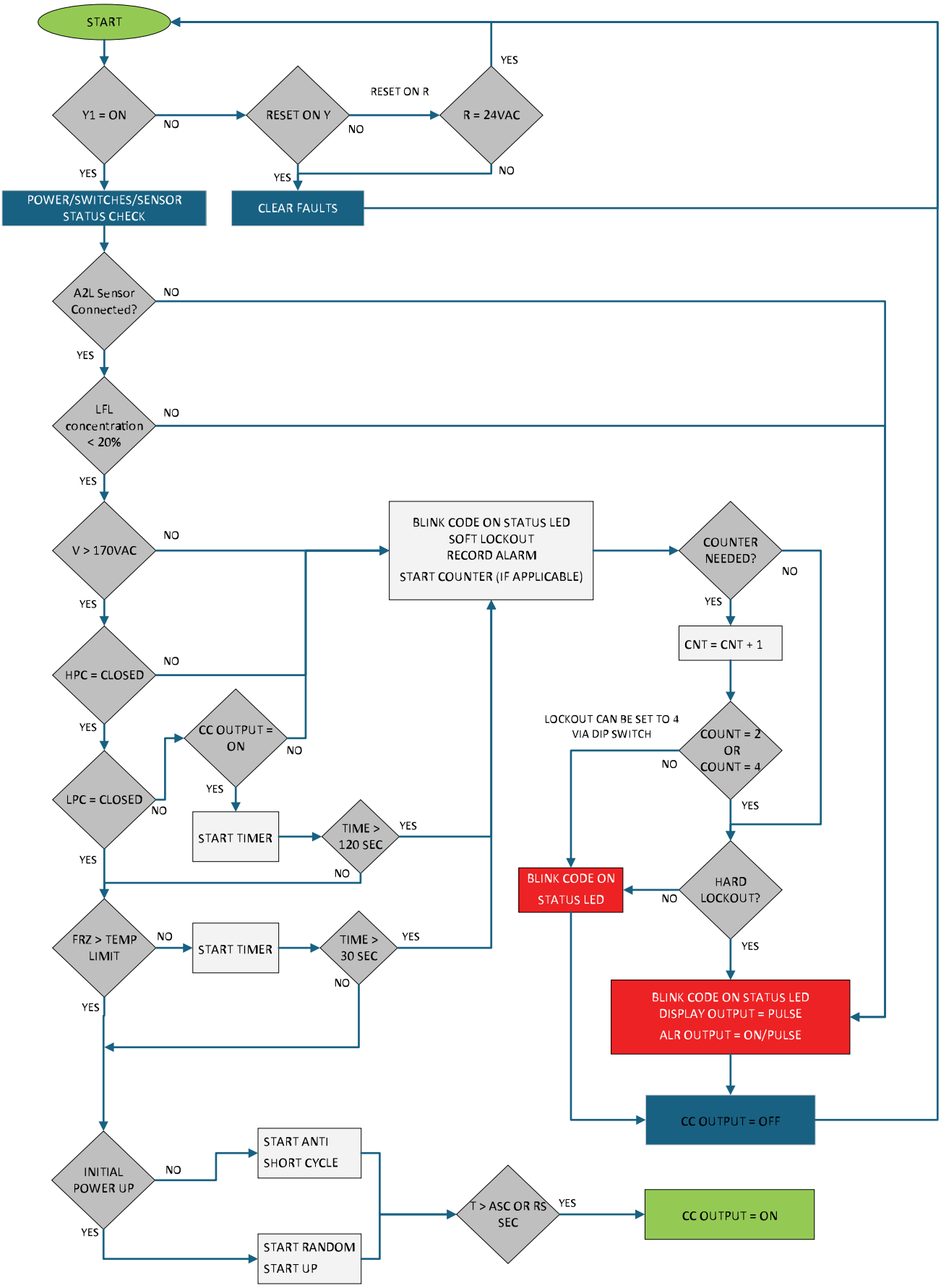


Fig. 23 – ODU Sequence of Operation (SOO) Flow Chart

System Function and Sequence of Operation

GZA models utilize either a Communicating System Control.

With a call for first stage cooling/heating, the low stage is energized. If low-stage cannot satisfy the cooling/heating demand, high stage is energized by the second stage of indoor thermostat. After second stage is satisfied, the unit returns to low-stage operation until the first stage is satisfied or until second stage is required again.

When both first and second stage cooling are satisfied, the compressor will shut off. When a 2-stage unit is operating at low-stage, system vapor (suction) pressure will be higher than a standard single-stage system or high-stage system.

Communicating Sequence: The ODU board controls all functions.

Communication and Status Function Lights

A green LED (COMM light) on the ODU (see Fig. 25) 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 18 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.

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.

The Board includes the following features:

- **LOW PRESSURE SWITCH**: The low pressure switch safety is designed to shut down the compressor in th 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.

