ENVISION™

Geothermal/Water Source Outdoor Split Heat Pump
2 to 6 Tons Dual Capacity

NDS Installation Manual

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AHRI CERTIFIED™ www.ahridirectory.org Water Source HP ANSI/AHRI/ASHRAE/ISO13256-1

ETL LISTED

ENERGY STAR

WaterFurnace® Smarter from the Ground Up™

IM1004SN 06/10

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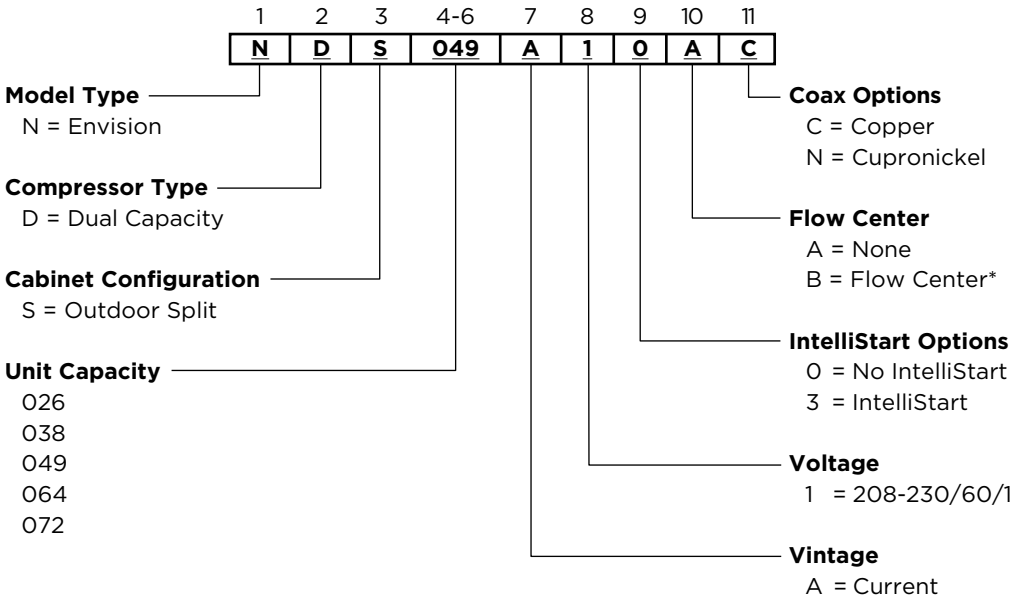
Model Nomenclature



NOTE: *026-049 uses the FC1-GL and 060-072 uses the FC2-GL, the flow center is factory installed. If these flow centers do not meet the flow requirements, select A = None for digit 10.

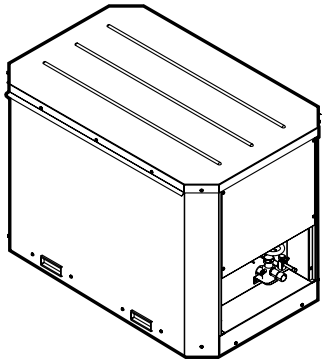
Physical Characteristics

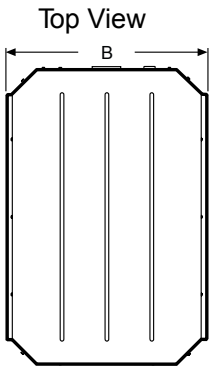
Model	026	038	049	064	072
Compressor (1 each)	Dual Capacity Scroll				
Factory Charge R-410A, oz. [kg]	52 [1.47]	56 [1.59]	90 [2.55]	92 [2.61]	104 [2.95]
Coax and Water Piping					
Coax and Piping Water Volume - gal. [l]	0.7 [2.6]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
Weight - Operating lb. [kg]	189 [85]	236 [107]	250 [113]	271 [123]	290 [132]
Weight - Packaged, lb. [kg]	209 [95]	256 [116]	270 [122]	291 [132]	310 [141]

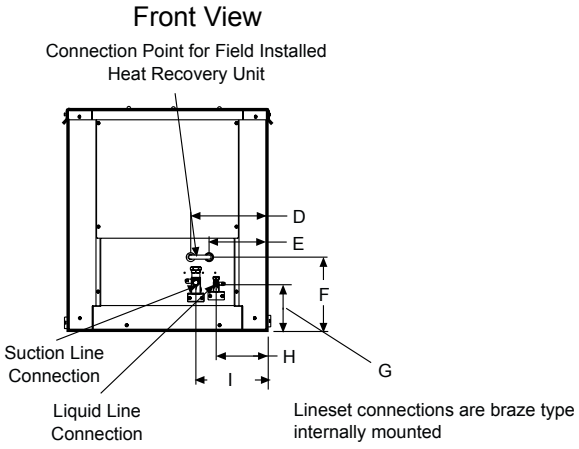
NOTE: All units have TXV expansion devices, and 1/2 in. [12.2 mm] and 3/4 in. [19.1 mm] electrical knockouts. 4/9/08

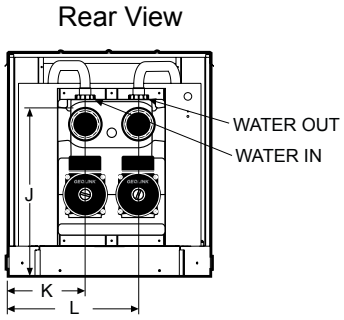
Physical Dimensions

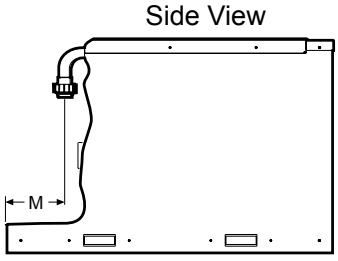
Cabinet Dimensions and Refrigerant Piping Connections

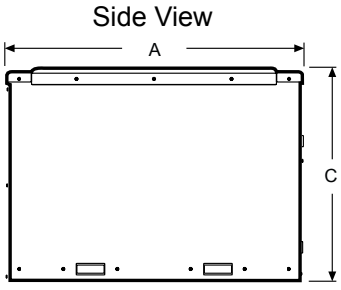












Model	A	B	C	D	E	F	G	H	I	J	K	L	M
026 thru 072	36.0	23.9	25.7	9.3	7.1	9.0	5.6	8.2	10.7	18.9	8.7	14.8	7.0
	[91.4]	[60.7]	[65.2]	[23.7]	[18.0]	[22.8]	[14.2]	[20.9]	[27.2]	[48.0]	[22.1]	[37.6]	[17.8]

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

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 NDS 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 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 an Envision 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 NAH air handler/coil. Fixed orifice or cap tube systems should not be used.
- Minimum of two (2) blower speeds

Utilizing Existing Coil or Air Handler

It is recommended that a new R-410A air handler be installed with an Envision Split considering the long term

General Installation Information cont.

benefits of reliability, warranty, etc. versus the short term installation cost savings. However, the existing air handler may be retained provided the following:

- Coil currently is R-410A rated
- Coil uses a TXV. No capillary or fixed orifice systems should be used
- A life expectancy of more than 7 years remaining for the air handler and components
- Flush air coil and line set

When utilizing the existing air coil or line set, only flushing compounds that vaporize should be used; which means they are packaged in a pressurized disposable cylinder. It is preferable to use a flushing agent that removes oil, water, and acid, plus, is biodegradeable and non-toxic. The flushing agent should be safe to use with both HCFC and HFC refrigerants. Once a flushing agent has been selected, follow the instructions provided with the product.

The first step should be purging the lines or air coil with nitrogen. Purging with nitrogen first will remove some of the particulate and residual oil which will allow the flushing agent to work better. Never blow the flushing agent through a compressor, filter drier, or txv as it will cause the components to fail.

When flushing is complete and the final system is assembled, an acid check should be preformed on the system. Acid test kits are available from most HVACR distributors.

