Geothermal 2GE Series Outdoor Split Heat Pump Installer's Guide

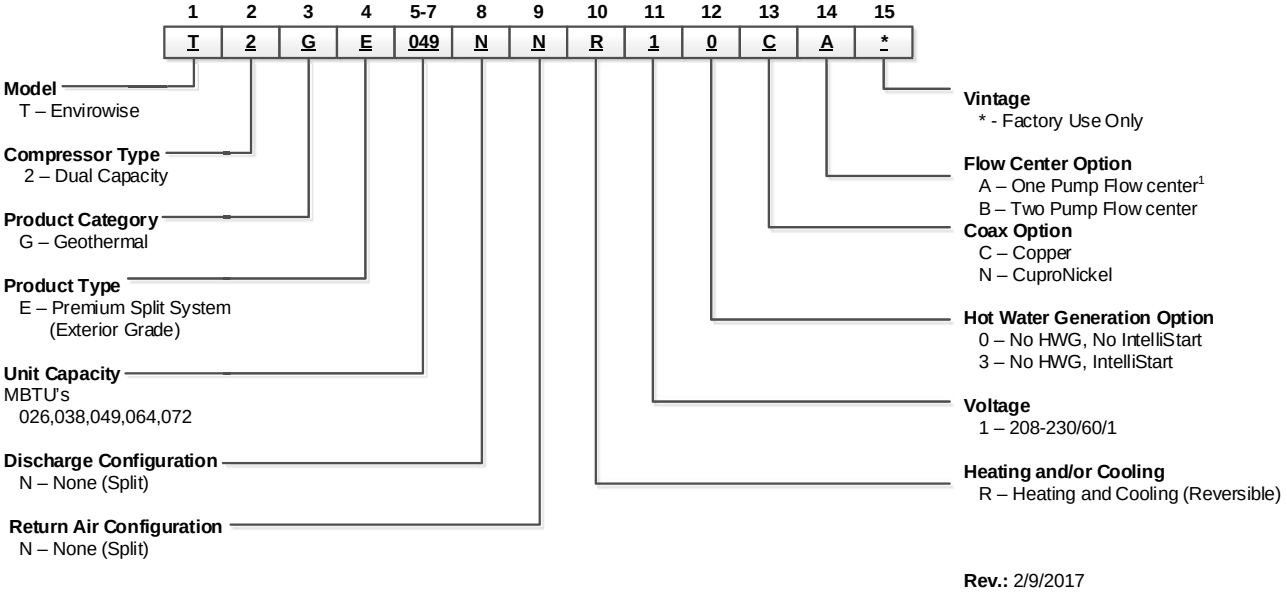
R-410A Refrigerant

2, 3, 4, 5 and 6 Tons Dual Capacity

T2GE

Table of Contents

MODEL NOMENCLATURE



Rev.: 2/9/2017

Note: FCI-GL not available on 064-072 models.

GENERAL INSTALLATION INFORMATION

SAFETY CONSIDERATIONS

⚠ WARNING

Before performing service or maintenance operations on a system, turn off main power switches to both units. Turn off accessory heater power switch if applicable. Electrical shock could cause personal injury. Installing and servicing heating and air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment.

Installing and servicing heating and air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. Untrained personnel can perform the basic maintenance functions of cleaning coils and cleaning and replacing filters. All other operations should be performed by trained service personnel. When working on heating and air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply, such as the following safety measures:

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use a quenching cloth for brazing operations.
- Have a fire extinguisher available for all brazing operations.

Moving and Storage

Move units in the normal "up" orientation. Units may be moved and stored per the information on the packaging. Do not stack more than three units in total height. Do not attempt to move units while stacked. When the equipment is received, all items should be carefully checked against the bill of lading to be sure all crates and cartons have been received. Examine units for shipping damage, removing the units from the packaging if necessary. Units in question should also be internally inspected. If any damage is noted, the carrier should make the proper notation on the delivery receipt, acknowledging the damage.

Split Unit Location

Locate the split compressor section away from areas that may disturb the customer and in a way that allows easy removal of the access panels and the top of the cabinet. Provide sufficient room to make water, electrical and refrigerant line connections and allow space for service personnel to perform maintenance. The GE Series split is approved for outdoor installation when properly installed.

Air Coil Location

Refer to the air handler manufacturer's instructions for the blower coil unit for details on installing the air handling portion of the system.

Condensate Drain

Follow the blower coil manufacturer's instructions.

Duct System

All blower coil units/air coils must be installed as specified by the manufacturer's installation instructions; however, the following recommendations should be considered to minimize noise and service problems.

An air filter must always be installed upstream of the air coil on the return air side of the air handler or furnace. If there is limited access to the filter rack for normal maintenance, it is suggested that a return air filter grill be installed. Be sure that the return duct is properly installed and free of leaks to prevent dirt and debris from bypassing the filter and plugging the air coil.

In applications using galvanized metal ductwork, a flexible duct connector is recommended on both the supply and return air plenums to minimize vibration from the blower. To maximize sound attenuation of the unit blower, the supply and return plenums should include an internal duct liner of 1-inch thick glass fiber or be constructed of ductboard. Insulation is usually not installed in the supply branch ducts. Ducts in unconditioned areas should be wrapped with a minimum of 1-inch duct insulation. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended as the unit's performance will be adversely affected. If the air handler is connected to existing ductwork, a previous check should have been made to assure that the duct system has the capacity to handle the air required for the unit application. If ducting is too small, as in replacement of heating only systems, larger ductwork should be installed. All existing ductwork should be checked for leaks and repairs made accordingly. The duct systems and diffusers should be sized to handle the design airflow quietly. If air noise or excessive airflow is a problem, the blower speed can be changed to a lower speed to reduce airflow. This will reduce the performance of the unit slightly in heating; however, it will increase the temperature rise across the air coil. Airflow must still meet minimum requirements.

Equipment Selection

The following guidelines should be used when mating a GE Series Split to an air handler/coil.

- Select R-410A components only.
- Match the air handler to the air handler coil data table.
- Indoor matching adjustable TXV is factory installed on every coil. Fixed orifice or cap tube systems should not be used. TAMG air handlers have electronic expansion valves (EEV).
- Minimum of two (2) stage cooling blower required. Variable speed ECM blower recommended.

Utilizing Existing Coil or Air Handler

It is recommended that a new R-410A air handler or CGX coil be installed with a GE Series Split considering the long term benefits of reliability, warranty, etc. versus the short term installation cost savings.

Connection to Air Coil

Typical Split System Application - Remote Blower Coil and Typical Split System Heat Pump Coil Add-on Fossil Fuel Furnace illustrations show typical GE Series Split installations. The Line Set Sizes table shows typical line set diameters and maximum length. Line sets over 60 feet are not recommended. If the line set is kinked or deformed and cannot be reformed, the bad section of pipe should be replaced. A restricted line set will affect unit performance. As in all R-410A equipment, a reversible liquid line filter drier is required to ensure all moisture is removed from the system. This drier should be replaced whenever "breaking into" the system for service. All line sets should be insulated with a minimum of 1/2" closed cell insulation. All exterior insulation should be painted with UV resistant paint or covering to ensure long insulation life.

Air Handler Installation

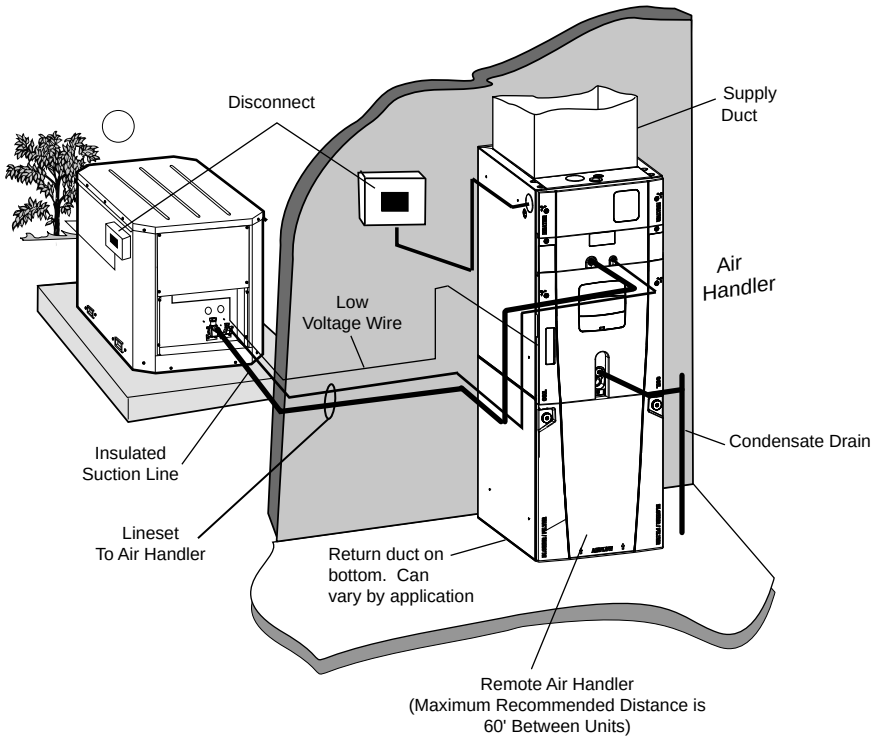
Air handlers used in dual capacity unit applications must be TAMG rated air handlers. Refer to the manufacturer's instructions for the blower coil unit for details on installing the air handling portion of the system. All blower coil units/air coils must be installed as specified by the manufacturer's installations instructions. However, the following recommendations should be considered to minimize noise and service problems.

An air filter must always be installed upstream of the air coil on the return air side of the air handler or furnace. If there is limited access to the filter rack for normal maintenance, it is suggested that a return air filter grille be installed. Be sure that the return duct is properly installed and free of leaks to prevent dirt and debris from bypassing the filter and plugging the air coil.

Ensure that the line set size is appropriate to the capacity of the unit (refer to Line Set Sizes table). Line sets should be routed as directly as possible, avoiding unnecessary bends or turns. All wall penetrations should be sealed properly. Line set should not come into direct contact with water pipes, floor joists, wall studs, duct work, floors, walls and brick. Line set should not be suspended from joists or studs with a rigid wire or strap which comes into direct contact with the tubing. Wide hanger strips which conform to the shape of the tubing are recommended. Isolate hanger straps from line set insulation by using metal sleeves bent to conform to the shape of insulation. Line set insulation should be pliable, and should completely surround the refrigerant line.

Note: Improper installation of equipment may result in undesirable noise levels in the living areas.