Pressure Switch Protection: The split 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 18).
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.

- **LOW 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.
- **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.
- **CONTROL FAULT**: If the split 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.
  NOTE: these DIP switch settings are for non-communicating (24V) t-stats. Connecting an Infinity/Evolution Connex System Control will override these DIP settings, and are then only accessible through the System Control.
  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

- **FREEZE SENSOR**: The water coil is protected by a thermistor located between the condensing water coil (coax) and the thermal expansion valve (see Fig. 12).
  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 setpoint (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 Freeze Sensor, refer to Table 18.

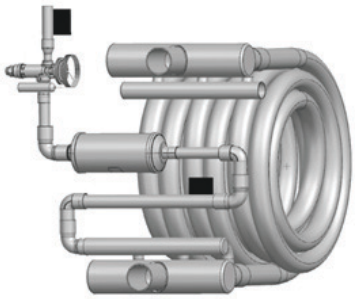


Fig. 24 – Waterside Freeze Sensor Location (FREEZE 1)

⚠ 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 anti-freeze 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.

- **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 dipswitch 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**: The control board input terminals labeled VS and L2 (see Fig. 25) 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.
  In an open loop application, with the end-switch field wired into the low-voltage compressor contactor circuit, no voltage error (47) could occur if the water valve does not open after 60 seconds.
- **COMPRESSOR VOLTAGE SENSING**: 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.
- **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 18. 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. Another cause could be a faulty open-loop valve if the end switch is field wired per Fig. 20.The control will flash the appropriate fault code. Check the contactor and control box wiring. Refer to Table 16 and Fig. 25.

Table 16 – ODU Voltage Detection

ODU Voltage Detection	Fault Code
Brown out L1 and L2	46
Compressor voltage sensing VS and L1	74
230V line power disconnect detection on L1 and L2	47
Contactor shorted detection VS and L1	73
24V transformer Sec 1 and Sec 2	No faults

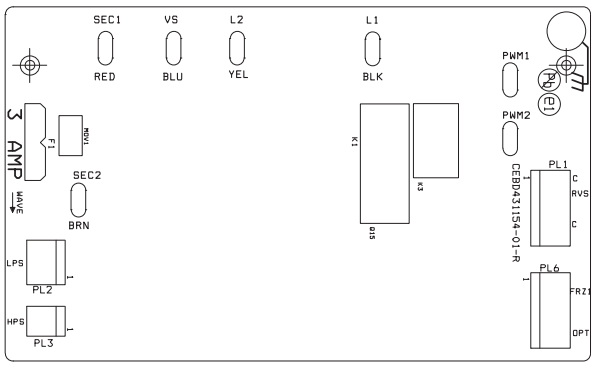


Fig. 25 – ODU Board
L1, L2, VS, SEC 1 and SEC 2 Locations

Timer Speed-Up and System Check-Out Mode

On systems with non-communicating thermostats, 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 startup

On a system with a communicating System 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.

Auxilliary Heat Lockout

The following applies to GZA split units used with a gas furnace or fan coil with electric heat:

When using the GZA communicating units, the "Lock-out" feature for the gas furnace or electric heat is not enabled by default on the Infinity®/Evolution™ Connex™ System Control. The System Control is "in charge" of the comfort and the staging.

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 the gas furnace, or supplement with electric heat, which will remain in operation until the thermostat is satisfied.

Any change to this default setting should only be done by experienced technicians, and knowledge that the ground loop is sized correctly in accordance to IGSPHA training and applicable standards. Concerns include, but are not limited to, the following.

- 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 gas furnace or 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 (gas furnace or 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.
- In the default “System in Control” setting the System Control takes the guesswork out of determining the change-over set-point and ensures that comfort and performance are not compromised.
- Infinity®/Evolution™ Connex™ System Control has additional lockout and staging options to fit more rare applications. Installers should only use these settings if the application requires to do so, and the ground loop is adequately designed.
  - Heat source lockout: Can be used to specify an outdoor air temperature in which electric heat is off. An outdoor air temperature sensor must be field wired to the ECM fan board for this function to work properly.
  - Windup Control setting “Enabled”: could reduce energy cost by turning on electric heat less often but could reduce comfort by not reaching setpoint as quickly.
  - No down-staging “Enabled”: The heat pump and electric/aux heat will not down-stage. The equipment and aux heat will run until demand is satisfied. This could result in higher energy costs and is most likely used for lake-plates and undersized loops.

Emerging From Set-Back

Some key operational features to consider are below:

In set-back (heating) mode:

- When coming out of set-back, the system will always first engage the GHP in first stage heat, then second stage heat, then auxiliary back-up (electric resistance or furnace).
- The system uses intelligent recovery.
- Back-up 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 setpoint several degrees:

- The system will always first engage the GHP in first stage heat, then second stage heat, then auxiliary back-up (electric resistance or furnace).
- Back-up 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 setpoint from, for example 70° to 74°, the extra heat is wanted now.