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 Envision 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

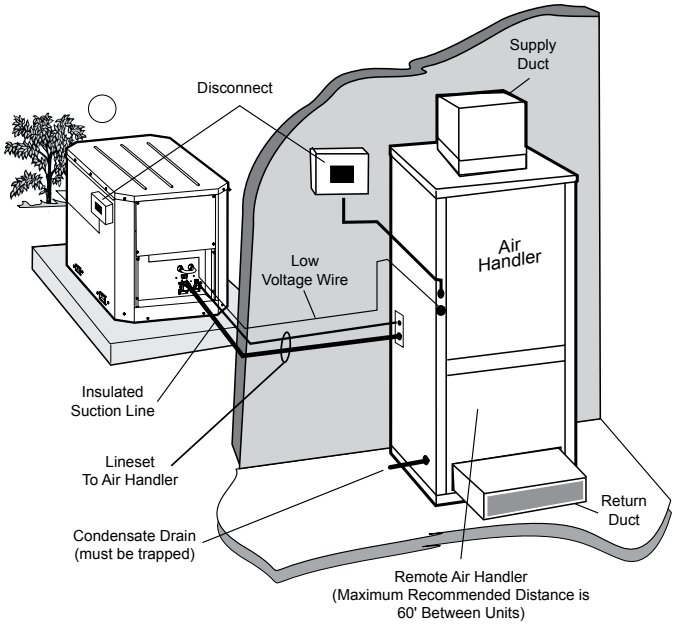
Air handlers used with dual capacity units must be capable of operating with a minimum of 2 blower speeds. Refer to the manufacturer’s instructions for the blower coil unit for details on installing the air handling portion of the system. All blower coil units/air coils must be installed as specified 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 of 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 - Remote Blower Coil



General Installation Information cont.

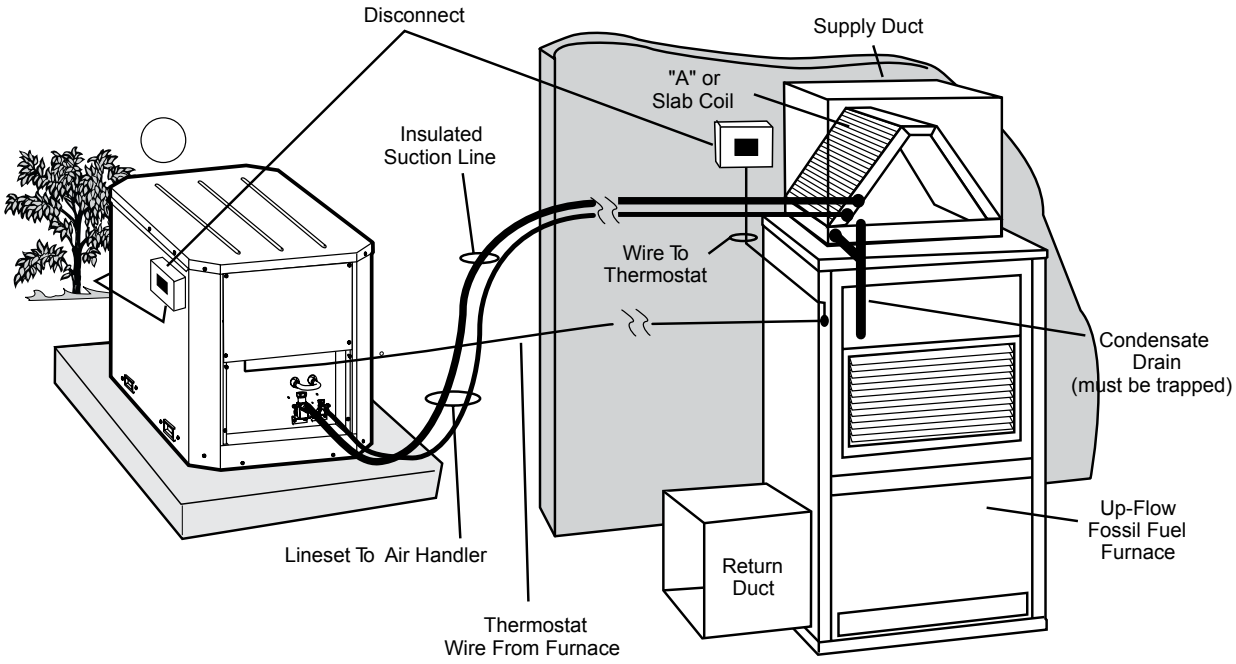
Dual Fuel Systems

Envision units can be connected to fossil fuel furnaces that include an A-coil or slab coil. Dual fuel installations utilize the Envision 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 Envision 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 WaterFurnace 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 Envision 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 Envision 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 Envision Split application. Refer to the Thermostat Wiring section for details.

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



Electrical Data

General

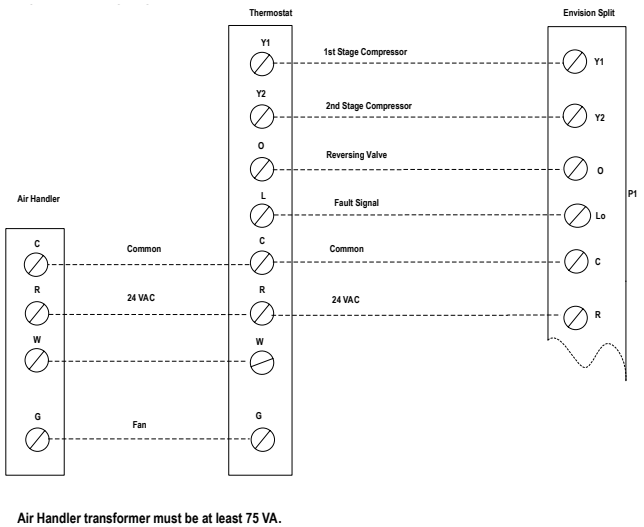
Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable. See unit electrical data for fuse or cicuit breaker sizing information.

Model	Rated Voltage	Voltage Min/Max	Compressor				HWA Pump FLA	Ext Loop FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA*					
026	208-230/60/1	197/253	16.0	10.2	52.0	18.0	0.4	5.4	16.0	18.6	25
038	208-230/60/1	197/253	26.0	16.6	82.0	29.0	0.4	5.4	22.4	26.6	40
049	208-230/60/1	197/253	33.0	21.1	96.0	34.0	0.4	5.4	26.9	32.2	50
064	208-230/60/1	197/253	40.0	25.6	118.0	41.0	0.4	5.4	31.4	37.8	60
072	208-230/60/1	197/253	42.5	27.2	150.0	53.0	0.4	5.4	33.0	39.8	60

Rated voltage of 208-230/60/1. 05/06/09
HACR circuit breaker in USA only.
Min/Max voltage of 197/253.
All fuses Class RK-5
* With optional IntelliStart

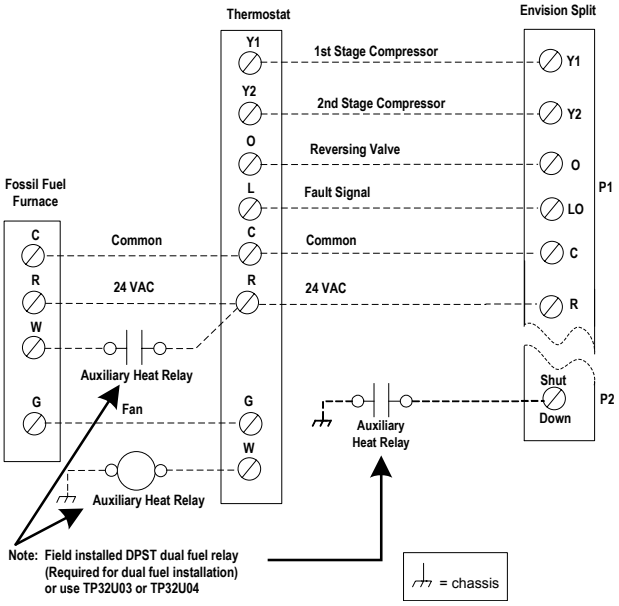
Thermostat Wiring

Thermostat Wiring



Air Handler transformer must be at least 75 VA.

Thermostat Wiring for Dual Fuel Applications



Water Quality

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.

Units 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.

Material		Copper	90/10 Cupro-Nickel	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 .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 .5 ppm	Less than .5 ppm	Less than .5 ppm
	Chlorides	Less than 20 ppm	Less than125 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 .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Nitrate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Hydroxide	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Sulfate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000-1500 ppm	1000-1500 ppm
	LSI Index	+0.5 to -.05	+0.5 to -.05	+0.5 to -.05
Iron Fouling (Biological Growth)	Iron, Fe^{2}+ (Ferrous) Bacterial Iron Potential	< .2 ppm	< .2 ppm	< .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

Grains = PPM divided by 17 • mg/l is equivalent to PPM

2/8/08

Water Piping

Residential NDS 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.