Typical Split System Application with TAMG Air Handler



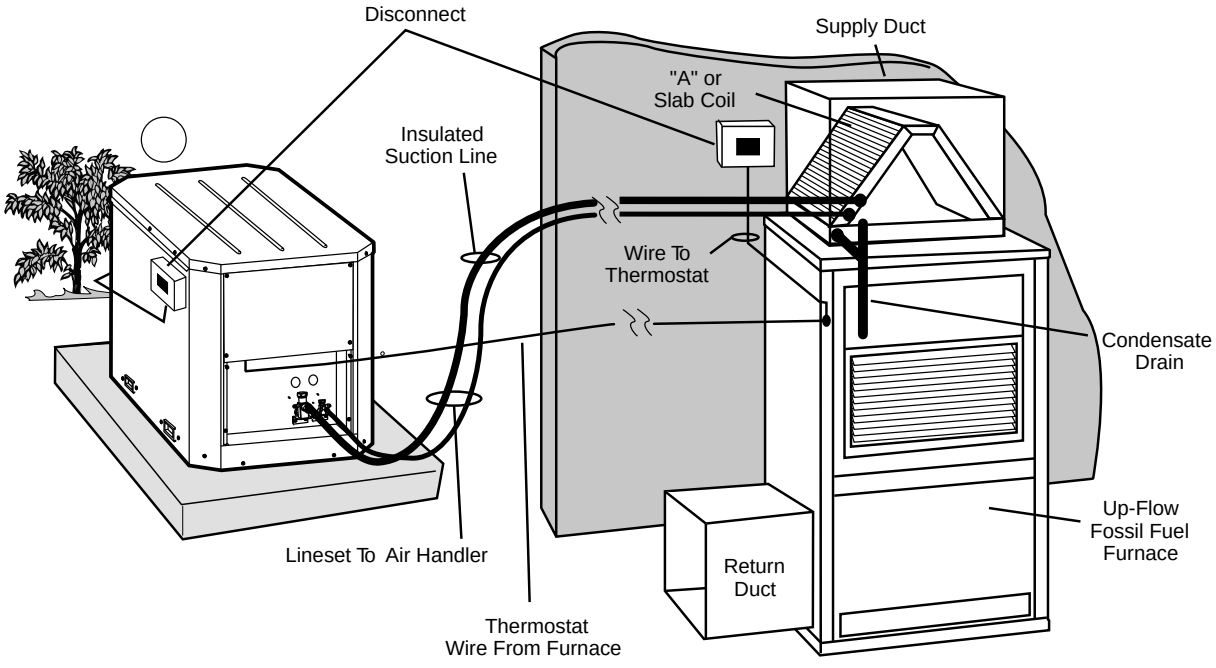
Dual Fuel Systems

GE Series units can be connected to fossil fuel furnaces that include an A-coil or slab coil. Dual fuel installations utilize the GE Series heat pump for heating until the point that auxiliary heat is called for on the thermostat. At that point, the furnace will be enabled and the heat pump will be disabled. The GE Series heat pump provides air conditioning through the furnace's refrigerant coils.

Refer to the furnace manufacturer's installation manual for the furnace installation, wiring and coil insertion. A Dual Fuel thermostat or a field-installed DPST relay is required. See the Typical Split System Heat Pump Coil Add-on Fossil Fuel Furnace illustration for typical Dual Fuel application.

In add-on GE Series Split applications, the coil should be located in the supply side of the furnace to avoid condensation damage to the furnace heat exchanger. A high temperature limit should be installed upstream of the coil to de-energize the compressor whenever the furnace is operating. Without this switch, the GE Series Split will trip out on high pressure. A dual fuel thermostat can remove the Y1 and Y2 calls when a W call is energized to allow gas furnace backup on an GE Series Split application. Refer to the Thermostat Wiring section for details.

Typical Split System Heat Pump Coil
Add-on Fossil Fuel Furnace



WATER QUALITY

It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations. Failure to adhere to the guidelines in the water quality table could result in loss of warranty. In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. The heat exchanger coils in ground water systems may, over a period of time, lose heat exchange capabilities due to a buildup of mineral deposits inside. These can be cleaned, but only by a qualified service mechanic, as special solutions and pumping equipment are required. Hot water generator coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing.

Heat pumps with cupronickel heat exchangers are recommended for open loop applications due to the increased resistance to build-up and corrosion, along with reduced wear caused by acid cleaning.

Water Treatment

Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. Purchase of a pre-mix antifreeze could significantly improve system reliability if the water quality is controlled and there are additives in the mixture to inhibit corrosion. There are many examples of such fluids on the market today such as Environol™ 1000 (pre-mix ethanol), and others. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

The heat exchangers and water lines in the units are copper or cupronickel tube. There may be other materials in the buildings piping system that the designer may need to take into consideration when deciding the parameters of the water quality. If antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water

In applications where the water quality cannot be held to prescribed limits, the use of a secondary or intermediate heat exchanger is recommended to separate the unit from the contaminated water. The table below outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	< 6 ft/sec

NOTES: Grains = ppm divided by 17
mg/L is equivalent to ppm

2/22/12

WATER PIPING

Residential GE Series Outdoor Split units are supplied standard with GeoLink swivel connections with P.T. ports.

⚠ CAUTION

Water piping exposed to outside temperatures may be subject to freezing

Water Piping

The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, use pressure/ temperature ports to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger.

Closed Loop - Earth coupled Systems (Outdoor Installations)

Locate unit on an air pad with access hole as shown below. When mounting on an existing concrete pad, holes must be bored through to accommodate 1 1/4-inch P.E. pipe with 1/2-inch insulation.

Connecting To Earth Loop

The earth loop trench should be continued directly under the unit as shown in the Typical Split System Outdoor Installation Using Closed Loop. Make the connections to optional fittings from the loop circulator pump(s) and ensure proper backfill to support the loop pipe during trench settling. All 1 1/4-inch piping should be insulated with a minimum of 1/2-inch closed cell insulation from below the ground surface to the loop circulator.

⚠ CAUTION

IMPORTANT: A freeze detection thermostat is installed in the unit to automatically start loop circulator pump if loop temperature drops below 20°F. Loop freeze detection should also be maintained to the lowest temperature the insulated loop may encounter in the case of power failure.

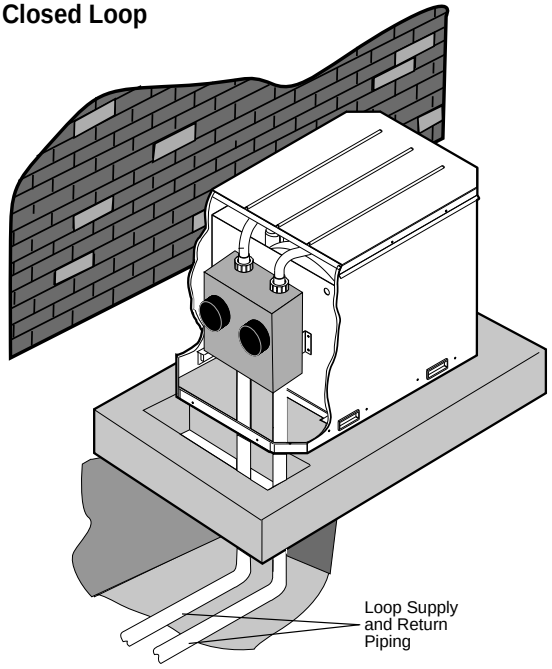
Open Loop (Indoor Installations)

GE Series Outdoor Splits can be installed on an open loop system, but only indoors. All GE Series Outdoor Splits are supplied with GeoLink swivel connectors. The swivel connectors will also accept 1 in O.D. copper pipe (sweat); which can be connected in an open loop system. The factory mounted flow center is not needed for open loop installation.

Flow Center Installation

Flow centers FC1-GL or FC2-GL, as needed, are factory installed and included with unit. FC1-GL is standard on *2GE026-049 and FC2-GL is standard on *2GE064-072. The hose and clamps to connect from the Flow Center to the HX are included with unit for field connection.

Typical Split System Outdoor Installation Using Closed Loop



ELECTRICAL DATA

General

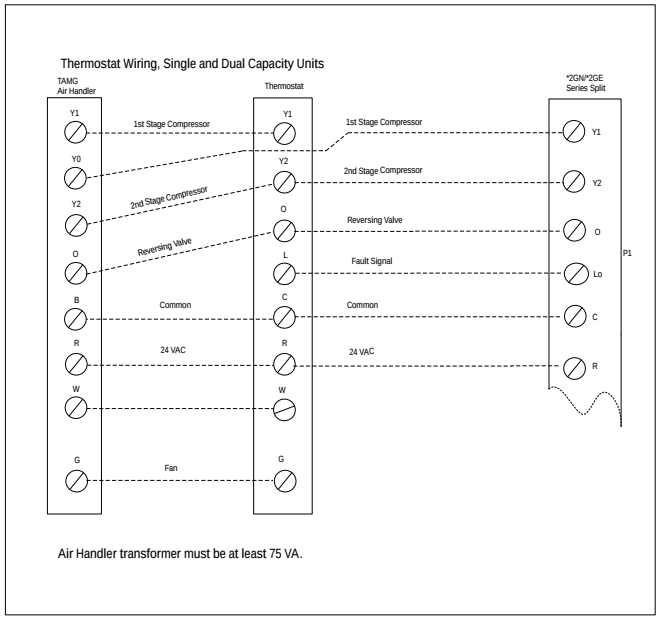
Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable. See unit electrical data for fuse or circuit breaker sizing information.

Model	Rated Voltage	Voltage Min/Max	Compressor				Ext Loop FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA*				
026	208-230/60/1	187/253	18.2	11.6	58.3	21.0	5.4	17.0	19.9	30
038	208-230/60/1	187/253	23.8	15.2	83.0	30.0	5.4	20.6	24.4	40
049	208-230/60/1	187/253	33.0	21.1	104.0	37.0	5.4	26.5	31.8	50
064	208-230/60/1	187/253	42.3	27.1	152.9	54.0	5.4	32.5	39.3	70
072	208-230/60/1	187/253	46.3	29.6	179.2	63.0	5.4	35.0	42.4	75

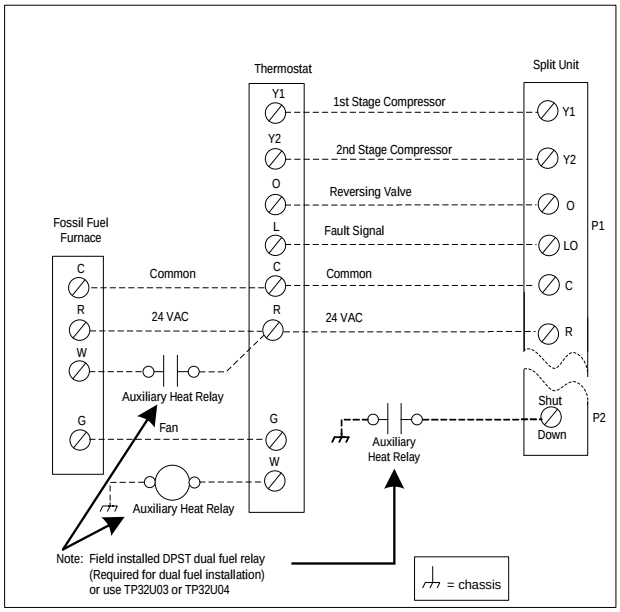
Rated Voltage of 208-230/60/1. 1/12/2015
*With optional IntelliStart
HACR circuit breaker in USA only.
All fuses Class RK-5.

THERMOSTAT WIRING

Thermostat Wiring

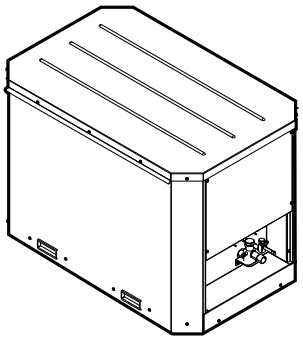


Thermostat Wiring for Dual Fuel Applications

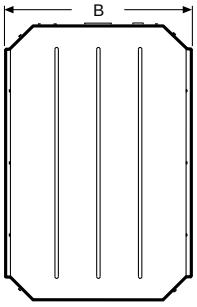


DIMENSIONAL DATA

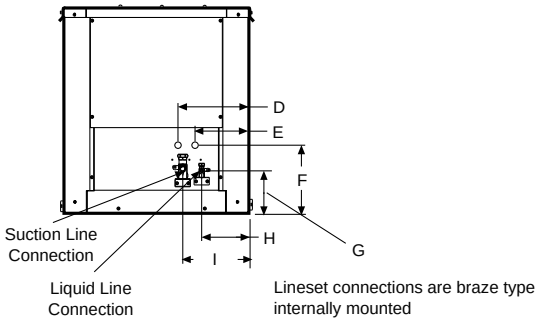
Cabinet Dimensions and Refrigerant Piping Connections