Table 17 – Water Side Pressure Drop

Model	Water Flow Rate (GPM)	Pressure Drop PSIG								
		30ºF	40ºF	50ºF	60ºF	70ºF	80ºF	90ºF	100ºF	110ºF
GZA024 w/ FE5***C36L* / FT5***C36L*	3.0	1.3	1.2	1.1	1.1	1.1	1.0	1.0	0.9	0.9
	4.5	2.5	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.9
	6.0	4.1	3.9	3.8	3.6	3.5	3.3	3.2	3.1	3.1
	8.0	6.7	6.4	6.2	5.9	5.7	5.5	5.3	5.2	5.1
GZA036 w/ FE5***C36L* / FT5***C36L*	4.5	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8
	6.8	2.2	2.1	2.0	1.9	1.8	1.7	1.7	1.6	1.6
	9.0	3.5	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6
	12.0	5.8	5.6	5.3	5.1	4.9	4.7	4.6	4.5	4.3
GZA036 w/ FE5***C48L* / FT5***C48L*	4.5	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8
	6.8	2.2	2.1	2.0	1.9	1.8	1.7	1.7	1.6	1.6
	9.0	3.6	3.4	3.2	3.1	3.0	2.8	2.8	2.7	2.6
	12.0	5.8	5.5	5.3	5.0	4.9	4.7	4.5	4.4	4.3
GZA048 w/ FE5***C48L* / FT5***C48L*	6.0	1.7	1.6	1.5	1.4	1.4	1.3	1.3	1.2	1.2
	9.0	3.3	3.1	3.0	2.9	2.8	2.7	2.6	2.5	2.4
	12.0	5.4	5.2	4.9	4.7	4.6	4.4	4.3	4.2	4.0
	16.0	8.9	8.5	8.1	7.8	7.6	7.3	7.1	6.9	6.7
GZA060 w/ FE5**D60L* / FT5**D60L*	7.5	1.8	1.7	1.6	1.5	1.5	1.4	1.4	1.4	1.3
	11.3	3.6	3.4	3.3	3.2	3.0	2.9	2.9	2.8	2.7
	15.0	5.9	5.6	5.4	5.2	5.0	4.9	4.7	4.6	4.5
	20.0	9.8	9.4	9.0	8.6	8.3	8.1	7.8	7.6	7.4
GZA072 w/ FE5**D60L* / FT5**D60L*	9.0	2.7	2.6	2.5	2.4	2.3	2.2	2.2	2.1	2.1
	13.5	5.5	5.3	5.1	4.9	4.7	4.6	4.4	4.3	4.2
	18.0	9.1	8.7	8.4	8.1	7.8	7.5	7.3	7.1	6.9
	24.0	14.9	14.4	13.9	13.4	12.9	12.5	12.1	11.8	11.5
GZA024 w/ CAA**2414AM*	3.0	1.3	1.2	1.2	1.1	1.1	1.0	1.0	1.0	0.9
	4.5	2.6	2.5	2.3	2.2	2.1	2.1	2.0	1.9	1.9
	6.0	4.2	4.0	3.8	3.7	3.5	3.4	3.3	3.2	3.1
	8.0	6.9	6.6	6.3	6.0	5.8	5.6	5.4	5.3	5.1
GZA036 w/ CAA**3617AM*	4.5	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.8	0.8
	6.8	2.1	2.1	2.0	1.9	1.8	1.7	1.7	1.6	1.6
	9.0	3.6	3.4	3.2	3.1	3.0	2.9	2.8	2.7	2.6
	12.0	5.8	5.6	5.3	5.1	4.9	4.7	4.6	4.4	4.3
GZA048 w/ CAA**4821AM*	6.0	1.5	1.4	1.4	1.3	1.3	1.2	1.2	1.2	1.1
	9.0	3.0	2.9	2.8	2.7	2.6	2.5	2.4	2.3	2.3
	12.0	5.0	4.8	4.6	4.4	4.3	4.1	4.0	3.9	3.8
	16.0	8.1	7.9	7.6	7.3	7.0	6.8	6.6	6.4	6.3
GZA060 w/ CAA**6024AM*	7.5	3.1	2.9	2.8	2.6	2.6	2.4	2.4	2.3	2.2
	11.3	6.1	5.8	5.5	5.3	5.1	4.9	4.7	4.6	4.5
	15.0	9.8	9.5	9.1	8.7	8.4	8.1	7.8	7.6	7.4
	20.0	16.1	15.5	14.9	14.3	13.8	13.3	12.9	12.5	12.2
GZA072 w/ CAA**6024AM*	9.0	4.2	4.0	3.8	3.6	3.5	3.3	3.2	3.1	3.0
	13.5	8.4	8.0	7.6	7.2	7.0	6.7	6.5	6.3	6.1
	18.0	13.2	12.8	12.3	11.9	11.5	11.1	10.7	10.4	10.1
	24.0	22.0	21.2	20.4	19.6	18.9	18.3	17.7	17.2	16.8