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)

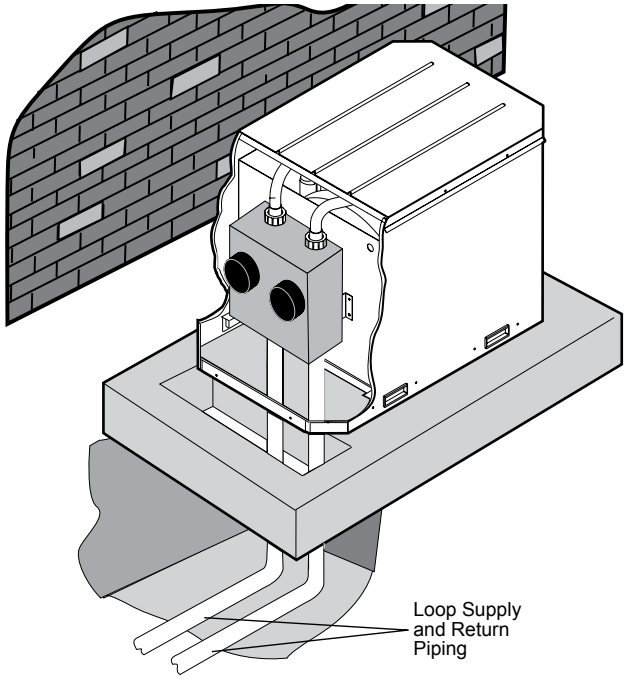
NDS Splits can be installed on an open loop system, but only indoors. All NDS Splits are supplied with GeoLink swivel connectors. The swivel connectors that are supplied with the NDS Split also accept 3/4 in. NPT pipe which can be connected in an open loop system.

Flow Center Installation

Flow centers FC1-GL or FC2-GL, as needed, may be internally mounted on the NDS splits, Two stub tubes with barbs are pre connected to the coax. Two tubes with brass fittings, to adapt to the flow center, 2 hoses to connect between the two sets of tubes, and four hose clamps are included with each NDS unit. The brass adapter fittings have plastic swivel connectors and are also internally threaded to accept 3/4 in. NPT fittings.

NOTE: For ease of installation, attach provided hoses to coax first and then trim to fit to elbows on flow center.

Typical Split System Outdoor Installation Using Closed Loop



Model Nomenclature - Air Handler

1-3	4-6	7	8-9	10	11	12
NAH	036	A	00	0	1	R

Model Type
NAH = Envision Series Air Handler

Unit Capacity

Refrigerant Models	Nom. CFM
022 MBTUH	800
026 MBTUH	925
030 MBTUH	980
036 MBTUH	1225
042 MBTUH	1425
048 MBTUH	1625
060 MBTUH	1760
Hydronic Models	
026 MBTUH	925
036 MBTUH	1225
048 MBTUH	1625
060 MBTUH	1760

Vintage
A = Current

Electric Heat
00 = No electric heat
05 = 5 kW (available on 022-036 only)
10 = 10 kW (available on 030-060 only)
15 = 15 kW (available on 042-060 only)
20 = 20 kW (available on 060 only)

Disconnect
0 = No breaker installed
(only on 5kW & 10kW heaters)
1 = Breaker installed
(only on 15kW & 20kW heaters)

Motor
1 = ECM 208-230/60/1

Air Coil
R = Refrigerant
H = Hydronic

NOTE: Kit NAHBC must be ordered to field convert the NAH042-060 to bottomflow air discharge.

Coil Data - Air Handler

Envision Split Model	Matching Air Handler	Coil Surface Area (ft^2)	FPI	Rows	Tube Diameter
022 - 038	NAH036	5.83	12	2	3/8 in.
042 - 072	NAH060	5.83	12	3	3/8 in.

Compatibilty Table - Air Handler

Air Handler	Indoor Split Model (Single)	Indoor Split Model (Dual Capacity)	Outdoor Split Model (Dual Capacity)	Airflow(CFM)	Electric Heat (kW)
NAH022A*1R**	NSZ022	-		800	5
NAH026A*1R**	-	NDZ026	NDS026	925	5
NAH030A*1R**	NSZ030	-	-	980	5, 10
NAH036A*1R**	NSZ036	-	-	1225	5, 10
NAH036A*1R**	-	NDZ038	NDS038	1225	5, 10
NAH042A*1R**	NSZ042	-	-	1425	10, 15
NAH048A*1R**	NSZ048	-	-	1625	10, 15
NAH048A*1R**	-	NDZ049	NDS049	1625	10, 15
NAH060A*1R**	NSZ060	-	-	1760	10, 15, 20
NAH060A*1R**	-	NDZ064	NDS064	1760	10, 15, 20
NAH060A*1R**	NSZ070	-	-	1760	10, 15, 20
NAH060A*1R**	-	NDZ072	NDS072	1760	10, 15, 20

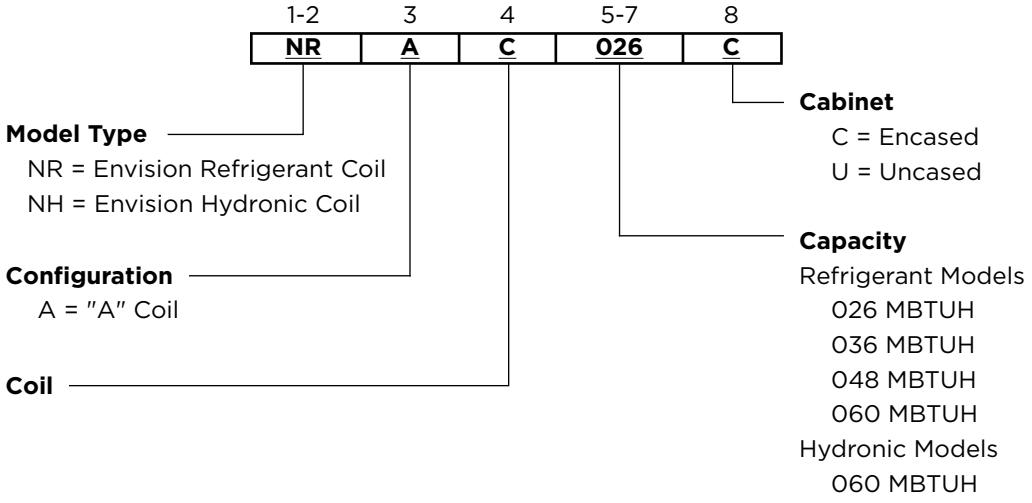
6/9/08

Physical Data - Air Handler

Air Handler Model Number (Refrigerant)		NAH022	NAH026	NAH030	NAH036	NAH042	NAH048	NAH060
Evaporator Coil	Air Coil Total Face Area, ft2 [m2]	5.83 [0.54]						
	Tube outside diameter - in. [mm]	3/8 [9.52]						
	Number of rows	2				3		
	Fins per inch	12						
	Suction line connection - in. [mm] sweat	5/8 [15.87]				7/8 [22.22]		
	Liquid line connection - in. [mm] sweat	3/8 [9.52]						
Refrigerant		R-410a						
Nominal cooling capacity - tons [kW]		1.8 [6.44]	2.1 [7.59]	2.5 [8.79]	3 [10.55]	3.5 [12.30]	4 [14.06]	5 [17.58]
Condensate drain connection - (FPT) in. [mm]		3/4 [19.05]						
Blower Wheel Size (Dia x W), in. [mm]		11 x 10 [279 x 254]						
Blower motor type/speeds		ECM variable speed						
Blower motor output - hp [W]		1/2 [373]				1 [746]		
Filter Standard - 1" [51mm] MERV3 disposable, in. [mm]		20 x 24 [508 x 635]						
Electrical characteristics (60hz)		208/230 - 1ph						
Shipping weight - lbs. [kg]		215 [97.52]				220 [99.79]		
Operating weight - lbs. [kg]		195 [88.45]				200 [90.71]		

1/11/08

Model Nomenclature - Envision Coil



NOTE: All Refrigerant Coils include TXV.