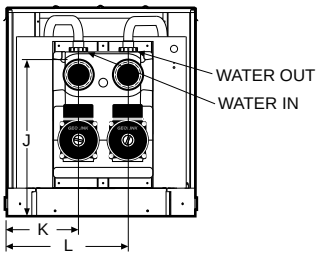
Top View



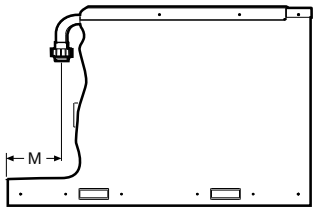
Front View



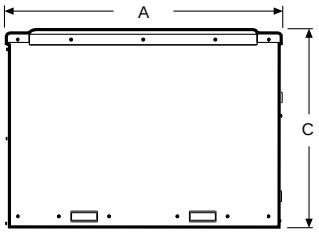
Rear View



Side View



Side View



MODEL		A	B	C	D	E	F	G	H	I	J	K	L	M
026 THRU 072	IN	36.0	23.9	26.7	9.3	7.1	9.0	5.6	8.2	10.7	18.9	8.7	14.8	7.0
	[CM]	[91.4]	[60.7]	[67.8]	[23.7]	[18.0]	[22.8]	[14.2]	[20.9]	[27.2]	[48.0]	[22.1]	[37.6]	[17.8]

Notes: Refer to Physical Dimensions and Piping Connections drawings, Inches [cm]

PHYSICAL DATA

Model		026	038	049	064	072
	Compressor (1 each)	Dual Capacity Scroll				
	Factory Charge R410a, oz [kg]	52 [1.47]	56 [1.59]	90 [2.55]	92 [2.61]	104 [2.95]
Coax and Water Piping						
	Water Connections Size - Swivel- in [mm]	1 [25.4]				
	Brass Service Valve - Liquid Line - in [mm]	3/8" [9.525]			1/2" [12.7]	
	Brass Service Valve - Suction Line - in [mm]	5/8" [15.875]	3/4" [19.05]		7/8" [22.225]	
	Coax & Piping Water Volume - gal [l]	0.7 [2.6]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
	Weight - Operating, lb [kg]	189 [186]	236 [107]	250 [113]	271 [123]	290 [132]
	Weight - Packaged, lb [kg]	209 [95]	256 [116]	270 [122]	291 [132]	310 [141]

Notes: 01/12/15

All units have TXV expansion devices, and 1/2" [12.2mm] & 3/4" [19.1mm] electrical knockouts.

Brass service valves are sweat type valves.

AIR HANDLER COMPATIBILITY

AIR HANDLER	INDOOR SPLIT MODEL (DUAL CAPACITY)	OUTDOOR SPLIT MODEL (DUAL CAPACITY)	AIRFLOW (CFM)	ELECTRIC HEAT SINGLE-PHASE (KW)	ELECTRIC HEAT 3-PHASE (KW)
TAMGA0A24	2GN026	2GE026	900	5,8,10	10
TAMGA0C36	2GN038	2GE038	1250	5,8,10,15	10,15
TAMGA0C48	2GN049	2GE049	1600	5,8,10,15,20,25	10,15
TAMGA0C60	2GN064	2GE064	1900	5,8,10,15,20,25	10,15
TAMGA0C60	2GN072	2GE072	2000	5,8,10,15,20,25	10,15

5, 8, and 10 KW Single Phase heaters available in breaker (BK) or lug (LG) 1/12/2015
15, 20, and 25 KW Single Phase heaters available in breaker (BK)
10 and 15 KW Three Phase heaters available in lug (LG)

PHYSICAL DATA - AIR HANDLER

AIR HANDLER MODEL NUMBER (REFRIGERANT)		TAMGA0A24	TAMGA0C36	TAMGA0C48	TAMGA0C60
EVAPORATOR COIL	AIR COIL TOTAL FACE AREA, FT2 [M2]	3.67 [0.34]	5.50 [0.51]	5.96 [0.55]	5.96 [0.55
	TUBE OUTSIDE DIAMETER - IN. [MM]	3/8 [9.52]			
	NUMBER OF ROWS	3		4	
	FINS PER INCH	14			
	SUCTION LINE CONNECTION - IN. [MM] SWEAT	3/4 [19.05]	7/8 [22.22]		
	LIQUID LINE CONNECTION - IN. [MM] SWEAT	3/8 [9.52]			
REFRIGERANT		R-410A			
NOMINAL COOLING CAPACITY - TONS [KW]		2.0 [7.03]	3.0 [10.55]	4.0 [14.07]	5.0 [17.58]
CONDENSATE DRAIN CONNECTION - (NPT) IN. [MM]		3/4 [19.05]			
BLOWER WHEEL SIZE (DIA X W), IN. [MM]		11 X 8 [279 X 203]	11 X 10 [279 X 254]		
BLOWER MOTOR TYPE/SPEEDS		ECM VARIABLE SPEED			
BLOWER MOTOR OUTPUT - HP [W]		1/2 [373]		3/4 [559]	1 [745]
FILTER STANDARD - 1" [51MM] MERV3 DISPOSABLE, IN. [MM]		16 X 20 [406 X 508]	22 X 20 [559 X 508]		
ELECTRICAL CHARACTERISTICS (60HZ)		208/230 - 1PH			
SHIPPING WEIGHT - LBS. [KG]		127 [57.6]	157 [71.2]	175 [79.4]	
OPERATING WEIGHT - LBS. [KG]		116 [52.6]	146 [66.2]	163 [74.9]	

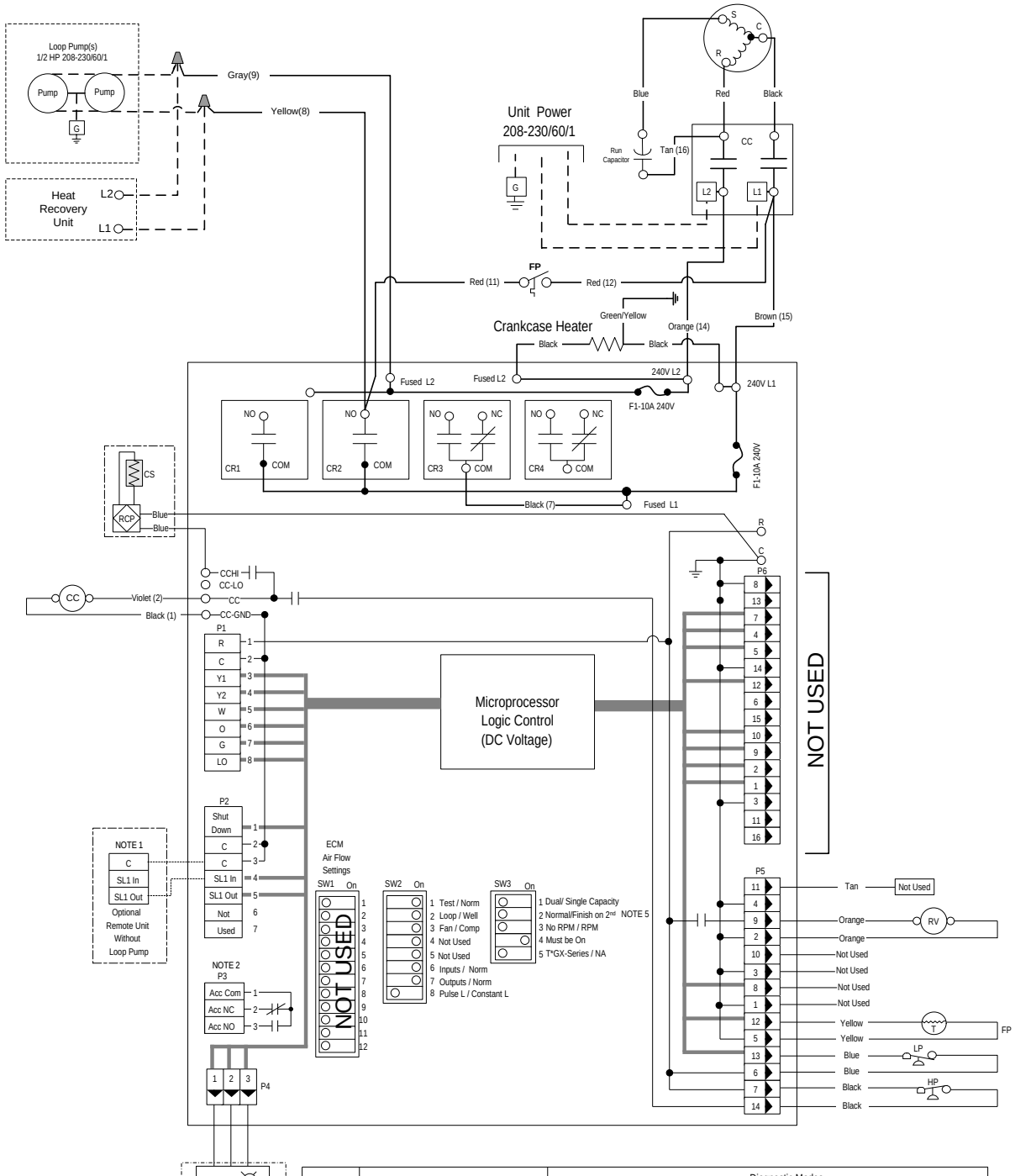
REFRIGERANT COIL COMPATIBILITY

ENCASED/UNCASED COIL	INDOOR SPLIT MODEL (DUAL CAPACITY)	OUTDOOR SPLIT MODEL (DUAL CAPACITY)	RECOMMENDED AIRFLOW (CFM)
GCX026*	2GN026	2GE026	925
GCX036*	2GN038	2GE038	125
GCX048*	2GN049	2GE049	1625
GCX060*	2GN064	2GE064	1760
GCX060*	2GN072	2GE072	1900

1/12/2015

WIRING SCHEMATICS

Dual Capacity Split - 208-230/60/1



LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Not Used	Not Used	Y1	Lo Capacity Compressor	Not Used
Water Flow	FP thermistor (loop<15°F,well<30°F) Lockout	FP thermistor (loop<15°F, well<30°F)	Y2	Hi Capacity Compressor	Not Used
High Press	High Pressure	High Pressure	O	RV	Not Used
Low Press	Low Pressure	Low Pressure	Not Used	FAN	Not Used
Air Flow	Not Used	Not Used	Not Used	Not Used	Not Used
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump 1	Not Used
DHW Limit	Not Used	Not Used	SL2	Loop Pump 2	Not Used
DHW off	Not Used	Not Used	Not Used	Not Used	Not Used

*Green LED not flashing

Dual Capacity Split - 208-230/60/1 cont.

Notes

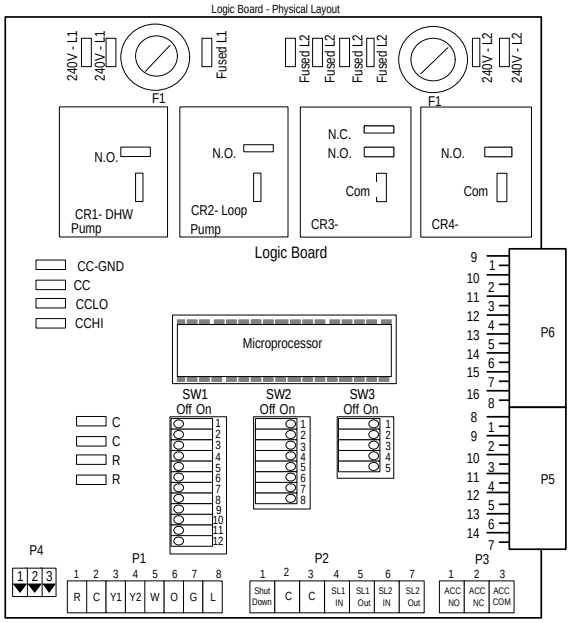
1 - Connection of remote unit that does not have a loop pump for linking operation.
2 - 24V Accessory relay (see SW2 - 3 for description of operation)
3 - Field installed DPDT dual fuel relay. (Required for dual fuel installation)
4 - DHW pump only in models with hot water generation option.
5 – This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON.