All values based upon pure water at 70° F.
This chart shows approximate temperatures and pressures for a unit in good repair. The values shown are meant as a guide only and should not be used to estimate system charge. This chart assumes rated air flow and 80°F d.b./67°F w.b. entering air temperature in cooling, 70°F d.b. entering air temperature in heating. Heating data at entering fluid temperatures below 50°F assumes the use of antifreeze. As a result of continuing research and development, specifications are subject to change without notice.

PRESSURE TEMP PERFORMANCE

			Cooling				Heating			
Model	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
GZA024 w/ FE5***C36L* / FT5***C36L*	30	3					75-85	75-95	8-9	13-17
		6					81-91	82-102	4-5	14-18
	40	3	134-151	210-228	21-24	19-23	87-97	90-110	10-11	16-20
		6	132-149	175-193	10-13	19-23	96-106	99-119	5-6	17-21
	50	3	135-152	238-256	20-23	19-23	102-112	105-125	12-13	18-22
		6	133-150	203-221	10-13	19-23	112-122	116-136	6-7	20-24
	60	3	137-154	269-287	20-23	19-23	115-125	120-140	14-15	20-24
		6	135-152	234-252	10-13	19-23	126-136	131-151	7-8	22-26
	70	3	138-155	303-321	19-22	18-22	128-138	134-154	15-16	22-26
		6	137-154	268-286	9-12	19-23	141-151	147-167	8-9	25-29
	80	3	140-157	340-358	19-22	18-22	142-152	148-168	17-18	25-29
		6	138-155	306-324	9-12	18-22	159-169	166-186	9-10	27-31
	90	3	141-158	380-398	18-21	17-21	157-167	165-185	19-20	27-31
		6	140-157	348-366	9-12	17-21	178-188	186-206	10-11	30-34
	100	3	143-160	423-441	17-20	16-20				
		6	142-159	394-412	8-11	17-21				
GZA036 w/ FE5***C36L* / FT5***C36L*	30	4.5					71-81	282-302	9-10	19-23
		9					77-87	287-307	4-5	21-25
	40	4.5	119-135	197-221	19-22	21-25	82-92	292-312	10-11	22-26
		9	117-133	171-195	9-12	21-25	90-100	301-321	5-6	24-28
	50	4.5	121-137	224-248	19-22	21-25	95-105	306-326	12-13	25-29
		9	119-135	198-222	9-12	21-25	105-115	316-336	6-7	27-31
	60	4.5	123-139	254-278	19-22	21-25	109-119	320-340	13-14	28-32
		9	121-137	228-252	9-12	21-25	122-132	334-354	7-8	31-35
	70	4.5	124-140	288-312	18-21	20-24	125-135	337-357	15-16	31-35
		9	123-139	261-285	9-12	21-25	140-150	353-373	8-9	35-39
	80	4.5	126-142	324-348	17-20	20-24	142-152	355-375	17-18	35-39
		9	125-141	299-323	8-11	20-24	161-171	375-395	9-10	39-43
	90	4.5	127-143	363-387	17-20	20-24	161-171	374-394	19-20	39-43
		9	126-142	340-364	8-11	20-24	185-195	401-421	10-11	44-48
	100	4.5	129-145	405-429	16-19	19-23				
		9	128-144	385-409	8-11	19-23				
GZA036 w/ FE5***C48L* / FT5***C48L*	30	4.5					69-79	251-271	8-9	14-18
		9					76-86	256-276	4-5	15-19
	40	4.5	130-146	207-231	21-24	21-25	80-90	260-280	9-10	16-20
		9	128-144	177-201	10-13	21-25	88-98	266-286	5-6	18-22
	50	4.5	131-147	234-258	20-23	21-25	93-103	267-287	11-12	19-23
		9	130-146	204-228	10-13	21-25	102-112	277-297	6-7	20-24
	60	4.5	133-149	265-289	20-23	20-24	106-116	281-301	12-13	21-25
		9	131-147	235-259	10-13	21-25	118-128	290-310	7-8	23-27
	70	4.5	134-150	298-322	19-22	20-24	122-132	292-312	14-15	24-28
		9	133-149	268-292	9-12	20-24	136-146	303-323	8-9	27-31
	80	4.5	135-151	335-359	18-21	20-24	138-148	303-323	16-17	27-31
		9	134-150	306-330	9-12	20-24	157-167	322-342	9-10	30-34
	90	4.5	137-153	374-398	18-21	19-23	157-167	320-340	18-19	30-34
		9	136-152	347-371	9-12	19-23	179-189	339-359	10-11	34-38
	100	4.5	139-155	417-441	17-20	19-23				
		9	138-154	392-416	8-11	19-23				

