OPERATION & MAINTENANCE

Affinity Indoor Split

R-454B \ 60HZ

OMW5-0021Y

PROUD MEMBER

Intertek

Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

ENERGY STAR PARTNER

⚠ WARNING

WARNING: Before performing service or maintenance operations on the system, turn off main power switches to the unit. Electrical shock could cause serious personal injury.

WARNING: All products are designed, tested, and manufactured to comply with the latest publicly released and available edition of UL 60335-2-40 for electrical safety certification. All field electrical connections must follow the National Electrical Code (NEC) guide standards and / or any local codes that may be applicable for the installation.

WARNING: Only factory authorized personnel are approved for startup, check test and commissioning of this unit.

INSTALLER: Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

For the User

⚠ WARNING

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

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

Keep this manual in a safe place in order to provide your service personnel with necessary information.

NOTICE

NOTICE: To avoid equipment damage, do not leave the system filled in a building without heat during cold weather, unless adequate freeze protection levels of antifreeze are used. Heat exchangers do not fully drain and will freeze unless protected, causing permanent damage.

Definition of Warnings and Symbols

⚠ DANGER	Indicates a situation that results in death or serious injury.
⚠ WARNING	Indicates a situation that could result in death or serious injury.
⚠ CAUTION	Indicates a situation that could result in minor or moderate injury.
NOTICE	Indicates a situation that could result in equipment or property damage.

Table of Contents

General Installation Information

NOTICE: Do not store or install units in corrosive environments or in locations subject to temperature or humidity extremes. Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life.

NOTICE: A minimum of 24 in. clearance should be allowed for access to front access panel.

NOTICE: To avoid equipment damage, DO NOT use these units as a source of heating or cooling during the construction process. The mechanical components and filters can quickly become clogged with construction dirt and debris, which may cause system damage and void product warranty.

For the Installer

If you are NOT sure how to install or operate the unit, contact your dealer.

Installing and servicing air conditioning and heating 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. 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.

This manual contains specific information about the required qualification of the working personnel for maintenance, service and repair operations. Every working procedure that affects safety means shall only be carried out by competent persons.

Examples for such working procedures are:

- breaking into the refrigerating circuit;
- opening of sealed components or ventilated enclosures.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available for all brazing operations. Follow all procedures to remain in compliance with national gas regulations.

Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized. Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapor being present while the work is being performed. All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

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

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

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

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

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

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

⚠ WARNING

If the appliance locks out on E5: FREEZE PROTECTION FP1. The appliance must set for 5 hours before being restarted.

Instructions for Equipment Using R-454B Refrigerant

⚠ WARNING

- **Do NOT pierce or burn**
- **Do NOT use means to accelerate the defrosting process or to clean the equipment, other than those recommended by the manufacturer**
- **Be aware that refrigerants may not contain an odor**

⚠ WARNING

- **the Appliance should be stored so as to prevent mechanical damage and in a well ventilated room without continuously operating ignition sources (example: open flames, an operating gas appliance or an operating electric heater) and the room size should be as specified (see “Determination of Minimum Floor Area.”)**

General Installation Information

⚠ WARNING

Ventilated Area: ensure that the area is in the open or that it is adequately ventilated before breaking into the system of conducting any hot work. A degree of ventilation should continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it. Keep ventilation area clear of obstructions!

⚠ WARNING

Do NOT use potential sources of ignition in searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

The following leak detection methods are deemed acceptable for all refrigerant systems. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need recalibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL. of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work. NOTE Examples of leak detection fluids are bubble method, fluorescent method agents If a leak is suspected, all naked flames shall be removed/extinguished. If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall follow the procedure outlined in this manual.

Installation Site

This equipment has been evaluated to be installed up to a maximum altitude of 3000m (9843ft) and should not be installed at an altitude greater than 3000m. For installation only in locations not accessible to the general public.

⚠ WARNING

For appliances using A2L refrigerants connected via an air duct system to one or more rooms, only auxiliary devices approved by the appliance manufacturer or declared suitable with the refrigerant shall be installed in connecting ductwork. The manufacturer shall list in the instructions all approved auxiliary devices by manufacturer and model number for use with the specific appliance, if those devices have a potential to become an ignition source.