Legend

	Factory Low voltage wiring
	Factory Line voltage wiring
	Field low voltage wiring
	Field line voltage wiring
	Optional block
	DC Voltage PCB traces
	Internal junction
	Quick connect terminal
	Wire nut
L1	Field wire lug
	Ground
	Relay Contacts- N.O., N.C.
	Fuse

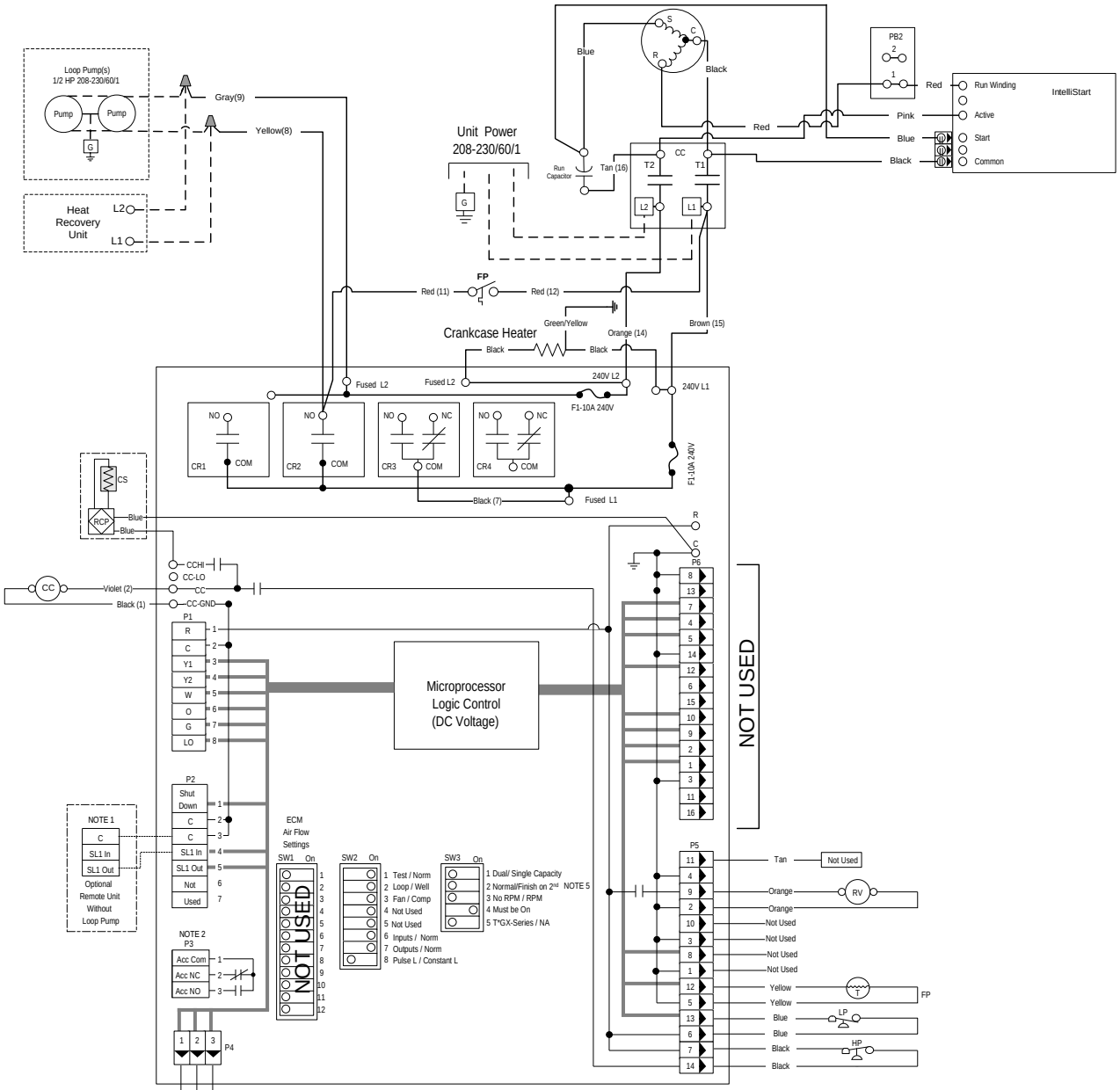
CS -	Compressor Solenoid
CC -	Compressor Contactor
CR1 -	Not Used
CR2-	Loop Pump Relay 1
CR3 -	Loop Pump Relay 2
CR4 -	Not Used
F1 and F2 -	Fuses
FP -	Freeze protection sensor
HP -	High Pressure Switch
LP -	Low Pressure Switch
RV -	Reversing Valve Coil
SW1 -	Not Used
SW2 -	DIP Package 8 Position
SW3 -	DIP Package 5 Position

	Crankcase Heater
T	Thermistor
G	Light Emitting Diode - Green
	Relay Coil
	Capacitor w/ Bleed Resistor
	Switch - High Pressure
	Switch - Low Pressure
P 2 3 1	Polarized Connector



97P788-09 12/11/12

Dual Capacity Split with IntelliStart - 208-230/60/1



LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Not Used	Not Used	Y1	Lo Capacity Compressor	Not Used
Water Flow	FP thermistor (loop<15°F,well<30°F) Lockout	FP thermistor (loop<15°F, well<30°F)	Y2	Hi Capacity Compressor	Not Used
High Press	High Pressure	High Pressure	O	RV	Not Used
Low Press	Low Pressure	Low Pressure	Not Used	FAN	Not Used
Air Flow	Not Used	Not Used	Not Used	Not Used	Not Used
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump 1	Not Used
DHW Limit	Not Used	Not Used	SL2	Loop Pump 2	Not Used
DHW off	Not Used	Not Used	Not Used	Not Used	Not Used

*Green LED not flashing

Dual Capacity Split with IntelliStart - 208-230/60/1 cont.

Notes

1 - Connection of remote unit that does not have a loop pump for linking operation.
2 - 24V Accessory relay (see SW2 - 3 for description of operation)
3 - Field installed DPDT dual fuel relay. (Required for dual fuel installation)
4 - DHW pump only in models with hot water generation option.
5 – This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON.

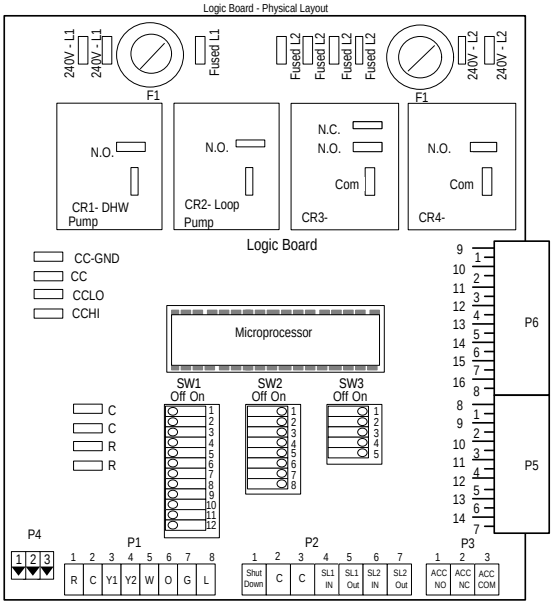
Legend

	Factory Low voltage wiring
	Factory Line voltage wiring
	Field low voltage wiring
	Field line voltage wiring
	Optional block
	DC Voltage PCB traces
	Internal junction
	Quick connect terminal
	Wire nut
L1	Field wire lug
	Ground
	Relay Contacts- N.O., N.C.
	Fuse

CS -	Compressor Solenoid
CC -	Compressor Contactor
CR1 -	Not Used
CR2-	Loop Pump Relay 1
CR3 -	Loop Pump Relay 2
CR4 -	Not Used
F1 and F2 -	Fuses
FP -	Freeze protection sensor
HP -	High Pressure Switch
LP -	Low Pressure Switch
RV -	Reversing Valve Coil
SW1 -	Not Used
SW2 -	DIP Package 8 Position
SW3 -	DIP Package 5 Position

	Crankcase Heater
T	Thermistor
G	Light Emitting Diode - Green
	Relay Coil
	Capacitor w/ Bleed Resistor
	Switch - High Pressure
	Switch - Low Pressure
P 2 3 1	Polarized Connector

Logic Board - Physical Layout



97P788-10 12/11/12

MICROPROCESSOR CONTROL

The GE control system is a microprocessor-based printed circuit board conveniently located in the unit control box for easy accessibility. The microprocessor control is specifically designed for the GE Series heat pumps. The microprocessor provides control of the entire unit as well as outputs for status modes, faults, and diagnostics. Low voltage terminal strips provide all necessary terminals for field connections. An LED board is installed for quick diagnostics. The control offers optimal space conditioning. The board accepts traditional 24VAC thermostat inputs.

Startup

The unit will not operate until all the inputs and safety controls are checked for normal conditions. At first power-up, a four-minute delay is employed before the compressor is energized.

Component Sequencing Delays

Components are sequenced and delayed for optimum space conditioning performance.

Accessory Relay

An accessory relay on the control board allows for field connection of solenoid valves, electronic air cleaners, etc. The accessory relay has a normally open output and a normally closed output. The accessory relay is factory set to control the optional electronic air-cleaner.

Short Cycle Protection

The control employs a minimum "off" time of four minutes and a minimum "on" time of two minutes to provide for short cycle protection of the compressor.

Loop Pump Linking Signals

A signal between multiple GE Series control boards at the SL1 In and Out terminals will provide for remote control of the loop pump on any unit.

Shutdown Input

A 24VAC common signal to the "shutdown" input on the control board puts the unit into shutdown mode. Compressor, hot water pump and fan operation are suspended.

Safety Controls

The GE control receives separate signals for a high pressure switch for safety, a low pressure switch to prevent loss of charge damage, and a low suction temperature thermistor for freeze sensing. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is suspended (see Fault Retry), the appropriate lockout LED begins flashing, and an output signal (LO) is made available for connection to a "fault" LED at the thermostat.

Testing

The GE control allows service personnel to shorten most timing delays for faster diagnostics.

Fault Retry

All faults are retried twice before finally locking the unit out. The "fault retry" feature is designed to prevent nuisance service calls.

Diagnostics

The GE control board allows all inputs and outputs to be displayed on the LEDs for fast and simple control board diagnosis.

Heating Operation

Note: At first power up, a four-minute time delay is employed before the compressor is energized.

Heat, 1st Stage (Y1)

The compressor and loop pumps are energized 10 seconds after the Y1 input.

Heat, 2nd Stage (Y1,Y2) Dual Capacity Units

The second stage compressor will be activated 5 seconds after receiving a "Y2" input as long as the minimum first stage compressor run time of 1 minute has expired.

Cooling Operation

In all cooling operations, the reversing valve directly tracks the "O" input. Thus, anytime the "O" input is present, the reversing valve will be energized.

Cool, 1st Stage (Y1, O)

The compressor and loop pumps are energized 10 seconds after the Y1 input.

Cool, 2nd Stage (Y1, Y2, O) Dual Capacity Units

The second stage compressor will be activated 5 seconds after receiving a "Y2" input as long as the minimum first stage compressor run time of 1 minute has expired.

Fan Only Operation

The Fan Only mode is controlled directly from the unit thermostat to the unit air handler. No input is given to the microprocessor to operate the fan function.

Lockout Conditions

During lockout mode, the appropriate thermostat lockout LEDs (if available) will illuminate. The compressor and loop pumps are de-energized and if the thermostat calls for third stage heating, emergency heat operation will occur.

Lockout modes of any kind can be reset at the thermostat after a 5-second waiting period, which restores normal operation.

High Pressure

This lockout mode occurs immediately when the normally closed safety switch is momentarily opened.

Low Pressure

This lockout mode occurs when the normally closed switch is opened for 30 continuous seconds.