PRESSURE TEMP PERFORMANCE (Continued)

			Cooling				Heating			
Model	**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**
GZA048 w/ FE5*C48L* / FT5***C48L***	30	6					64-84	260-280	8-9	20-24
		12					74-94	282-302	4-5	21-25
	40	6	119-135	202-222	19-22	23-27	79-99	282-302	9-10	23-27
		12	117-133	180-200	9-12	24-28	89-109	292-312	4-5	25-29
	50	6	121-137	230-250	19-22	23-27	92-112	295-315	11-12	26-30
		12	120-136	207-227	9-12	23-27	102-122	305-325	6-7	28-32
	60	6	123-139	260-280	18-21	23-27	105-125	307-327	13-14	29-33
		12	122-138	238-258	9-12	23-27	117-137	314-334	7-8	32-36
	70	6	124-140	294-314	18-21	22-26	120-140	316-336	14-15	33-37
		12	123-139	273-293	8-11	22-26	136-156	326-346	8-9	37-41
	80	6	126-142	331-351	17-20	22-26	139-159	334-354	16-17	37-41
		12	125-141	312-332	8-11	22-26	158-178	354-374	8-9	41-45
	90	6	127-143	372-392	16-19	21-25	159-179	356-376	17-18	41-45
		12	126-142	356-376	8-11	22-26	182-202	377-397	9-10	46-50
	100	6	129-145	417-437	16-19	21-25				
		12	128-144	404-424	7-10	21-25				
GZA060 w/ FE5D60L* / FT5**D60L***	30	7.5					69-85	261-318	7-9	22-26
		15					75-91	276-334	4-5	23-28
	40	7.5	106-131	157-196	17-23	22-26	80-98	279-341	9-10	25-29
		15	106-130	152-188	8-11	22-26	88-107	291-354	5-6	27-32
	50	7.5	107-133	180-226	17-23	23-27	92-113	295-361	11-12	28-33
		15	108-133	175-218	8-11	22-27	102-124	306-374	6-7	30-36
	60	7.5	113-140	210-263	17-23	23-28	105-128	312-383	12-14	31-37
		15	113-138	202-252	8-12	24-28	117-142	325-398	7-8	34-40
	70	7.5	116-143	236-297	17-23	23-27	119-146	327-403	14-16	35-41
		15	116-142	233-290	8-12	23-27	135-163	345-423	8-9	38-45
	80	7.5	118-146	270-338	16-22	23-27	136-165	346-426	15-18	38-45
		15	119-145	267-330	8-11	23-27	154-185	367-450	8-10	42-49
	90	7.5	120-148	311-387	15-21	23-27	153-185	364-450	17-20	42-50
		15	121-148	306-376	8-11	23-27	169-203	380-467	9-11	45-53
	100	7.5	122-151	348-431	15-20	22-26				
		15	123-150	349-426	8-11	22-26				
GZA072 w/ FE5D60L* / FT5**D60L***	30	9					71-87	279-336	6-8	26-30
		18					76-92	296-354	3-4	27-32
	40	9	89-115	138-178	15-19	20-25	82-100	303-365	8-9	29-33
		18	103-128	174-212	7-12	23-28	89-108	312-375	4-5	31-36
	50	9	98-125	172-220	15-20	22-27	95-116	319-385	9-10	33-38
		18	106-132	193-238	8-11	24-29	103-125	332-400	5-6	35-41
	60	9	108-135	205-261	16-20	25-29	109-132	338-409	10-12	37-43
		18	109-136	211-263	7-12	25-29	119-144	356-429	6-7	39-45
	70	9	112-140	247-309	16-20	24-29	123-150	360-436	12-14	41-47
		18	112-139	243-302	7-12	24-29	135-163	378-456	6-7	43-50
	80	9	114-142	278-348	15-20	24-28	139-168	382-462	13-16	44-51
		18	114-142	278-344	7-10	24-29	152-183	425-508	7-9	47-54
	90	9	116-145	316-394	15-19	24-28	151-183	378-464	15-18	47-55
		18	116-144	317-389	7-10	24-28	165-199	422-509	9-11	50-58
	100	9	117-147	360-444	14-18	23-27				
		18	118-147	361-440	7-10	23-27				

PRESSURE TEMP PERFORMANCE (Continued)