Refrigerant Coil Compatibility

Encased/Uncased Coil	Indoor Split Model (Single)	Indoor Split Model (Dual Capacity)	Outdoor Split Model (Dual Capacity)	Recommended Airflow (CFM)
NRAC026*	NSZ022	-		800
NRAC026*	-	NDZ026	NDS026	925
NRAC026*	NSZ030	-	-	980
NRAC036*	NSZ036	-	-	1225
NRAC036*	-	NDZ038	NDS038	1225
NRAC048*	NSZ042	-	-	1425
NRAC048*	NSZ048	-	-	1625
NRAC048*	-	NDZ049	NDS049	1625
NRAC060*	NSZ060	-	-	1760
NRAC060*	-	NDZ064	NDS064	1760
NRAC060*	NSZ070	-	-	1760
NRAC060*	-	NDZ072	NDS072	1760

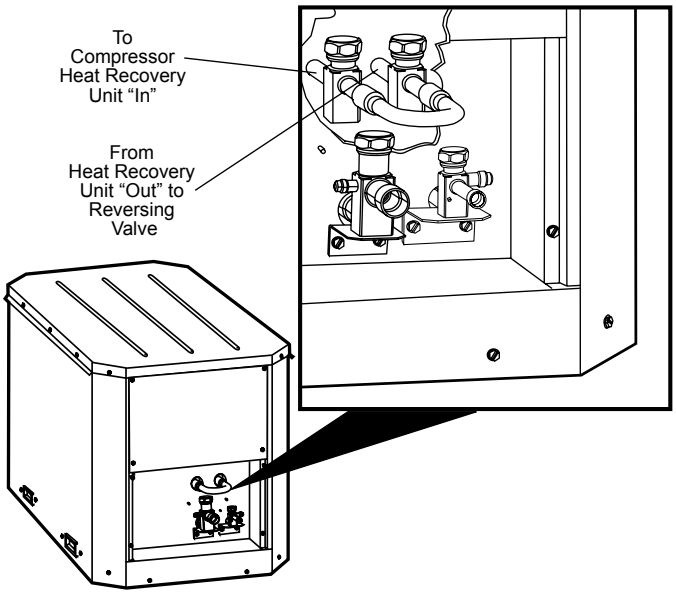
7/14/08

Heat Recovery Unit for Domestic Hot Water

Service valves have been provided inside the unit for connecting the discharge gas line to a water heating heat recovery unit (see Service Valves for Heat Recovery Unit Connections illustration). To make the connections, close the service valves inside the unit by turning clockwise. Using a recovery canister connect to either of the schrader ports on the DSH service valves and recover the small amount of refrigerant trapped inside of the U-tube. Prior to brazing ensure that all refrigerant has been removed from U-tube. Once the refrigerant is removed, it is recommended that the tube be cut at the "U" to remove any excess oil that may be trapped. (This will also allow for easier removal of the tubing with a torch, since each section can be removed independently). Service valves must be protected to prevent overheating. Unbraze the 1/2-inch O.D. U-tube and run tubing from the left hand service valve to the inlet of the heat recovery unit and from the outlet of the heat recovery unit to the right hand of the service valve. Typically the one way discharge line length should be limited to 25-30 feet and line size must be increased depending on unit size and length of run. Follow the instructions supplied with the heat recovery unit for mounting location, water piping, and start up. A typical installation is shown below.

IMPORTANT: Reopen discharge line service valves before starting up unit, but only after leak checking, purging, and evacuating new discharge line.

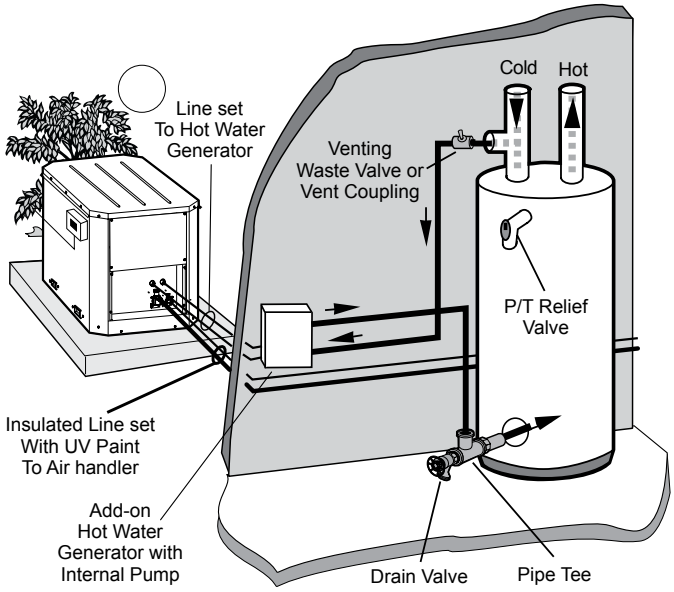
Service Valves for Heat Recovery Unit Connections



Maximum One-Way Line Length

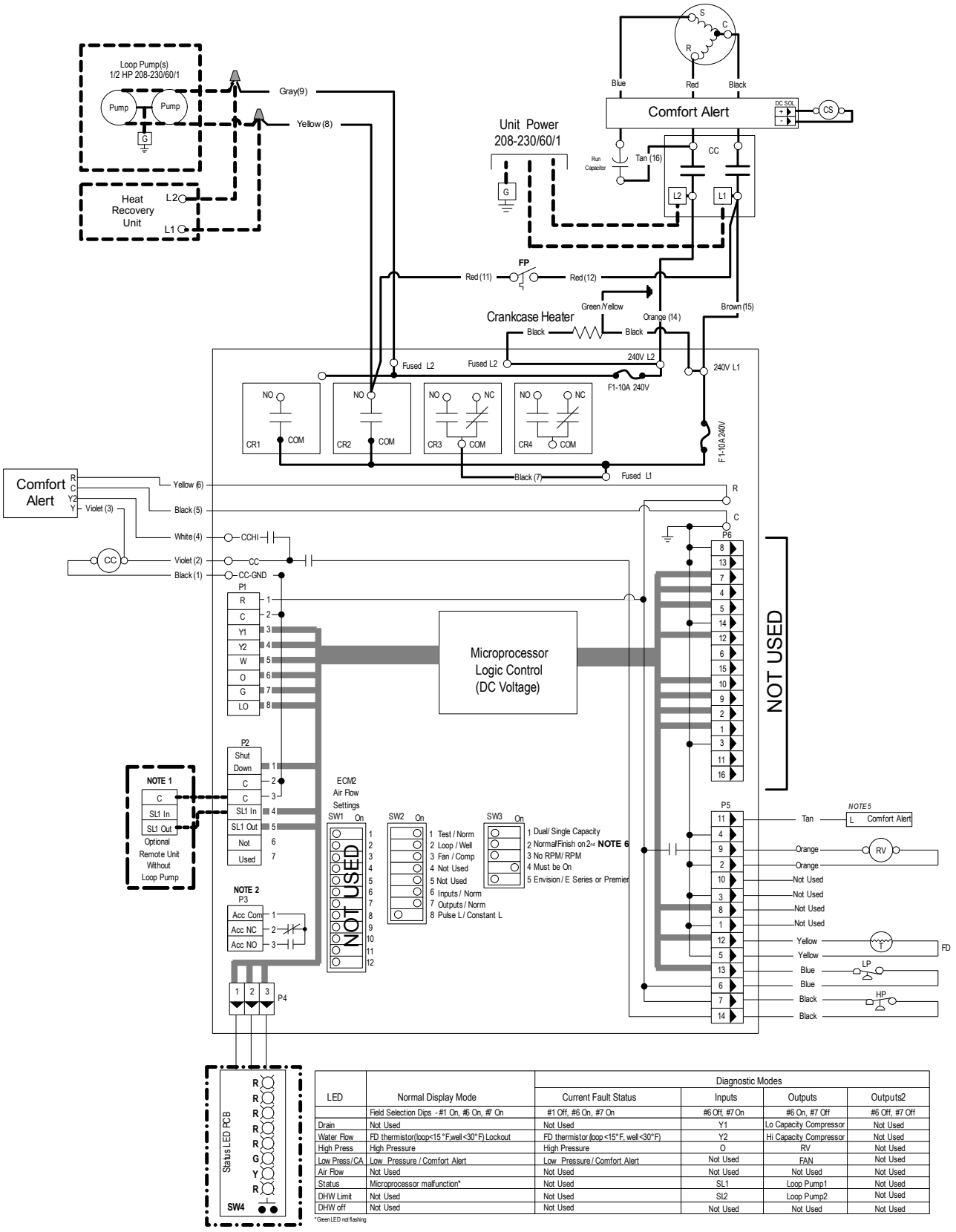
SIZE	1/2" OD	5/8" OD	3/4" OD
026 - 038	Up to 9 ft.	Up to 25 ft.	Up to 30 ft.
049	Up to 5 ft.	Up to 13 ft.	Up to 30 ft.
064	N/A	Up to 9 ft.	Up to 25 ft.
072	N/A	Up to 6 ft.	Up to 20 ft.