Freeze Detection (Water Flow)

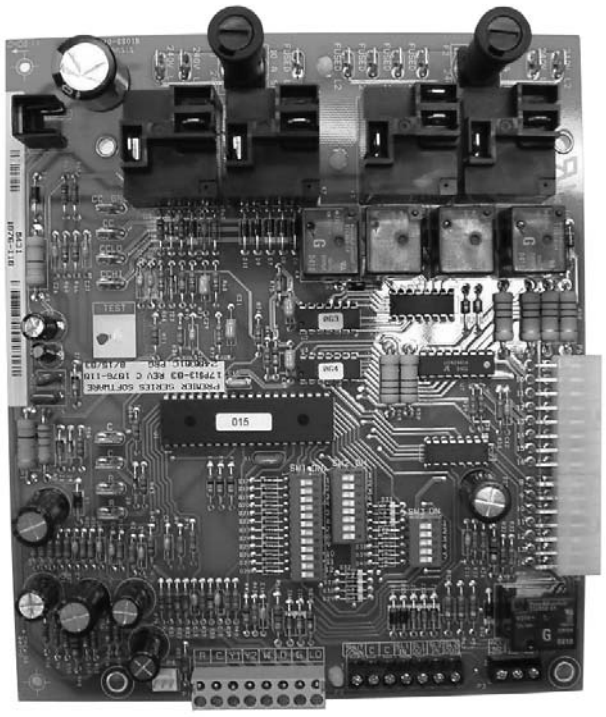
This lockout mode occurs when the freeze detection thermistor temperature (located between the TXV and coax) is at or below the selected freeze sensing point (well 30°F or loop 15°F) for 30 continuous seconds.

The unit also contains a secondary freeze detection sensor located on the entering water line of the unit. If the loop reaches a temperature of 20°F the secondary freeze detection sensor will cycle the loop pumps "on" until the loop temperature rises to or above 25°F.

Dual Capacity Operation Logic

OPERATION	HEATING			COOLING	
	STG1	STG2	STG3	STG1	STG2*
COMPRESSOR-LOW	ON	OFF	OFF	ON	OFF
COMPRESSOR-HI	OFF	ON	OFF	OFF	ON
FAN	ON	ON	ON	ON	ON
LOOP PUMP	ON	ON	OFF	ON	ON
REVERSING VALVE	OFF	OFF	OFF	ON	ON
T-STAT SIGNAL	Y1	Y1, Y2	W	Y1, O	Y1, Y2, O

Logic Board - Dual Capacity



Thermostat Displays

When using a fault monitor thermostat and SW2-8 is in the pulsing "L" position (off), the system monitor will enable a user to view the thermostat and count the fault indicator flashes to determine the lockout condition the unit is experiencing.

When using an A/TCONT802 or 803 thermostat and SW2-8 is in the pulsing "L" position (off), the system monitor will enable the user to view the thermostat and determine the fault. SW2-8 in the "on" position will send a constant signal to the fault indicator in the event of a system lockout condition. The LED board on the front of the unit will display all lockouts.

The following table shows the codes that will be displayed when the System Monitor (L) is connected to the F terminal of an A/TCONT802 or 803 Comfort Control.

A/TCONT802 or 803 Thermostats	
Thermostat Display Lockout Code	Lockout Description
2 Flashes	High Pressure Fault
3 Flashes	Low Pressure Fault
4 Flashes	Not Applicable
5 Flashes	Water Flow Fault
6 Flashes	Not Applicable
7 Flashes	Condensate Fault
8 Flashes	Voltage out of Range
9 Flashes	RPM Fault

DIP SWITCH SETTINGS

DIP SWITCH NUMBER		DESCRIPTION	OFF POSITION	ON POSITION
SW1	**N/A**	**NOT USED**	**N/A**	**N/A**
SW2	**1**	SERVICE/TEST MODE - ALLOWS CONTROL OF "NORM" OR "TEST" OPERATIONAL MODES. TEST MODE ACCELERATES MOST TIMING FUNCTIONS 16 TIMES TO ALLOW FASTER TROUBLESHOOTING. TEST MODE ALSO ALLOWS VIEWING THE "CURRENT" STATUS OF THE FAULT INPUTS ON THE LED DISPLAY.	TEST	NORM
	2	FREEZE DETECTION SETTING THIS DIP ALLOWS FIELD SELECTION OF FREEZE DETECTION FAULT SENSING FOR WELL WATER (30°F) OR ANTI-FREEZE PROTECTED EARTH LOOPS (15°F).	LOOP (SENSING 15° F)	WELL (SENSING 30° F)
	3	ACCESSORY RELAY ALLOWS FIELD SELECTION OF THE ACCESSORY RELAY TO OPERATE WITH THE COMPRESSOR OR BLOWER.	BLOWER	COMP
	4	NOT USED	N/A	N/A
	5	NOT USED	N/A	N/A
	6	INPUT DIAGNOSTICS - ALLOWS VIEWING THE INPUTS FROM THE THERMOSTAT TO THE CONTROL BOARD SUCH AS Y1, Y2, O, G, W, SL1-IN ON THE LED DISPLAY.	DIAGNOSTIC INPUTS VIEWED AT LEDS	NORMAL DISPLAY VIEWED AT LEDS
	7	OUTPUT DIAGNOSTICS - ALLOWS VIEWING THE OUTPUTS FROM THE CONTROL BOARD SUCH AS THE COMPRESSOR, REVERSING VALVE, BLOWER, AND LOOP PUMP ON THE LED DISPLAY.	DIAGNOSTIC OUTPUTS VIEWED AT LEDS	NORMAL DISPLAY VIEWED AT LEDS
	8	THERMOSTAT SELECTION CONFIGURES THE CONTROL FOR A PULSED LOCKOUT SIGNAL (COMFORTALK AND FAULTFLASH THERMOSTATS) OR CONTINUOUS 5 VAC LOCKOUT SIGNAL.	PULSED "L" SIGNAL	CONTINUOUS "L" SIGNAL
SW3	**1**	SINGLE OR DUAL CAPACITY OPERATION	DUAL CAP	1 SPEED
	2	ZONED/FINISH ON SECOND STAGE THIS SWITCH ALLOWS THE UNIT TO DOWN STAGE WITH THE THERMOSTAT WHEN OFF AND FINISH WITH SECOND STAGE WHEN ON. FINISH ON SECOND STAGE REDUCES STAGE CHANGING IN RECIPROCATING DUAL CAPACITY COMPRESSORS.	NORMAL - ALL OTHER SYSTEMS	FINISH ON 2ND UNZONED DUAL CAPACITY E-SERIES OR PREMIER 2 SPEED
	3	ECM BLOWER MONITORING - SET FOR NO RPM ON SPLIT SYSTEMS	NO RPM	RPM
	4	NOT USED	N/A	N/A
	5	ON DUAL CAPACITY UNITS THIS SWITCH ALLOWS STAGE CHANGE: ON THE FLY WHEN OFF, AND 1 MINUTE DELAY WHEN ON. A DELAY IS REQUIRED ON ALL RECIPROCATING DUAL CAPACITY UNITS.	GE SERIES	N/A

REFRIGERATION

Leak Testing

The refrigeration line set must be pressurized and checked for leaks before purging and charging the unit. To pressurize the line set, attach refrigerant gauges to the service ports and add an inert gas (nitrogen or dry carbon dioxide) until pressure reaches 60 to 90 PSIG. Never use oxygen or acetylene to pressure test. Use an electronic leak detector or a good quality bubble solution to detect leaks on all connections made in the field. Check the service valve ports and stem for leaks and all connections made in the field. If a leak is found, repair it and repeat the above steps. For safety reasons do not pressurize the system above 150 psi. Purge pressure from line set. The system is now ready for evacuating and charging.

System Evacuation

Ensure that the line set and air coil are evacuated before opening service valves to the split unit. The line set must be evacuated to at least 200 microns to remove the moisture and air that may still be in the line set and coil. Evacuate the system through both service ports to prevent false readings on the gauge because of pressure drop through service ports.

Charge Amount When Using TAMG Air Handler

The split system is shipped with a factory pre-charge. This volume of refrigerant is not sufficient to run the system and additional refrigerant must be added. If using an TAMG Air Handler please refer to the table in this section for charge amounts to be added. The "Factory Charge" column is the charge amount the compressor section/split is shipped with from the factory. The "Charge Amount with TAMG Air Handler" column is the total amount of charge for the TAMG Air Handler + Compressor section/split. This column does not factor in additional refrigerant needed for the line set. The installer of the system must add charge appropriately for the specific length of the line set. A 3/8 in. liquid line is calculated at 0.50 oz. of charge per linear foot, and a 1/2 in. liquid line is calculated at 1.0 oz. of charge per linear foot using R-410A refrigerant. The suction line will not hold "liquid" and should be ignored for the charge calculation.

Example: GE038/TAMGA0C36 with 20 ft. of 3/8 in. liquid line. Remember that when using the TAMG Air Handler, the column "Charge Amount with TAMG Air Handler" will be used. Now calculate for the additional 20 ft. lineset.

Additional refrigerant to be added = (20 ft. x 0.5 oz.) = 10 oz.

Solution: 10 oz. should be added to the recommended charge of 82 oz. found in the "Charge Amount with TAMG Air Handler" column for a total charge of 92 oz.

After initial charge, the system should be operated and the system subcooling and superheat verified to the Unit Operating Parameters table.

If an air handler manufactured by others is used then refrigerant should be added to the split system factory pre-charge. Refrigerant should be added for liquid line length. This should result in a slightly under-charged system exhibiting low subcooling and high superheat. As charge is added, the subcooling should rise and the superheat should fall.

Charging the System

Charge Method – After purging and evacuating the line set, fully open the service valves counterclockwise. Add R-410A (liquid) into the liquid line service port until the pressure in the system reaches approximately 200 PSIG. Never add liquid refrigerant into the suction side of a compressor. Start the unit and measure superheat and subcooling. Keep adding refrigerant until the unit meets the superheat and subcooling values in the Operating Parameters tables.

Checking Superheat and Subcooling

Determining Superheat

1. Measure the temperature of the suction line at the point where the expansion valve bulb is clamped.
2. Determine the suction pressure in the suction line by attaching refrigeration gauges to the schrader connection on the suction side of the compressor.
3. Convert the pressure obtained in Step 2 to the saturation temperature by using the Pressure Temperature Conversion Chart for R-410A.
4. Subtract the temperature obtained in Step 3 from Step 1. The difference is the amount of superheat for the unit. Refer to the Operating Parameters tables for superheat ranges at specific entering water conditions.

Superheat Adjustment

TXVs are factory set to a specific superheat; however, the superheat should be adjusted for the application. To adjust the TXV to other superheat settings:

1. Remove the seal cap from the bottom of the valve.
2. Turn the adjustment screw clockwise to increase superheat and counterclockwise to decrease superheat. One complete 360° turn changes the superheat approximately 3-4°F, regardless of refrigerant type. You may need to allow as much as 30 minutes after the adjustment is made for the system to stabilize.
3. Once the proper superheat setting has been achieved, replace and tighten the seal cap.

⚠ WARNING

There are 8 total (360°) turns on the superheat adjustment stem from wide open to fully closed. When adjusting the superheat stem clockwise (superheat increase) and the stop is reached, any further clockwise turning adjustment will damage the valve

Determining Subcooling

1. Measure the temperature of the liquid line on the small refrigerant line (liquid line) just outside the split cabinet. This location will be adequate for measurement in both modes unless a significant temperature drop in the liquid line is anticipated.
2. Measure the liquid line pressure by attaching refrigerant gauges to the schrader connection on the liquid line service valve.
3. Convert the pressure obtained in Step 2 to the saturation temperature by using the Pressure Temperature Conversion Chart for R-410A.
4. Subtract the temperature in Step 1 from the temperature in Step 3. The difference will be the subcooling value for that unit. Refer to the Operating Parameters tables for subcooling ranges at specific enter water conditions.