Installation Space Requirements

NOTE: Equipment with refrigerant charge less than 63 oz does not have a minimum floor area requirement and does not require a refrigerant leak detection sensor.
The sensor might be added as a feature.

⚠ WARNING

Equipment containing R-454B refrigerant shall be installed, operated, and stored in a room with floor area larger than the area defined in the "Minimum Floor Area" chart based on the total refrigerant charge in the system. This requirement applies to indoor equipment with or without a factory refrigerant leakage sensor.

⚠ CAUTION

This equipment requires connections to a water supply. See the "Water Quality Guidelines" section of this manual for more information on the quality of water required for this operation. If a potable water source is used for this equipment's water supply, the source water supply shall be protected against back siphonage by the equipment.

⚠ WARNING

This equipment comes with a factory installed Refrigerant Detection Device which is capable of determining it's specified end-of-life and replacement instructions. Refrigerant sensors for refrigerant detection systems shall only be replaced with sensors specified by the appliance manufacture.

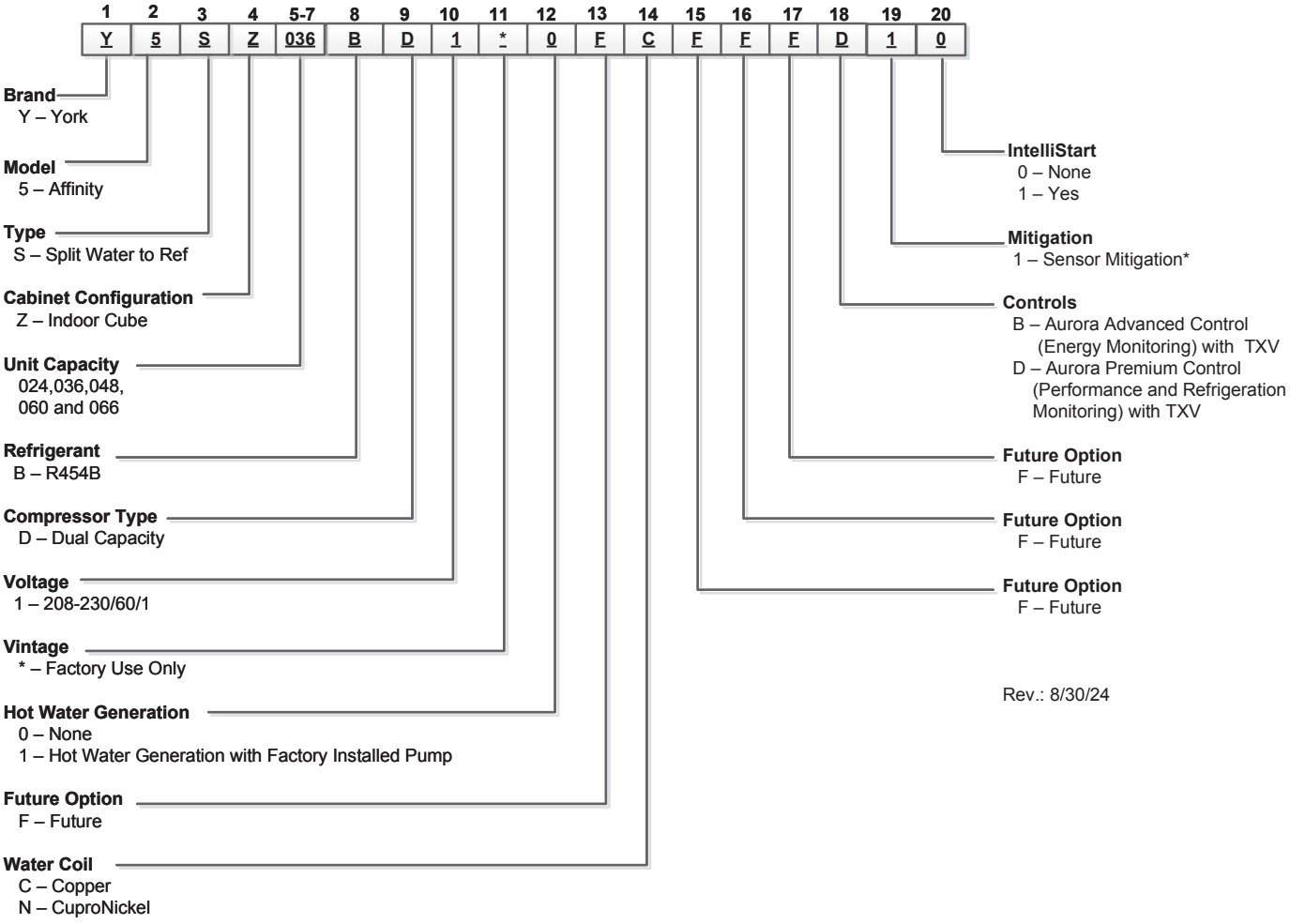
⚠ WARNING

Take sufficient precautions in case of refrigerant leakage. If refrigerant gas leaks, ventilate the area immediately.
POSSIBLE RISKS: Excessive refrigerant concentrations in a closed room can lead to oxygen deficiency

⚠ WARNING

ALWAYS recover the refrigerant. Do NOT release them directly into the environment. Follow handling instructions carefully in compliance with national regulations.

Nomenclature



* Unit equipped with single ASB board to support compressor section and air handler's refrigeration detection sensors

AHRI Data

The performance standard AHRI/ASHRAE/ISO 13256-1 became effective January 1, 2000 and replaces ARI Standards 320, 325, and 330. This new standard has three major categories: Water Loop (comparable to ARI 320), Ground Water (ARI 325), and Ground Loop (ARI 330). Although these standards are similar there are some differences:

Unit of Measure: The Cooling COP

The cooling efficiency is measured in EER (US version measured in Btu/h per Watt. The Metric version is measured in a cooling COP (Watt per Watt) similar to the traditional COP measurement.

Water Conditions Differences