Typical Hot Water Piping Layout



Wiring Schematics

Dual Capacity Split Wiring Schematic - 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	FD thermistor(loop<15°F,well<30°F) Lockout	FD 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/CA	Low Pressure / Comfort Alert	Low Pressure / Comfort Alert	Not Used	FAN	Not Used
Air Flow	Not Used	Not Used	Not Used	Not Used	Not Used
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump1	Not Used
DHW Limit	Not Used	Not Used	SL2	Loop Pump2	Not Used
DHW off	Not Used	Not Used	Not Used	Not Used	Not Used

*Green LED not flashing

Wiring Schematics cont.

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

Notes

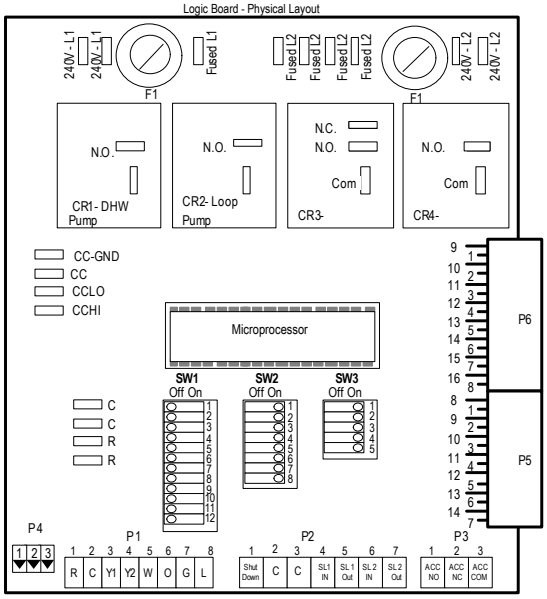
1 - Connection of remote unit that does not have a loop pump for slave operation.
2 - 24V Accessory relay (see SW2 -3 for description of operation)
3 - Field installed DPDT dual fuel relay. (Required for dual fuel installation)
4 - DHW pump only in models with hot water generation option.
5 - Comfort Alert fault output to Premier Control Board
6 - This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON. Finish second stage reduces stage changing in recip dual capacity compressors and should be ON for unzoned Dual Cap E-Series or Premier 2 speed units.

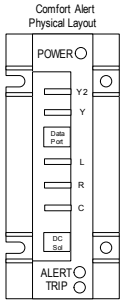
Legend

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
Field wire lug
Ground
Relay Contacts - N.O., N.C.
Fuse

CA- Comfort Alert
CS- Compressor Solenoid
CC - Compressor Contactor
CR1 - Not Used
CR2- Loop Pump Relay1
CR3 - Loop Pump Relay2
CR4 - Not Used
F1 and F2 - Fuses
FD - Freeze Detection 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
Thermistor
Light Emitting Diode - Green
Relay Coil
Capacitor w/ Bleed Resistor
Switch-High Pressure
Switch-Low Pressure
Polarized Connector

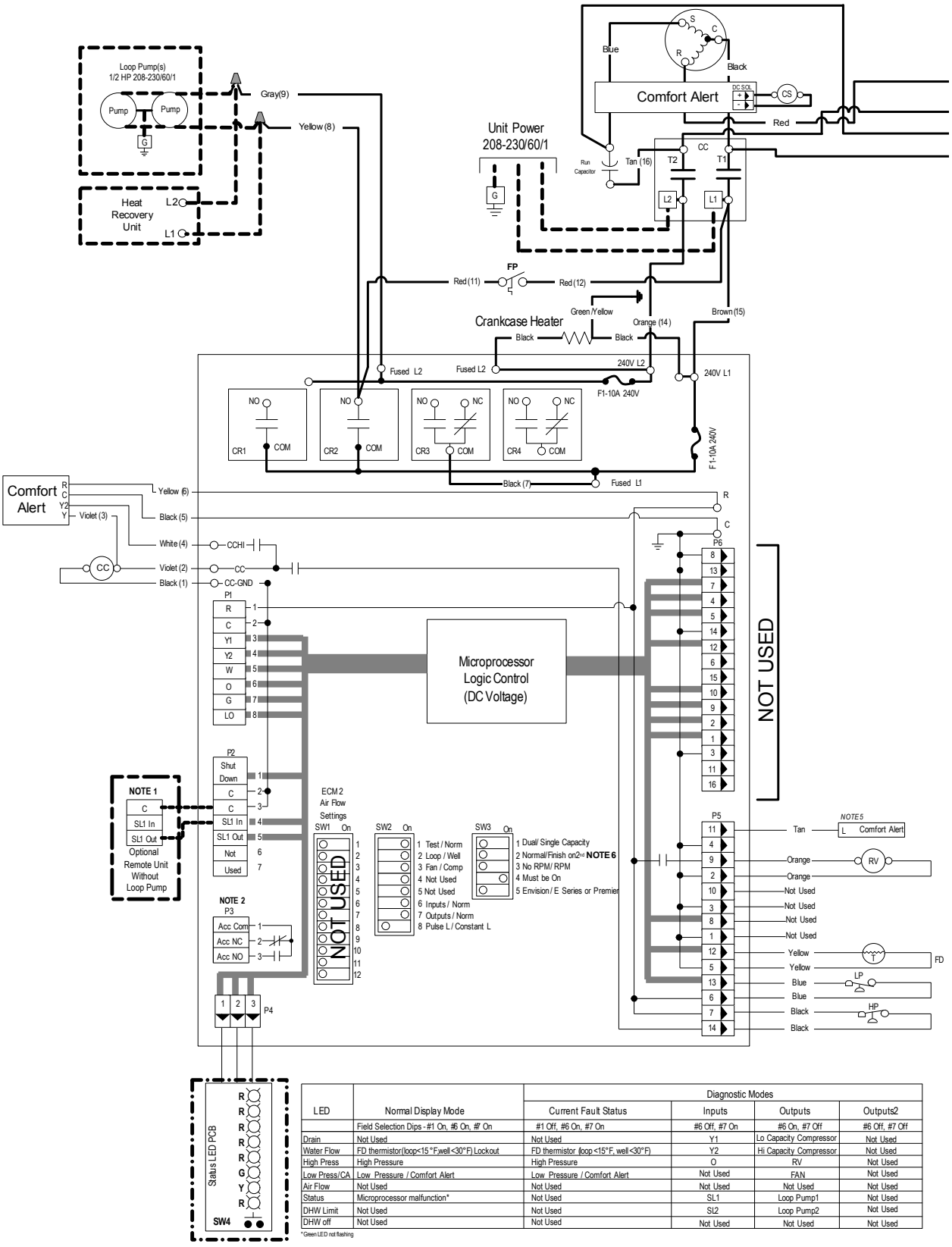




Comfort Alert Status		
LED	Flash Code	Description
Green	Solid	Module Has Power
Red	Solid	Y1 Present But Compressor Not Running
Yellow	Code 1	Long Run Time
	Code 2	System Pressure Trip
	Code 3	Short Cycling
	Code 4	Locked Rotor
	Code 5	Open Circuit
	Code 6	Open Start Circuit
	Code 7	Open Run Circuit
	Code 8	Welded Contactor
	Code 9	Low Voltage

Wiring Schematics cont.