LINE SET SIZES

Unit Size	Air Handler	20 feet		40 feet		60 feet		Factory Charge (oz.)	*Charge Amount with TAMG Air Handler (oz.)
		Suction	Liquid	Suction	Liquid	Suction	Liquid		
026	TAMGA0A24	5/8" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	52	60
038	TAMGA0C36	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	56	82
049	TAMGA0C48	3/4" OD	3/8" OD	7/8" OD	3/8" OD	7/8" OD	1/2" OD	90	112
064	TAMGA0C60	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	92	111
072	TAMGA0C60	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	104	111

Notes: *The "Charge Amount with TAMG Air Handler" column is based on the charge amount for a TAMG Air Handler+Compressor Section/Split. 1/12/2015
Additional charge will have to be added accordingly for lineset length.
After Charge is added adjustments can be made to get appropiate subcooling and superheat.
Additional charge for R410A is 0.50 oz. per ft. for 3/8" and 1.0 oz. per ft. for 1/2" tube.

PRESSURE/TEMPERATURE CONVERSION CHART FOR R-410A

PRESSURE (PSIG)	TEMP °F
60	8.5
62	9.9
64	11.2
66	12.5
68	13.8
70	15.1
72	16.3
74	17.5
76	18.7
78	19.8
80	21.0
82	22.1
84	23.2
86	24.3
88	25.4
90	26.5
92	27.5
94	28.6
96	29.6
98	30.6
100	31.6
102	32.6
104	33.5
106	34.5
108	35.4
110	36.4
112	37.3
114	38.2
116	39.1
118	40.0
120	40.9
122	41.7
124	42.6
126	43.4
128	44.3
130	45.1
132	45.9
134	46.7
136	47.5
138	48.3
140	49.1
142	49.9
144	50.7
146	51.5
148	52.2
150	53.0
152	53.7
154	54.5
156	55.2
158	55.9
160	56.6
162	57.4
164	58.1
166	58.8
168	59.5
170	60.2
172	60.8
174	61.5
176	62.2
178	62.9

PRESSURE (PSIG)	TEMP °F
180	63.5
182	64.2
184	64.8
186	65.5
188	66.1
190	66.8
192	67.4
194	68.0
196	68.7
198	69.3
200	69.9
202	70.5
204	71.1
206	71.7
208	72.3
210	72.9
212	73.5
214	74.1
216	74.7
218	75.3
220	75.8
222	76.4
224	77.0
226	77.5
228	78.1
230	78.7
232	79.2
234	79.8
236	80.3
238	80.9
240	81.4
242	81.9
244	82.5
246	83.0
248	83.5
250	84.1
252	84.6
254	85.1
256	85.6
258	86.1
260	86.6
262	87.1
264	87.7
266	88.2
268	88.7
270	89.2
272	89.6
274	90.1
276	90.6
278	91.1
280	91.6
282	92.1
284	92.6
286	93.0
288	93.5
290	94.0
292	94.5
294	94.9
296	95.4
298	95.8

PRESSURE (PSIG)	TEMP °F
300	96.3
302	96.8
304	97.2
306	97.7
308	98.1
310	98.6
312	99.0
314	99.5
316	99.9
318	100.4
320	100.8
322	101.2
324	101.7
326	102.1
328	102.5
330	103.0
332	103.4
334	103.8
336	104.2
338	104.7
340	105.1
342	105.5
344	105.9
346	106.3
348	106.7
350	107.2
352	107.6
354	108.0
356	108.4
358	108.8
360	109.2
362	109.6
364	110.0
366	110.4
368	110.8
370	111.2
372	111.6
374	112.0
376	112.3
378	112.7
380	113.1
382	113.5
384	113.9
386	114.3
388	114.7
390	115.0
392	115.4
394	115.8
396	116.2
398	116.5
400	116.9
402	117.3
404	117.6
406	118.0
408	118.4
410	118.7
412	119.1
414	119.5
416	119.8
418	120.2

PRESSURE (PSIG)	TEMP °F
420	120.6
422	120.9
424	121.3
426	121.6
428	122.0
430	122.3
432	122.7
434	123.0
436	123.4
438	123.7
440	124.1
442	124.4
444	124.8
446	125.1
448	125.4
450	125.8
452	126.1
454	126.5
456	126.8
458	127.1
460	127.5
462	127.8
464	128.1
466	128.5
468	128.8
470	129.1
472	129.4
474	129.8
476	130.1
478	130.4
480	130.7
482	131.1
484	131.4
486	131.7
488	132.0
490	132.3
492	132.7
494	133.0
496	133.3
498	133.6
500	133.9
502	134.2
504	134.5
506	134.9
508	135.2
510	135.5
512	135.8
514	136.1
516	136.4
518	136.7
520	137.0
522	137.3
524	137.6
526	137.9
528	138.2
530	138.5
532	138.8
534	139.1
536	139.4
538	139.7

PRESSURE (PSIG)	TEMP °F
540	140.0
542	140.3
544	140.6
546	140.9
548	141.2
550	141.4
552	141.7
554	142.0
556	142.3
558	142.6
560	142.9
562	143.2
564	143.5
566	143.7
568	144.0
570	144.3
572	144.6
574	144.9
576	145.1
578	145.4
580	145.7
582	146.0
584	146.2
586	146.5
588	146.8
590	147.1
592	147.3
594	147.6
596	147.9
598	148.2
600	148.4
602	148.7
604	149.0
606	149.2
608	149.5

OPERATING PARAMETERS

First Stage Operation

Cooling -- No Desuperheater									
Entering Water Temp °F	Water Flow GPM/Ton	T2GE026 thru T2GE064		T2GE072		T2GE026 thru T2GE072			
		Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
50	1.5	120-150	190-230	130-150	200-245	8-16	7-14	15-21	18-24
	3.0	115-153	170-205	125-140	190-225	8-16	3-10	9-14	18-25
70	1.5	140-155	250-300	135-150	245-285	6-16	4-16	12-18	18-25
	3.0	135-160	240-270	125-145	245-270	6-18	5-11	5-10	18-24
90	1.5	130-155	335-385	130-155	300-365	7-16	6-18	10-16	19-25
	3.0	125-160	310-345	130-165	305-350	7-18	7-14	5-10	17-22

Heating -- No Desuperheater									
Entering Water Temp °F	Water Flow GPM/Ton	T2GE026 thru T2GE064		T2GE072		T2GE026 thru T2GE072			
		Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	75-100	280-305	75-105	315-365	6-11	4-16	5-9	20-29
	3.0	80-110	285-310	70-110	320-370	6-11	4-16	3-7	20-32
50	1.5	105-120	305-330	100-130	340-400	5-12	4-16	5-12	24-32
	3.0	110-130	315-340	110-125	345-395	9-15	2-14	4-9	20-34
70	1.5	130-155	330-360	130-165	370-430	5-12	2-14	8-12	24-39
	3.0	140-165	335-370	140-160	375-425	7-17	7-15	4-10	24-39

Second Stage Operation

Cooling -- No Desuperheater									
Entering Water Temp °F	Water Flow GPM/Ton	T2GE026 thru T2GE064		T2GE072		T2GE026 thru T2GE072			
		Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
50	1.5	110-145	195-250	105-150	210-270	7-17	6-14	15-21	19-26
	3.0	110-150	175-210	105-125	200-245	7-15	4-11	9-14	20-24
70	1.5	115-150	265-315	105-150	280-350	9-15	6-18	12-18	19-25
	3.0	120-145	245-275	110-140	260-300	10-16	8-16	5-10	18-24
90	1.5	105-160	345-395	120-145	325-385	8-14	6-18	10-16	18-24
	3.0	100-155	325-355	130-145	335-360	8-14	7-15	5-10	17-23

Heating -- No Desuperheater									
Entering Water Temp °F	Water Flow GPM/Ton	T2GE026 thru T2GE064		T2GE072		T2GE026 thru T2GE072			
		Suction Pressure PSIG	Discharge Pressure PSIG	Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	70-90	370-330	70-100	320-370	7-18	10-20	5-9	18-24
	3.0	70-95	270-335	75-90	315-365	7-18	10-20	3-7	18-27
50	1.5	95-115	315-365	95-130	365-420	6-14	6-18	5-12	23-34
	3.0	105-125	320-370	100-125	370-415	6-14	6-18	4-9	20-37
70	1.5	125-150	340-400	130-165	400-470	6-12	4-15	8-12	28-38
	3.0	135-155	345-410	135-160	405-465	7-14	4-15	4-10	24-42

Note: Cooling performance based on entering air temperatures of 80° F DB, 67° F WB. 1/12/2015
Heating performance based on entering air temperature of 70° F DB.

PRESSURE DROP

Dual Capacity

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
026 full load	4	1.4	1.3	1.2	1.1	1.0
	6	2.8	2.6	2.4	2.3	2.1
	8	4.7	4.4	4.1	3.8	3.5
	10	7.0	6.6	6.2	5.8	5.3
026 part load	3	0.8	0.7	0.7	0.7	0.6
	5	2.0	1.8	1.7	1.6	1.5
	7	3.6	3.4	3.2	3.0	2.8
	9	5.8	5.5	5.1	4.8	4.4
038 full load	5	1.2	1.2	1.1	1.0	1.0
	7	2.2	2.1	1.9	1.8	1.7
	9	3.4	3.2	3.0	2.8	2.6
	11	4.9	4.6	4.3	4	3.7
038 part load	4	0.9	0.8	0.8	0.7	0.7
	6	1.7	1.6	1.5	1.4	1.3
	8	2.8	2.6	2.5	2.3	2.1
	10	4.2	3.9	3.7	3.4	3.2
049 full load	6	1.2	1.2	1.1	1.0	1.0
	9	2.4	2.2	2.1	2.0	1.8
	12	3.9	3.6	3.4	3.2	2.9
	15	5.7	5.3	5	4.7	4.3
049 part load	5	0.9	0.9	0.8	0.8	0.7
	8	2.0	1.8	1.7	1.6	1.5
	11	3.4	3.1	2.9	2.8	2.5
	14	5.0	4.7	4.4	4.1	3.8
064 full load	8	1.8	1.7	1.6	1.4	1.3
	12	3.8	3.5	3.3	3.0	2.8
	16	6.5	6.0	5.6	5.2	4.8
	20	9.7	9.1	8.5	8.0	7.4
064 part load	6	1.0	0.9	0.9	0.8	0.8
	10	2.6	2.5	2.3	2.1	2.0
	14	5.0	4.7	4.4	4.1	3.8
	18	8.1	7.6	7.1	6.6	6.1
072 full load	12	3.2	3.0	2.8	2.6	2.4
	15	4.5	4.2	4.0	3.7	3.4
	18	6.0	5.7	5.3	4.9	4.6
	21	7.8	7.3	6.8	6.4	5.9
072 part load	10	2.3	2.1	2.0	1.9	1.7
	13	3.6	3.3	3.0	2.8	2.6
	16	5.0	4.6	4.3	4.0	3.7
	19	6.5	6.2	5.8	5.4	5.0

1/12/2015

COMPRESSOR RESISTANCE

Unit Model No.	208-203/60/1	
	Run Winding (ohms)	Start Winding (ohms)
026	1.23-1.41	1.30-1.50
038	.829-.954	1.19-1.38
049	.590-.679	1.41-1.62
064	.455-.524	.558-.643
072	.344-.395	.495-.570

1/12/2015

THERMISTOR RESISTANCE

THERMISTOR TEMPERATURE (°F)	MICROPROCESSOR RESISTANCE (OHMS)
5	75757-70117
14	57392-53234
23	43865-40771
32	33809-31487
41	26269-24513
50	20570-19230
59	16226-15196
68	12889-12093
77	10310-9688
86	8300-7812
95	6723-6337
104	5480-5172
113	4490-4246
122	3700-3504
131	3067-2907
140	2554-2424
149	2149-2019