Entering water temperatures have changed to reflect the centigrade temperature scale. For instance the water loop heating test is performed with 68°F (20°C) water rounded down from the old 70°F (21.1°C).

Air Conditions Differences

Entering air temperatures have also changed (rounded down) to reflect the centigrade temperature scale. For instance the cooling tests are performed with 80.6°F (27°C) dry bulb and 66.2°F (19°C) wet bulb entering air instead of the traditional 80°F (26.7°C) DB and 67°F (19.4°C) WB entering air temperatures. 80.6/66.2 data may be converted to 80/67 using the entering air correction table. This represents a significantly lower relative humidity than the old 80/67 of 50% and will result in lower latent capacities.

Pump Power Correction Calculation

Within each model, only one water flow rate is specified for all three groups and pumping Watts are calculated using the following formula. This additional power is added onto the existing power consumption.

- Pump power correction = (gpm x 0.0631) x (Press Drop x 2990) / 300
  Where 'gpm' is waterflow in gpm and 'Press Drop' is the pressure drop through the unit heat exchanger at rated water flow in feet of head.

Blower Power Correction Calculation

Blower power is corrected to zero external static pressure using the following equation. The nominal airflow is rated at a specific external static pressure. This effectively reduces the power consumption of the unit and increases cooling capacity but decreases heating capacity. These Watts are significant enough in most cases to increase EER and COPs fairly dramatically over ARI 320, 325, and 330 ratings.

- Blower Power Correction = (cfm x 0.472) x (esp x 249) / 300
  Where 'cfm' is airflow in cfm and 'esp' is the external static pressure at rated airflow in inches of water gauge.

ISO Capacity and Efficiency Calculations

The following equations illustrate cooling calculations:

- ISO Cooling Capacity = Cooling Capacity (Btu/h) + (Blower Power Correction (Watts) x 3.412)
- ISO EER Efficiency (W/W) = ISO Cooling Capacity (Btu/h) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

The following equations illustrate heating calculations:

- ISO Heating Capacity = Heating Capacity (Btu/h) - (Blower Power Correction (Watts) x 3.412)
- ISO COP Efficiency (W/W) = ISO Heating Capacity (Btu/h) x 3.412 / [Power Input (Watts) - Blower Power Correction (Watts) + Pump Power Correction (Watt)]