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

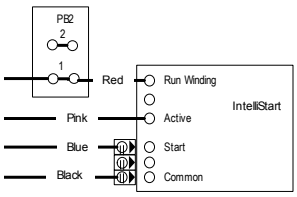


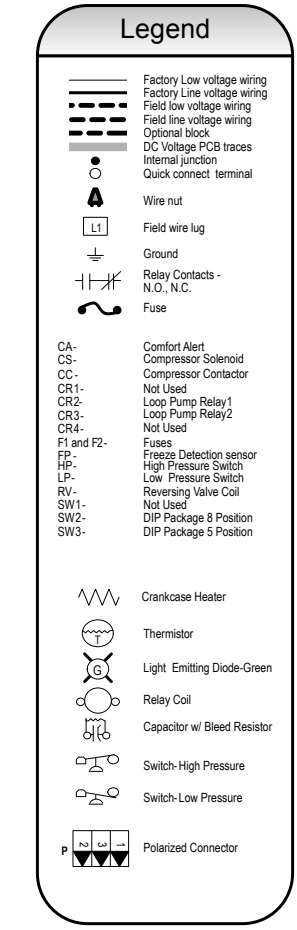
LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Not Used	Not Used	Y1	Lo Capacity Compressor	Not Used
Water Flow	FD thermistor(loop<15 °F,well <30°F) Lockout	FD 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/CA	Low Pressure / Comfort Alert	Low Pressure / Comfort Alert	Not Used	FAN	Not Used
Air Flow	Not Used	Not Used	Not Used	Not Used	Not Used
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump1	Not Used
DHW Limit	Not Used	Not Used	SI2	Loop Pump2	Not Used
DHW off	Not Used	Not Used	Not Used	Not Used	Not Used

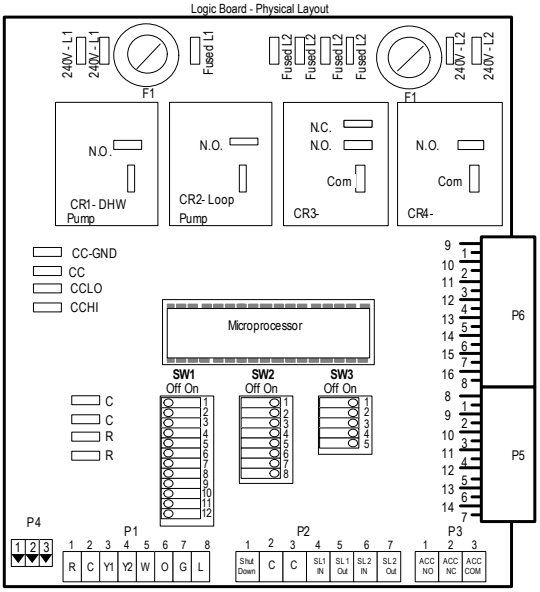
*Green LED not flashing

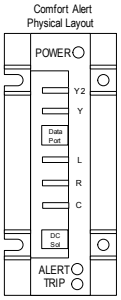
Wiring Schematics cont.

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









Comfort Alert Status		
LED	Flash Code	Description
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	Code 2	System Pressure Trip
	Code 3	Short Cycling
	Code 4	Locked Rotor
	Code 5	Open Circuit
	Code 6	Open Start Circuit
	Code 7	Open Run Circuit
	Code 8	Welded Contactor
	Code 9	Low Voltage

Notes

1 - Connection of remote unit that does not have a loop pump for slave 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 - Comfort Alert fault output to Premier Control Board
6 - This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON. Finish second stage reduces stage changing in recip dual capacity compressors and should be ON for unzoned Dual Cap E Series or Premier 2 speed units.

Microprocessor Control

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.

Short Cycle Protection

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

Shutdown Mode

A 24VAC common signal to the "shutdown" input on the control board puts the unit into shutdown mode. Compressor and blower operation are suspended.

Safety Controls

The Envision 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 detection. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is suspended, the appropriate lockout LED begins flashing. (Refer to the "Fault Retry" section below.)

Testing

The Envision control allows service personnel to shorten most timing delays for faster diagnostics. (Refer to the Field Selection DIP switch table.)

Fault Retry

All faults are retried twice before finally locking the unit out. An output signal is made available for a fault LED at the thermostat. The "fault retry" feature is designed to prevent nuisance service calls.

Diagnostics

The Envision control board allows all inputs and outputs to be displayed on the LEDs for fast and simple control board diagnosis. (Refer to the Field Selection DIP Switch SW2-1 table.)

Heating Operation

Heat, 1st Stage (Y1)

The blower motor is started on low speed immediately (PSC ON), the loop pump is energized 5 seconds after the "Y1" input is received, and the compressor is energized on low capacity 10 seconds after the "Y1" input. The blower is switched to medium speed 15 seconds after "Y1" input (ECM only).

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. The ECM blower changes from medium to high speed 15 seconds after the "Y2" input.

The Comfort Alert will delay the second stage compressor until 5 seconds after it receives a "Y2" from the board.

Heat, 3rd Stage (Y1,Y2,W) Dual Capacity Units

The 1st stage of resistance heat is energized 10 seconds after "W" input, and with continuous 3rd stage demand, the additional stages of resistance heat engage 90 seconds after the first stage.

Emergency Heat (W only)

The blower is started on high speed, and the first stage of resistance heat is energized 10 seconds after the "W" input. Continuing demand will engage the additional stages of resistance heat 90 seconds after the first stage.

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 blower motor is started immediately, the loop pump(s) is energized 5 seconds after the "Y1" input is received. The compressor will be energized (on low capacity for Dual Capacity units) 10 seconds after the "Y1" input. The ECM blower will shift from low to medium speed 15 seconds after the "Y1" input (85% of medium speed if in dehumidification mode).

Cool, 2nd Stage (Y1, Y2, O) Single Speed Units

The blower changes to high speed (85% of high speed if in dehumidification mode) 15 seconds after the "Y2" input (ECM only).

Microprocessor Control cont.

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. The ECM blower changes to high speed 15 seconds after the “Y2” input (85% of high speed if in dehumidification mode). The Comfort Alert will delay the second stage compressor until 5 seconds after it receives a “Y2” from the board.

Blower (G only)

The blower starts on low speed (PSC ON). Regardless of blower input “G” from thermostat, the blower will remain on low speed for 30 seconds at the end of each heating, cooling or emergency heat cycle.

Lockout Conditions

During lockout mode, the appropriate unit and thermostat lockout LEDs will illuminate. The compressor, loop pump, and accessory outputs are de-energized. The blower will continue to run on low speed. If the thermostat calls for heating, emergency heat operation will occur.

Comfort Alert lockouts cannot be reset at the thermostat. All other lockout modes can be reset at the thermostat after turning the unit off, then on, which restores normal operation but keeps the unit lockout LED illuminated. Interruption of power to the unit will reset a lockout without a waiting period and clear all lockout LEDs.

High Pressure

This lockout mode occurs when the normally closed safety switch is opened momentarily (set at 600 PSI).

Low Pressure

This lockout mode occurs when the normally closed low pressure switch is opened for 30 continuous seconds (set at 40 PSI). A low pressure fault may also be indicated when a Comfort Alert lockout has occurred.

Freeze Detection (Water Flow)

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

Microprocessor Control cont.

Compressor Monitoring/Comfort Alert

The Comfort Alert displays abnormal compressor conditions through a unique flash code and communicates the conditions to the heat pump microprocessor control. The heat pump microprocessor will determine which fault to act on and ignore. Fault codes 2 (system pressure), 4 (locked rotor), 6 (open start circuit), and 7 (open run circuit) will result in a lockout. All other fault codes are passive. All compressor alerts are displayed on the module by flashing the yellow Alert LED a specific number of times consecutively followed by a pause, and then repeated. The number of consecutive flashes or “Flash Code” correlates to a specific abnormal condition. The red “TRIP” LED means there is a thermostat demand signal “Y” present but the compressor is not running. The green “POWER” LED means the module has power.

Green "POWER" LED - module has power
Red "TRIP" LED - Thermostat "Y" demand signal is present, but the compressor is not running.

Comfort Alert Flash Codes		
Yellow "ALERT" LED	**LED Description**	**Cause**
Flash Code 1	Long Run Time	Eighteen consecutive hours of compressor run time
Flash Code 2	System Pressure Trip	Not applicable
Flash Code 3	Short Cycling	Compressor run time of less than 3 minutes on 4 consecutive cycles
Flash Code 4	Locked Rotor	Four consecutive compressor protector trips indicating compressor won't start
Flash Code 5	Open Circuit	"Y" thermostat demand signal with no compressor current
Flash Code 6	Open Start Circuit	"Y" thermostat demand signal with no current in the start circuit
Flash Code 7	Open Run Circuit	"Y" thermostat demand signal with no current in the run circuit
Flash Code 8	Welded Contactor	Current detected with no "Y" thermostat demand signal present
Flash Code 9	Low Voltage	Less than 17 VAC detected in control circuit

* Flash code number corresponds to a number of LED flashes, followed by a pause and then repeated.

* TRIP and ALERT LEDs flashing at the same time indicates control circuit voltage is too low for operation.

* Reset ALERT flash code by removing 24 VAC power from module.

* Last ALERT flash code is displayed for 1 minute after module is powered on.

Resetting Comfort Alert Codes

Alert codes can be reset manually by cycling power off and on to the Comfort Alert module. Alert codes will reset automatically if conditions return to normal.