7/6/10

REFRIGERANT CIRCUIT GUIDELINE

SYMPTOM	HEAD PRESSURE	SUCTION PRESSURE	COMPRESSOR AMP DRAW	SUPER HEAT	SUB COOLING	AIR TEMP. DIFF	WATER TEMP. DIFF
UNDER CHARGED SYSTEM (POSSIBLE LEAK)	LOW	LOW	LOW	HIGH	LOW	LOW	LOW
OVER CHARGED SYSTEM	HIGH	HIGH	HIGH	NORMAL	HIGH	NORMAL/LOW	NORMAL
LOW AIR FLOW HEATING	HIGH	HIGH	HIGH	HIGH/ NORMAL	LOW	HIGH	LOW
LOW AIR FLOW COOLING	LOW	LOW	LOW	LOW/NORMAL	HIGH	HIGH	LOW
LOW WATER FLOW HEATING	LOW/ NORMAL	LOW/ NORMAL	LOW	LOW	HIGH	LOW	HIGH
LOW WATER FLOW COOLING	HIGH	HIGH	HIGH	HIGH	LOW	LOW	HIGH
HIGH AIR FLOW HEATING	LOW	LOW	LOW	LOW	HIGH	LOW	LOW
HIGH AIR FLOW COOLING	LOW	HIGH	NORMAL	HIGH	LOW	LOW	NORMAL
HIGH WATER FLOW HEATING	NORMAL	LOW	NORMAL	HIGH	NORMAL	NORMAL	LOW
HIGH WATER FLOW COOLING	LOW	LOW	LOW	LOW	HIGH	NORMAL	LOW
LOW INDOOR AIR TEMP HEATING	LOW	LOW	LOW	NORMAL	HIGH	NORMAL	NORMAL/ HIGH
LOW INDOOR AIR TEMP COOLING	LOW	LOW	LOW	NORMAL/LOW	HIGH	LOW	LOW
HIGH INDOOR AIR TEMP HEATING	HIGH	HIGH	HIGH	NORMAL/ HIGH	NORMAL/LOW	LOW	NORMAL
HIGH INDOOR AIR TEMP COOLING	HIGH	HIGH	HIGH	HIGH	LOW	LOW	HIGH
RESTRICTED TXV (CHECK SERVICE ADVISORY)	HIGH	LOW	NORMAL/LOW	HIGH	HIGH	LOW	LOW
INSUFFICIENT COMPRESSOR (POSSIBLE BAD VALVES)	LOW	HIGH	LOW	HIGH	NORMAL/HIGH	LOW	LOW
TXV - BULB LOSS OF CHARGE	LOW	LOW	LOW	HIGH	HIGH	LOW	LOW
SCALED COAXIAL HEAT EXCHANGER HEATING	LOW	LOW	LOW	NORMAL/LOW	HIGH	LOW	LOW
SCALED COAXIAL HEAT EXCHANGER COOLING	HIGH	HIGH	HIGH	NORMAL/LOW	LOW	LOW	LOW
RESTRICTED FILTER DRIER	CHECK TEMPERATURE DIFFERENCE (DELTA T) ACROSS FILTER DRIER.						

7/6/10

DUAL CAPACITY HE/HR TABLE

Model		GPM	Heat of Extraction (kBtuh)				Heat of Rejection (kBtuh)				
			30°F	50°F	70°F	90°F	30°F	50°F	70°F	90°F	110°F
026	Part Load	3.0		12.6	16.8	20.5		24.9	23.8	22.9	
		5.0	9.2	13.4	17.7	21.5	22.2	25.0	23.9	22.8	21.6
		7.0	9.4	13.7	18.0	21.9	22.4	25.2	23.9	22.8	21.6
	Full Load	4.0		17.3	22.8	27.5		33.7	32.4	31.2	
		6.0	13.0	18.4	24.1	28.9	30.2	33.9	32.5	31.0	29.7
		8.0	13.2	18.8	24.5	29.5	30.5	34.1	32.5	31.1	29.7
038	Part Load	4.0		17.5	22.0	25.9		33.2	31.7	30.3	
		6.0	12.7	18.3	23.2	27.5	31.2	33.4	31.9	30.4	28.3
		8.0	13.8	19.3	23.8	27.5	31.5	33.9	32.3	30.8	28.6
	Full Load	5.0		25.9	30.7	34.3		46.6	45.0	42.4	
		7.0	20.2	27.0	32.4	36.7	42.6	46.6	45.5	43.1	41.3
		9.0	20.7	27.7	33.4	38.0	43.0	46.9	45.8	43.3	41.5
049	Part Load	5.0		21.4	25.9	29.9		43.9	42.4	40.6	
		8.0	17.7	23.7	28.7	33.4	36.8	44.0	42.0	40.1	38.0
		11.0	18.2	29.9	35.0	41.8	37.2	44.0	42.3	40.8	38.8
	Full Load	6.0		31.0	37.5	41.6		60.5	61.2	57.6	
		9.0	25.6	34.2	41.5	46.4	52.9	60.3	60.6	56.4	51.9
		12.0	26.5	35.6	43.8	49.5	53.3	60.1	60.9	57.4	53.1
064	Part Load	6.0		29.9	37.8	43.4		60.2	57.9	55.0	
		10.0	22.0	30.3	39.5	46.9	49.4	60.1	58.0	55.3	52.3
		14.0	23.2	31.4	40.3	47.0	49.8	60.1	58.1	55.6	52.6
	Full Load	8.0		39.4	51.3	60.3		76.7	78.8	76.0	
		12.0	33.3	42.3	53.6	61.3	68.2	77.1	79.2	76.2	73.0
		16.0	33.6	43.2	55.3	64.0	68.6	77.6	79.6	76.6	73.1
072	Part Load	10.0		36.7	48.4	53.8		66.3	64.5	63.3	
		13.0	27.1	37.9	47.5	57.2	56.2	66.1	66.0	63.0	59.8
		16.0	28.0	38.7	49.5	57.9	56.6	66.3	65.7	63.2	59.7
	Full Load	12.0		47.0	61.6	73.2		79.7	84.0	82.1	
		15.0	37.7	50.4	64.3	74.4	69.8	80.0	84.3	52.3	78.3
		18.0	38.1	51.4	66.4	77.6	70.2	80.5	84.9	82.8	78.6

Note: operation not recommended in shaded areas.

5/23/2017

REFERENCE CALCULATIONS

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{GPM \times 500}$	$LWT = EWT + \frac{HR}{GPM \times 500}$
$LAT = EAT + \frac{HC}{CFM \times 1.08}$	$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$
$TH = HC + HW$	$LC = TC - SC$
	$S/T = \frac{SC}{TC}$

LEGEND

ABBREVIATIONS AND DEFINITIONS:

CFM	=	airflow, cubic feet/minute
EWT	=	entering water temperature, Fahrenheit
GPM	=	water flow in gallons/minute
WPD	=	water pressure drop, PSI and feet of water
EAT	=	entering air temperature, Fahrenheit (dry bulb/wet bulb)
HC	=	air heating capacity, MBTUH
TC	=	total cooling capacity, MBTUH
SC	=	sensible cooling capacity, MBTUH
KW	=	total power unit input, kilowatts
HR	=	total heat of rejection, MBTUH
HE	=	total heat of extraction, MBTUH
HW	=	desuperheater capacity, MBTUH
EER	=	Energy Efficient Ratio
	=	BTU output/Watt input
COP	=	Coefficient of Performance
	=	BTU output/BTU input
LWT	=	leaving water temperature, °F
LAT	=	leaving air temperature, °F
TH	=	total heating capacity, MBTUH
LC	=	latent cooling capacity, MBTUH
S/T	=	sensible to total cooling ratio

OPERATING LIMITS

OPERATING LIMITS	COOLING	HEATING
AIR LIMITS		
MINIMUM AMBIENT AIR, DB	-10°F [-23.3°C]	-10°F [-23.3°C]
RATED AMBIENT AIR, DB	80.0 [26.7°C]	70°F [21.1°C]
MAXIMUM AMBIENT AIR, DB	120 [48.8°C]	85°F [29°C]
WATER LIMITS		
MINIMUM ENTERING WATER	30°F [-1°C]	20°F [-6.7°C]
NORMAL ENTERING WATER	50-110°F [10-43°C]	30-70°F [-1 TO 21°C]
MAXIMUM ENTERING WATER	120°F [49°C]	90°F [32°C]
NORMAL WATER FLOW	1.5 TO 3.0 GPM PER TON [1.6 TO 3.2 L/M PER KW]	

NOTES: Minimum/maximum limits are only for start-up conditions, and are meant for bringing the space up to occupancy temperature. Units are not designed to operate at the minimum/maximum conditions on a regular basis. The operating limits are dependant upon three primary factors: 1) water temperature, 2) return air temperature, and 3) ambient temperature. When any of the factors are at the minimum or maximum levels, the other two factors must be at the normal level for proper and reliable unit operation.

STARTUP

Before Powering Unit, Check The Following:

- **High voltage is correct and matches nameplate.**
- **DIP switches are set correctly.**
- Fuses, breakers and wire size correct.
- Low voltage wiring complete.
- Piping completed and water system cleaned and flushed.
- Air is purged from closed loop system.
- Isolation valves are open, water control valves or loop pumps wired.
- Transformer switched to 208V if applicable.
- DHW pump switch is "OFF" unless piping is completed and air has been purged.
- Blower rotates freely.
- Blower speed correct.
- Air filter/cleaner is clean and in position.
- Service/access panels are in place.
- Return air temperature is between 50-80ºF heating and 60-95ºF cooling.
- Check air coil cleanliness to ensure optimum performance. Clean as needed according to maintenance guidelines. To obtain maximum performance the air coil should be cleaned before startup. A 10-percent solution of dishwasher detergent and water is recommended for both sides of coil, a thorough water rinse should follow.

Startup Steps

Notes: Complete the Equipment Start-Up/Commissioning Check Sheet during this procedure. Refer to thermostat operating instructions and complete the startup procedure.