			Cooling				Heating			
Model	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
GZA024 w/ CAA**2414AM*	30	3					74-84	274-294	7-8	19-23
		6					80-90	281-301	3-4	21-25
	40	3	129-146	213-231	20-23	26-30	87-97	288-308	8-9	23-27
		6	128-145	179-197	10-13	26-30	95-105	297-317	4-5	25-29
	50	3	130-147	240-258	20-23	25-29	101-111	303-323	10-11	26-30
		6	129-146	206-224	9-12	26-30	111-121	315-335	5-6	29-33
	60	3	132-149	271-289	19-22	25-29	116-126	321-341	12-13	30-34
		6	130-147	237-255	9-12	25-29	129-139	335-355	6-7	33-37
	70	3	133-150	304-322	18-21	24-28	133-143	340-360	13-14	34-38
		6	132-149	270-288	9-12	25-29	148-158	357-377	7-8	37-41
	80	3	134-151	341-359	18-21	24-28	150-160	360-380	15-16	38-42
		6	133-150	308-326	9-12	24-28	169-179	379-399	9-10	41-45
	90	3	136-153	380-398	17-20	23-27	169-179	380-400	18-19	41-45
		6	134-151	349-367	8-11	24-28	192-202	405-425	10-11	46-50
	100	3	138-155	423-441	16-19	23-27				
		6	136-153	395-413	8-11	23-27				
GZA036 w/ CAA**3617AM*	30	4.5					73-83	299-319	8-9	20-24
		9					80-90	307-327	4-5	21-25
	40	4.5	121-137	202-226	20-23	25-29	85-95	314-334	9-10	23-27
		9	119-135	175-199	9-12	25-29	94-104	324-344	5-6	25-29
	50	4.5	123-139	229-253	19-22	25-29	99-109	330-350	11-12	26-30
		9	121-137	202-226	9-12	25-29	110-120	344-364	6-7	28-32
	60	4.5	124-140	260-284	19-22	24-28	115-125	349-369	13-14	30-34
		9	123-139	232-256	9-12	25-29	128-138	365-385	7-8	32-36
	70	4.5	126-142	293-317	18-21	24-28	132-142	370-390	14-15	33-37
		9	125-141	266-290	9-12	24-28	147-157	388-408	8-9	37-41
	80	4.5	127-143	330-354	17-20	23-27	152-162	393-413	16-17	37-41
		9	126-142	304-328	8-11	24-28	170-180	415-435	9-10	41-45
	90	4.5	129-145	370-394	17-20	23-27	173-183	419-439	18-19	42-46
		9	128-144	345-369	8-11	23-27	195-205	446-466	10-11	46-50
	100	4.5	131-147	413-437	16-19	22-26				
		9	130-146	391-415	8-11	23-27				
GZA048 w/ CAA**4821AM*	30	6					67-87	280-300	8-9	20-24
		12					74-94	287-307	4-5	22-26
	40	6	120-136	214-234	19-22	25-29	80-100	294-314	9-10	23-27
		12	118-134	186-206	9-12	25-29	88-108	304-324	5-6	25-29
	50	6	122-138	242-262	19-22	24-28	94-114	311-331	11-12	27-31
		12	120-136	213-233	9-12	25-29	104-124	324-344	6-7	29-33
	60	6	123-139	272-292	18-21	24-28	109-129	330-350	13-14	31-35
		12	122-138	243-263	9-12	24-28	121-141	346-366	7-8	34-38
	70	6	125-141	306-326	18-21	23-27	125-145	351-371	15-16	34-38
		12	123-139	277-297	9-12	24-28	141-161	371-391	8-9	38-42
	80	6	126-142	343-363	17-20	23-27	143-163	374-394	16-17	38-42
		12	125-141	315-335	8-11	23-27	162-182	399-419	9-10	42-46
	90	6	128-144	384-404	16-19	23-27	163-183	400-420	18-19	42-46
		12	126-142	357-377	8-11	23-27	187-207	429-449	10-11	47-51
	100	6	129-145	427-447	16-19	22-26				
		12	128-144	402-422	8-11	22-26				

PRESSURE TEMP PERFORMANCE (Continued)