Flash Code Number	LED Description	Automatic Reset of Alert Codes
Flash Code 1	Long Run Time	Thirty "alert free" on and off cycles to reset automatically
Flash Code 2	System Pressure Trip	Not applicable
Flash Code 3	Short Cycling	Four "alert free" on and off cycles to reset automatically
Flash Code 4	Locked Rotor	Four "alert free" on and off cycles to reset automatically
Flash Code 5	Open Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 6	Open Start Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 7	Open Run Circuit	One "alert free" on and off cycles to reset automatically
Flash Code 8	Welded Contactor	One "alert free" on and off cycles to reset automatically
Flash Code 9	Low Voltage	Resets when voltage rises above 19 VAC

* Reset ALERT flash code by removing 24 VAC power from module.

Microprocessor Control cont.

Thermostat Displays

Fault Flash

When using a TA32W01 or TP32W02 thermostat and SW2-8 is in the pulsing “L” position, FaultFlash will enable a user to view the thermostat and count the fault indicator flashes to determine the lockout condition the unit is experiencing.

ComforTalk

When using a TP32U03, 04 or 05 thermostat and SW2-8 is in the pulsing “L” position, ComforTalk will enable the user to view the thermostat and determine the fault. The thermostat can be configured to show either lockout text or lockout codes.

The LED board on the front of the unit will display all lockouts. The Low Pressure LED will flash for a low pressure condition or a Comfort Alert fault. If the low pressure lockout was caused by Comfort Alert codes 4, 6 or 7, then the Comfort Alert will be flashing. If no Comfort Alert code is visible, then it is a low pressure lockout.

The following tables show the codes that will be displayed on the different ComforTalk and FaultFlash thermostats.

FaultFlash Thermostats

TA32W01 and TP32W02 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
10 Flashes	Comfort Alert Compressor Module Fault

Lockout code 10 - see Comfort Alert module to determine the specific flash code for compressor abnormalities.

ComforTalk Thermostats

TP32U03, TP32U04 and TP32U05 Thermostats	
Thermostat Display Lockout Code	Lockout Description
"High Pressure" or "E2"	High Pressure Fault
"Low Pressure" or "E3"	Low Pressure Fault
"E4"	Not Applicable
"Water Flow" or "E5"	Water Flow Fault
"E6"	Not Applicable
"Condensate" or "E7"	Condensate Fault
"Voltage Range" or "E8"	Voltage out of Range
"RPM" or "E9"	RPM Fault
"Comfort Alert" or "E10"	Comfort Alert Compressor Module Fault

These thermostats can be configured to display the lockout condition "text" or error number.

* A slow flash of 1 second on and off means the heat pump microprocessor SW2-1 is configured for "Test Mode" or thermostat is miswired.

Lockout code 10 - see Comfort Alert module to determine the specific flash code for compressor abnormalities.

Operation Logic Data

OPERATION LOGIC	HEATING				COOLING		SL1 - IN ON
	STG1	STG2	STG3	EMERG	STG1	STG2	
DUAL CAPACITY UNITS							
Compressor-Lo	On	Off	Off	Off	On	Off	-
Compressor-Hi	Off	On	On	Off	Off	On	-
Rev Valve	Off	Off	Off	Off	On	On	-
Loop Pumps	On	On	On	Off	On	On	On
Secondary 1- Out	On	On	On	Off	On	On	-
Secondary 2- Out	Off	On	On	Off	Off	On	-
Emerg LED	Off	Off	Off	On	Off	Off	-
T-Stat Signal	Y1	Y1, Y2	Y1, Y2, W	W	Y1, O	Y1, Y2, O	-

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 PRM 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.	Envision	E-Series or Premier

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 NAH Air Handler

The Envision Split is shipped with a facotry pre-charge. This volume of refrigerant is not sufficient to run the system and additional refrigerant must be added. If using an NAH 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 NAH Air Handler” column is the total amount of charge for the NAH 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: NDS036/NAH036 with 20 ft. of 3/8 in. liquid line. Remember that when using the NAH Air Handler, the column “Charge Amount with NAH Air Handler” will be used. Now calculate for the additional 20 ft. ineset.
Additional refrigerant to be added = (20 ft. x 0.5 oz.)
= 10 oz.

Solution: 10 oz. should be added to the recommended charge of 86 oz. found in the “Charge Amount with NAH Air Handler” column for a total charge of 96 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 Envision Split 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

Refrigeration cont.

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 NAH Air Handler (oz.)
		Suction	Liquid	Suction	Liquid	Suction	Liquid		
026	NAH026	5/8" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	52	74
038	NAH036	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	56	86
049	NAH048	3/4" OD	3/8" OD	7/8" OD	3/8" OD	7/8" OD	1/2" OD	90	115
064	NAH060	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	92	112
072	NAH060	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	104	132

NOTES: * The "Charge Amount with NAH Air Handler" column is based on the charge amount for an NAH Air Handler + Compressor Section Split.
Additional charge will have to be added accordingly for line set length.
After charge is added, adjustments can be made to get appropriate subcooling and superheat.
Additional charge for R-410A is 0.50 oz. per ft. for 3/8 in. and 1.0 oz. per ft. for 1/2 in. tube.

4/16/10

Pressure/Temperature Coversion 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

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow GPM/Ton	Cooling -- No Desuperheater					
		Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
50	1.5	125-140	205-225	9-15	3-10	17-21	17-23
	3.0	120-135	190-210	9-15	3-10	8-12	17-23
70	1.5	135-145	260-290	9-18	5-11	16-20	17-23
	3.0	126-143	230-250	9-18	5-11	9-13	17-23
90	1.5	138-150	315-345	8-14	7-14	14-20	17-23
	3.0	136-148	300-330	8-14	7-14	8-12	17-23

Entering Water Temp °F	Water Flow GPM/Ton	Heating -- No Desuperheater					
		Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	76-89	260-325	7-12	4-16	5-9	12-16
	3.0	80-93	265-330	7-12	4-16	3-7	14-18
50	1.5	105-120	295-355	7-14	4-16	7-11	18-22
	3.0	110-125	300-360	7-14	4-16	5-9	20-24
70	1.5	135-155	330-385	9-14	7-15	8-12	24-28
	3.0	140-160	335-390	9-14	7-15	6-10	22-30

Second Stage Operation

Entering Water Temp °F	Water Flow GPM/Ton	Cooling -- No Desuperheater					
		Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
50	1.5	120-135	215-235	10-16	3-11	17-21	17-23
	3.0	115-130	200-220	10-16	3-11	8-12	17-23
70	1.5	121-136	270-305	9-15	5-12	16-20	17-23
	3.0	118-133	255-285	9-15	5-12	9-13	17-23
90	1.5	126-143	325-360	8-14	7-15	14-20	17-23
	3.0	123-140	310-340	8-14	7-15	8-12	17-23

Entering Water Temp °F	Water Flow GPM/Ton	Heating -- No Desuperheater					
		Suction Pressure PSIG	Discharge Pressure PSIG	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	72-81	280-330	6-12	10-20	5-9	12-16
	3.0	76-85	285-335	6-12	10-20	3-7	14-18
50	1.5	100-115	305-370	6-12	6-18	7-11	18-22
	3.0	105-120	310-375	6-12	6-18	5-9	20-24
70	1.5	133-147	340-400	7-14	4-15	8-12	24-28
	3.0	138-152	345-405	7-14	4-15	6-10	22-30

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB.
Heating performance based on entering air temperature of 70º F DB.

Pressure Drop and Recommended Flow Rates

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

5/30/06

Unit Startup

Before Powering Unit, Check The Following:

- High voltage is correct and matches nameplate.
- 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.
- DIP switches are set correctly.
- 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.