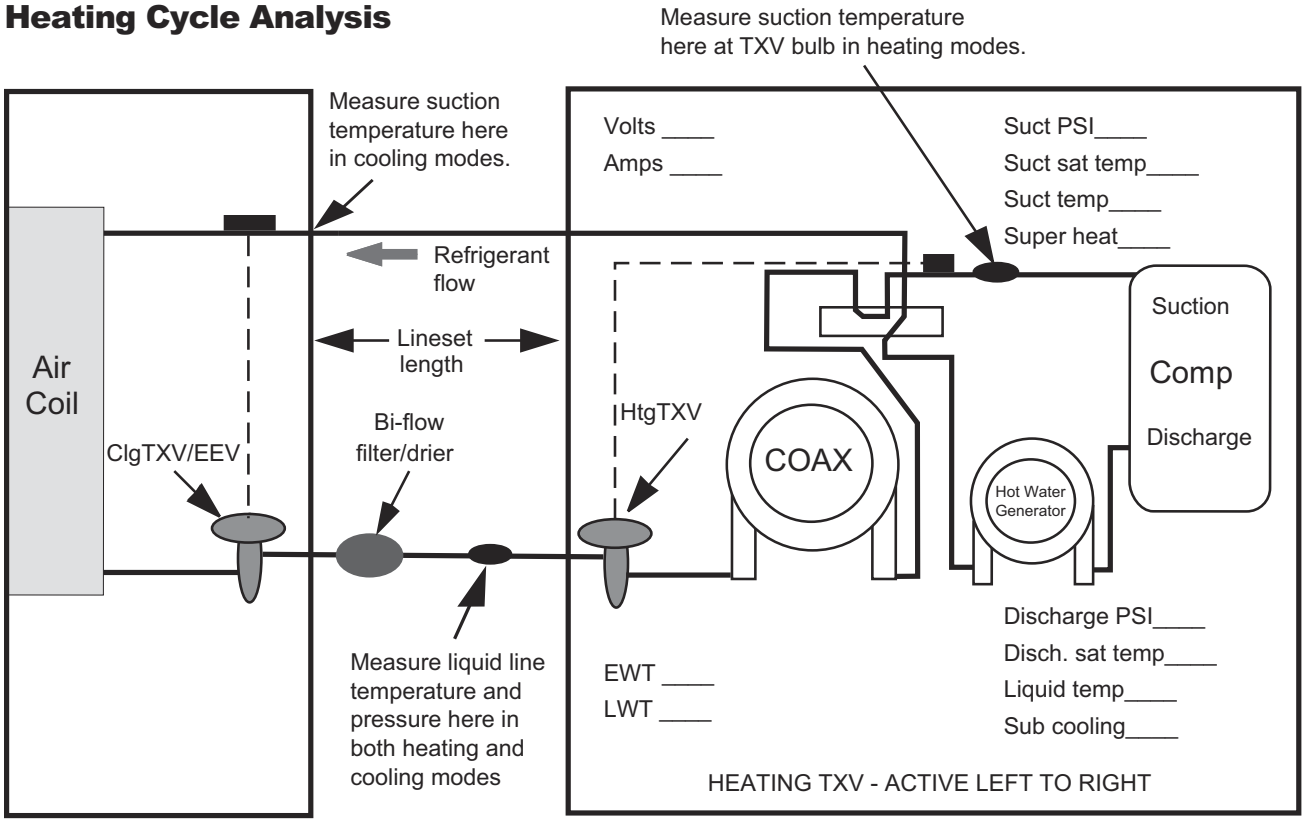
1. Initiate a control signal to energize the blower motor. Check blower operation.
2. Initiate a control signal to place the unit in the cooling mode. Cooling setpoint must be set below room temperature.
3. First stage cooling will energize after a time delay.
4. Be sure that the compressor and water control valve or loop pump(s) are activated.
5. Verify that the water flow rate is correct by measuring the pressure drop through the heat exchanger using the P/T plugs and comparing to unit capacity data in specification catalog.
6. Check the temperature of both the supply and discharge water (see Operating Parameters tables).
7. Check for an air temperature drop of 15°F to 25°F across the air coil, depending on the blower speed and entering water temperature.
8. Decrease the cooling set point several degrees and verify high-speed blower operation.
9. Adjust the cooling setpoint above the room temperature and verify that the compressor and water valve or loop pumps deactivate.
10. Initiate a control signal to place the unit in the heating mode. Heating set point must be set above room temperature.
11. First stage heating will energize after a time delay.
12. Check the temperature of both the supply and discharge water (see Operating Parameters tables).
13. Check for an air temperature rise of 20°F to 35°F across the air coil, depending on the blower speed and entering water temperature.
14. If auxiliary electric heaters are installed, increase the heating setpoint until the electric heat banks are sequenced on. All stages of the auxiliary heater should be sequenced on when the thermostat is in the Emergency Heat mode. Check amperage of each element.
15. Adjust the heating setpoint below room temperature and verify that the compressor and water valve or loop pumps deactivate.
16. During all testing, check for excessive vibration, noise or water leaks. Correct or repair as required.
17. Set system to desired normal operating mode and set temperature to maintain desired comfort level.
18. Instruct the owner/operator in the proper operation of the thermostat and system maintenance.

Notes: Be certain to fill out and forward all warranty registration papers.

Final Evaluation

After the initial check of superheat/subcooling values in the heating mode, shut off the unit and allow it to sit 3 to 5 minutes until pressures equalize. Restart the unit in the cooling mode and check the values against those in the Operating Parameters tables. If the unit performs satisfactorily, charging is complete. If the unit does not perform to specifications, the charge may need to be readjusted until the values are close. Adding refrigerant will increase subcooling. Recovering some of the refrigerant will decrease subcooling and increase superheat. If the superheat/subcooling values are still not close to the specifications in the Operating Parameters tables, analyze refrigerant circuit operation.

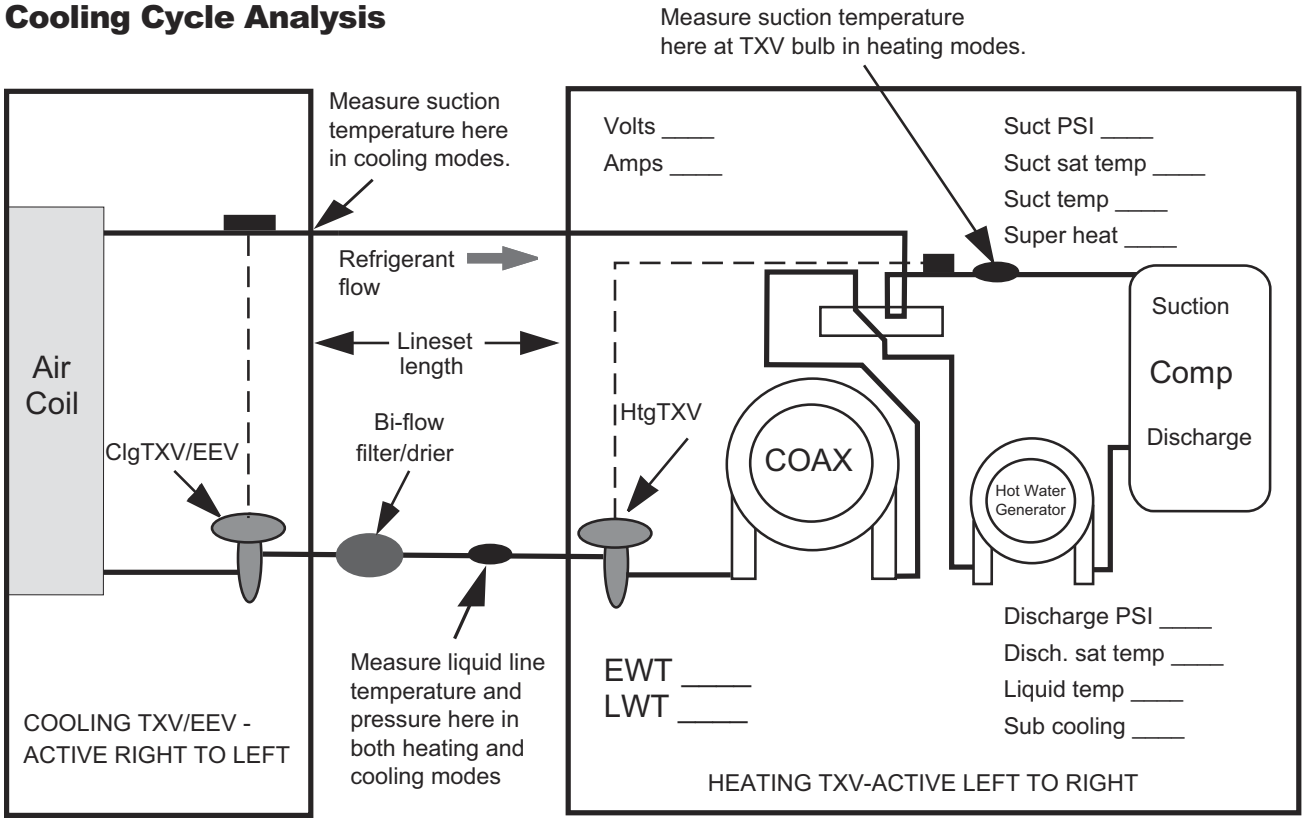
Heating Cycle Analysis



Heat of Extraction/Rejection = GPM x 500 (485 for water/antifreeze) x ΔT

Note: DO NOT hook up pressure gauges unless there appears to be a performance problem.

Cooling Cycle Analysis



TROUBLESHOOTING

Standard Microprocessor Controls

To check the unit control board for proper operation:

1. Disconnect thermostat wires at the control board.
2. Jumper the desired test input (Y1, Y2, W, O or G) to the R terminal to simulate a thermostat signal.
3. If control functions properly:
   - Check for thermostat and field control wiring (use the diagnostic inputs mode).
4. If control responds improperly:
   a. Ensure that component being controlled is functioning (compressor, blower, reversing valve, etc.).
   b. Ensure that wiring from control to the component is functioning (refer to the LED Definition table below and use the diagnostic outputs mode).
   c. If steps above check properly, replace unit control.

LED Definitions and Diagnostics

Standard Microprocessor

LED	NORMAL DISPLAY MODE		DIAGNOSTIC MODES							
			CURRENT FAULT STATUS		INPUTS		OUTPUTS 1		OUTPUTS 2	
	FIELD SELECTION DIPS									
	SW2-	1 ON	SW2-	1 OFF	SW2-	1 NA	SW2-	1 NA	SW2-	1 NA
	SW2-	6 ON	SW2-	6 ON	SW2-	6 OFF	SW2-	6 ON	SW2-	6 OFF
	SW2-	7 ON	SW2-	7 ON	SW2-	7 ON	SW2-	7 OFF	SW2-	7 OFF
DRAIN	DRAIN PAN OVERFLOW LOCKOUT		DRAIN PAN OVERFLOW		Y1		COMPRESSOR (ON OR LOW)		BLOWER LOW	
WATER FLOW	FD THERMISTOR (LOOP <15°F, WELL<30°F) LOCKOUT		FD THERMISTOR (LOOP <15°F, WELL<30°F)		Y2		COMPRESSOR (ON OR HIGH)		BLOWER MEDIUM	
HIGH PRESSURE	HIGH PRESSURE >600 PSI LOCKOUT		HIGH PRESSURE >600		O		REVERSING VALVE		BLOWER HIGH	
LOW PRESSURE	LOW PRESSURE <40		LOW PRESSURE <40		G		BLOWER		AUX HEAT 1	
STATUS	MICROPROCESSOR MALFUNCTION		NOT USED		SL1		LOOP PUMP 1		AUX HEAT 3	
DHW LIMIT	HWL THERMISTOR >130°F		HWL THERMISTOR >130°F		NOT USED		LOOP PUMP 2		AUX HEAT 4	
DHW OFF	DHW PUMP SWITCH OFF		DHW PUMP SWITCH OFF		–		–		–	

Refrigerant Systems

To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Compare the change in temperature on the air side as well as the water side to the Operating Parameters tables. If the unit's performance is not within the ranges listed, and the airflow and water flow are known to be correct, gauges should then be installed and superheat and subcooling numbers calculated. If superheat and subcooling are outside recommended ranges, an adjustment to the refrigerant charge may be necessary.

Notes: Refrigerant tests must be made with hot water generator turned "OFF". Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

PREVENTIVE MAINTENANCE

Water Coil Maintenance

1. Keep all air out of the water. An open loop system should be checked to ensure that the well head is not allowing air to infiltrate the water line. Lines should always be airtight.
2. Keep the system under pressure at all times. It is recommended in open loop systems that the water control valve be placed in the discharge line to prevent loss of pressure during off cycles. Closed loop systems must have positive static pressure.

Notes: On open loop systems, if the installation is in an area with a known high mineral content (125 PPM or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with either the cupronickel or copper water lines. Generally, the more water flowing through the unit the less chance for scaling.

⚠ CAUTION

Fin edges are sharp.

REPLACEMENT PROCEDURES

Obtaining Parts

When ordering service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

SERVICE PARTS LIST

Part Description		Dual Capacity Split Units				
		026	038	049	064	072
Compressor	Compressor	34P640-11	34P641-11	34P642-11	34P643-11	34P644-11
	Run Capacitor	16P002D19	16P002D20	16P002D18	16P002D31	
	Sound Jacket	92P504A16				
	Power Harness	11P781-01				
	Solenoid Harness	11P782-02				
	Crankcase Heater	19P535-09		19P535-07	19P535-08	
Refrigeration Components	Accumulator	36P509-02	36P509-01			
	Coax	62I594-01	62I542A01	62I543A01		
	TXV	33P609-01	33P609-03	33P609-05	33P609-06	
	Reversing Valve	33P506-05	33P503-05	33P526-05		
	Filter Dryer	36P500B01			36P500B02	
Electrical	Contactor	13P004A03				
	Status Light Board	17P503-02				
	Harness, Status Light Board	11P783-01				
	Premier Board	17P513-07				
Sensors & Safeties	Freeze Protection Thermistor	12P505B03				
	Low Temperature Sensor	35P505-02				
	High Pressure Switch Kit	SKHPE600				
	Low Pressure Switch Kit	SKHPE40				

Part numbers subject to change 1/12/2015

Trane
www.Trane.com

American Standard
www.AmericanStandard.com

06/17

The manufacturer has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.