			Cooling				Heating			
Model	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
GZA060 w/ CAA**6024AM*	30	7.5					68-84	270-327	8-10	21-25
		15					74-90	277-335	4-5	22-27
	40	7.5	112-137	189-228	18-24	25-29	79-97	281-343	10-11	24-28
		15	111-135	170-206	9-12	25-29	87-106	292-355	5-6	26-31
	50	7.5	112-138	209-255	18-24	25-29	91-112	296-362	11-12	27-32
		15	112-137	188-231	9-12	25-30	101-123	308-376	6-7	29-35
	60	7.5	113-140	235-288	17-23	24-29	104-127	312-383	12-14	30-36
		15	113-138	213-263	8-13	25-29	117-142	328-401	7-8	33-39
	70	7.5	114-141	263-324	17-23	24-28	119-146	330-406	14-16	34-40
		15	114-140	243-300	8-12	24-28	134-162	349-427	8-9	37-44
	80	7.5	115-143	295-363	16-22	24-28	135-164	350-430	15-18	37-44
		15	115-141	277-340	8-11	24-28	154-185	372-455	8-10	42-49
	90	7.5	117-145	328-404	15-21	23-27	154-186	371-457	17-20	41-49
		15	117-144	315-385	8-11	23-27	177-211	401-488	9-11	46-54
	100	7.5	116-145	335-418	15-20	23-27				
		15	117-144	320-397	8-11	23-27				
GZA072 w/ CAA**6024AM*	30	9					67-83	276-333	7-9	21-25
		18					73-89	282-340	4-5	22-27
	40	9	106-132	188-228	17-22	25-30	78-96	288-350	9-10	24-28
		18	106-131	173-211	8-12	25-30	85-104	298-361	5-6	26-31
	50	9	107-134	210-258	17-21	24-29	89-110	303-369	10-11	27-32
		18	107-133	190-235	8-11	24-29	99-121	316-384	6-7	29-35
	60	9	109-136	235-291	16-21	24-28	103-126	320-391	11-13	30-36
		18	108-135	215-267	8-12	24-28	114-139	336-409	6-7	34-40
	70	9	110-138	264-326	16-20	23-28	117-144	339-415	13-15	34-40
		18	109-136	245-304	7-12	24-29	132-160	358-436	7-8	37-44
	80	9	111-139	295-365	15-20	23-27	133-162	360-440	14-17	38-45
		18	110-138	278-344	7-10	23-28	152-183	385-468	8-10	42-49
	90	9	112-141	330-408	15-19	23-27	152-184	385-471	16-19	42-50
		18	112-140	317-389	7-10	23-27	174-208	416-503	8-10	47-55
	100	9	113-143	368-452	14-19	22-26				
		18	114-143	359-438	7-10	22-26				

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 makinga conclusion.

Table 18 shows 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 18 – 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 connected to the unit. Open loop valve may be faultily or mis-wired if the application has field installed low voltage wiring with end-switch to the compressor contactor.
	Freeze Sensor Fault	57	Freeze sensor is invalid or out of range.. Check for open sensor, wire disconnected, sensor not connected 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 startup)	74	Compressor voltage not sensed when compressor should be starting. Contactor may be stuck open or there may be a wiring error. Open loop valve may be faulty or mis-wired if the application has field installed low voltage wiring with end-switch to the compressor contactor.
	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.
	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 19 – A2L dissipation Control Fault Table

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 (won't know until we try to open relay realistically)	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

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 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 21 can be used to verify if there is any damage to the compressor windings causing system malfunction.

Table 20 – Compressor Ohms

Model	Start Winding	Run Winding	Run Capacitor
GZA024	1.65	1.07	30µF/370V
GZA036	1.471	0.728	45µF/370V
GZA048	1.66	0.436	40µF/440V
GZA060	1.394	0.349	40µF/440V
GZA072	1.329	0.329	55µF/440V
Tolerance +/- 7%. All resistance values must be measured with compressor at room temperature.			

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 split 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 22).

Table 21 – Model Plug Information

Model	Model Plug Number	Pins 1-4	Pins 2-3
GZA024	HK70EZ035	18K	24K
GZA036	HK70EZ036	18K	33K
GZA048	HK70EZ037	18K	39K
GZA060	HK70EZ038	18K	51K
GZA072	HK70EZ039	18K	62K

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: 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 22. 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.

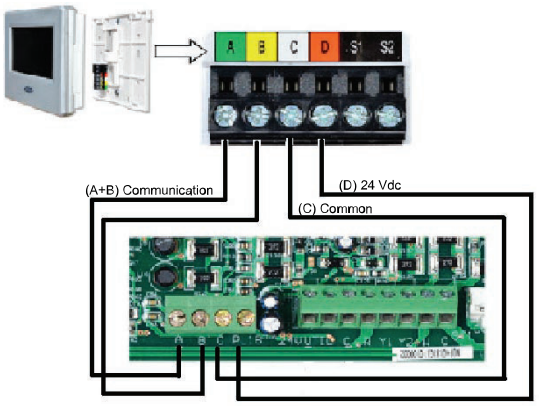


Fig. 26 – Service Tool Connection

When working on the outdoor unit of a split system, the technician would usually need to repeatedly walk between the indoor wall control and the unit outside. To save time, the communicating System 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.

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. 26.

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.

HRP Troubleshooting

The HR pump will be enabled when compressor discharge temperature is 120°F (48.9°C) or above.

The circulating pump will be disabled if water temperature reaches 140°F (60°C) or amperage exceeds 0.4 amps.