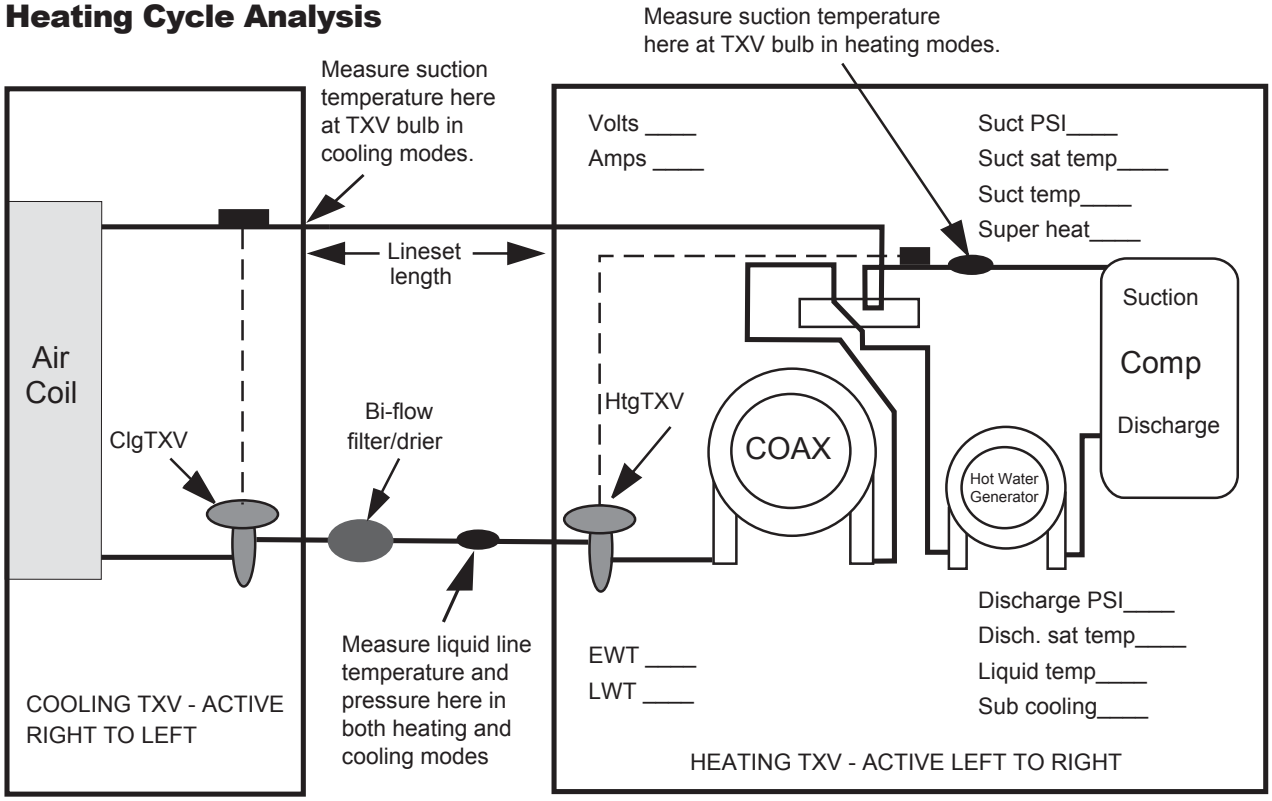
NOTES: Be certain to fill out and forward all warranty registration papers.

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.

Unit Startup and Troubleshooting

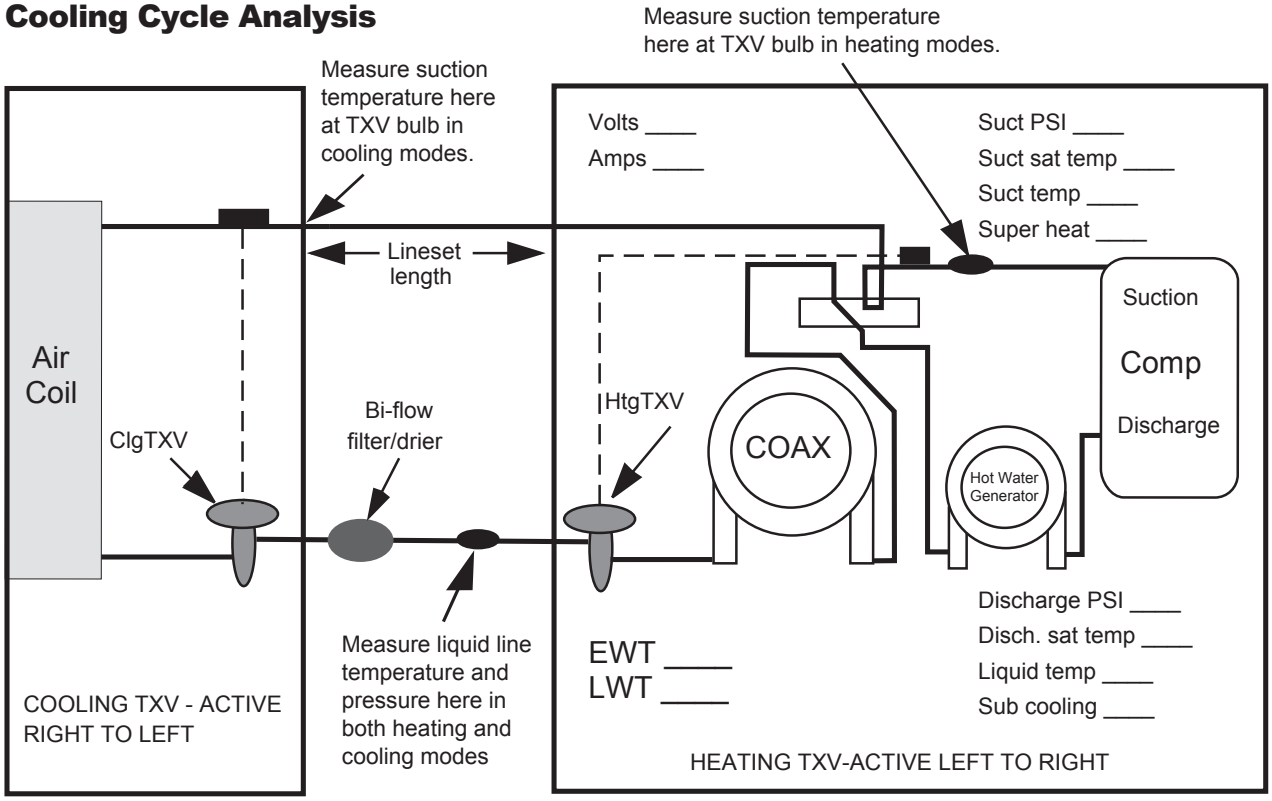
Heating Cycle Analysis



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:
    - Ensure that component being controlled is functioning (compressor, blower, reversing valve, etc.).
    - Ensure that wiring from control to the component is functioning (refer to the LED Definition table below and use the diagnostic outputs mode).
    - 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, Comfort Alert	Low Pressure <40/ Comfort Alert		Low Pressure <40/ Comfort Alert		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.

Other Maintenance

Filters

Filters must be clean to obtain maximum performance. They should be inspected monthly under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Condensate Drain

In areas where airborne bacteria produce a slime in the drain pan, it may be necessary to treat chemically to minimize the problem. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect twice a year to avoid the possibility of overflow.

Blower Motors

Blower motors on most air handlers are equipped with sealed ball bearings and require no periodic oiling.

Air Coil

The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum clean. Care must be taken not to damage the aluminum fins while cleaning.

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	34P585-01	34P573-01	34P574-01	34P575-01	34P586-01
	Run Capacitor	16P002D19	16P002D20	16P002D21	16P002D39	
	Sound Jacket	92P504A16				
	Power Harness	11P781-01				
	Solenoid Harness	11P782-01				
Refrigeration Components	Accumulator	36P509-02	36P509-01			
	Coax	62I504B01	62I542B01	62I543B01		
	TXV	33P609-01	33P609-03	33P609-05	33P609-06	
	Reversing Valve	33P506-04	33P503-05	33P526-04		
	Filter Dryer	36P500B01			36P500B02	
Hot Water Generator	Hot Water Generator	62P516-05		62P516-03		
	Hot Water Generator Pump	24P501-02				
Electrical	Comfort Alert	19P571-02				
	Contactor	13P004A03				
	Transformer	15P501B01				
	3 Pole Power Block	12P503-06				
	2 Pole Screw Term. Block	12P500A01				
	Status Light Board	17P503-02				
	Harness, Status Light Board	11P783-01				
	Premier Board	17P513-07				
Sensors & Safeties	Freeze Detection Thermistor	12P505B03				
	HWL Thermistor	12P505B02				
	High Pressure Switch	35P506B02				
	Low Pressure Switch	35P506B01				

Part numbers subject to change 6/8/10

Manufactured by
WaterFurnace International, Inc.
9000 Conservation Way
Fort Wayne, IN 46809
www.waterfurnace.com

Product:	**Envision NDS**
Type:	Geothermal/Water Source Outdoor Split Heat Pump
Size:	2-6 Tons Dual Capacity
Document:	Installation Manual

IM1004SN 06/10