Table 22 – HRP Troubleshooting

Problem	Possible Cause	Checks and Corrections
NO FLOW, LOW FLOW	No Power	Check power supply
	On/Off Switch Position	Set switch to “ON” position
	Compressor Contactor	Engage heat pump contactor
	Broken or loose wires	Repair or tighten wires
	Air Lock	Purge air from piping system
	Stuck pump shaft/impeller	Remove pump cartridge and clean
	Defective pump	Replace pump
	Kinked or under sized water piping	Repair kink and check for proper line size
HIGH WATER TEMPERATURE	Water temp limit closed	Stuck limit switch Sensor not attached securely to line
LOW HEAT OUTPUT	Scaled or fouled heat exchanger	Clean heat exchanger

Table 23 – 10K Temperature Sensor Resistance Table

°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

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 startup of the equipment.
3. The dissipation system must be cycled at least once a year by a qualified technician. Dissipation Test Mode can be activated by pressing the test button on the dissipation board and will result in 60 seconds of dissipation where compressor and heat signal are cut (W and Y) as well as blower (G) and alarm (dissipation fan) energized. If the fan motor is not operational it must be replaced with an authorized replacement part.
4. 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.
5. The condensate drain should be checked annually by cleaning and flushing to insure proper drainage.
6. 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 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.

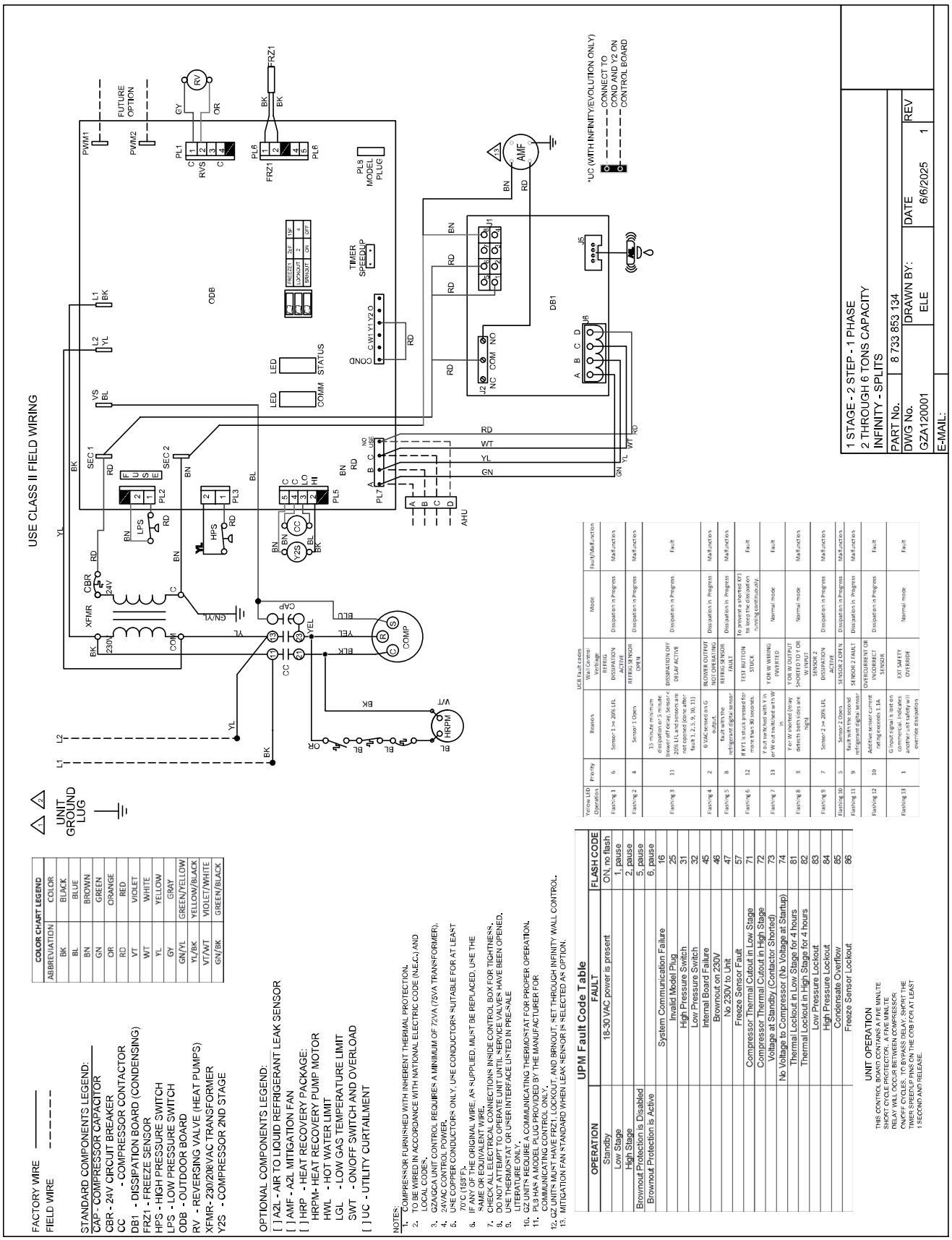
When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that 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.

Wiring Diagram



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