Comparison of Test Conditions

	ARI 320	ISO/AHRI 13256-1 WLHP	ARI 325	ISO/AHRI 13256-1 GWHP	ARI 330	ISO/AHRI 13256-1 GLHP
Cooling						
Entering Air - DB/WB °F	80/67	80.6/66.2	80/67	80.6/66.2	80/67	80.6/66.2
Entering Water - °F	85	86	50/70	59	77	77
Fluid Flow Rate	*	**	**	**	**	**
Heating						
Entering Air - DB/WB °F	70	68	70	68	70	68
Entering Water - °F	70	68	50/70	50	32	32
Fluid Flow Rate	*	**	**	**	**	**

Note *: Flow rate is set by 10°F rise in standard cooling test
Note **: Flow rate is specified by the manufacturer
Part load entering water conditions not shown.
WLHP = Water Loop Heat Pump; GWHP = Ground Water Heat Pump; GLHP = Ground Loop Heat Pump

Conversions:

Airflow (lps) = cfm x 0.472;
ESP (Pascals) = ESP (in wg) x 249;
WaterFlow (lps) = GPM x 0.0631;
Press Drop (Pascals) = Press Drop (ft hd) x 2990

AHRI Data cont.

Model	Capacity Modulation	Flow Rate		Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling EWT 59°F		Heating EWT 50°F		Cooling Brine Full Load 77°F Part Load 68°F		Heating Brine Full Load 32°F Part Load 41°F	
		gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
024	Full	8	850	25,800	23.8	22,700	4.6	23,800	18.4	18,800	3.9
	Part	7	750	19,100	30.0	16,400	5.0	18,800	25.2	15,100	4.3
036	Full	9	1200	38,100	25.2	35,000	5.0	37,000	19.8	28,400	4.2
	Part	8	800	29,100	33.8	25,200	5.1	28,000	27.8	22,600	4.5
048	Full	12	1500	50,900	24.3	47,300	4.8	47,100	18.2	37,900	4.2
	Part	11	1300	38,100	30.9	34,200	5.1	37,200	25.8	30,200	4.6
060	Full	16	1800	63,900	23.7	55,700	4.4	59,900	18.2	46,700	3.9
	Part	14	1500	48,900	30.5	38,100	4.7	46,300	25.4	34,500	4.2
066	Full	18	2000	70,100	22.1	66,100	4.2	63,700	16.9	53,900	3.7
	Part	16	1600	54,700	28.1	50,000	4.4	52,300	23.5	44,800	4.0

Notes: Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature.
Heating capacities based upon 68°F DB, 59°F WB entering air temperature.
All ratings based upon operation at the lower voltage of dual voltage rated models.
Refer to the air handler compatability table for matching air handler.

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Energy Star Compliance Table

Model	Tier 3	
	Ground Water	Ground Loop
024	Yes	Yes
036	Yes	Yes
048	Yes	Yes
060	Yes	Yes
066	No	Yes

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Energy Star Rating Criteria
In order for water-source heat pumps to be Energy Star rated they must meet or exceed the minimum efficiency requirements listed below.

Tier 3: 1/1/2012 – No Effective End Date Published

	EER	COP
Closed loop water-to-air	17.1	3.6
Open loop water-to-air	21.1	4.1
Closed loop water-to-water	16.1	3.1
Open loop water-to-water	20.1	3.5

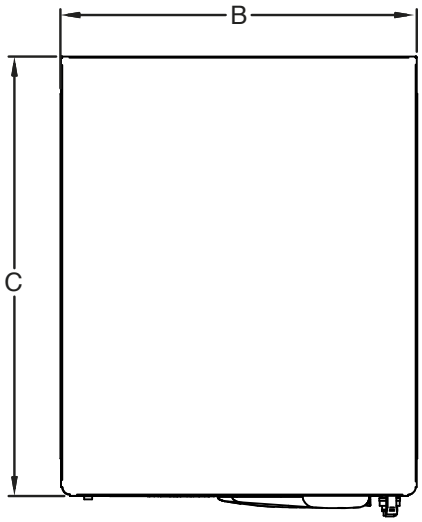
Physical Data

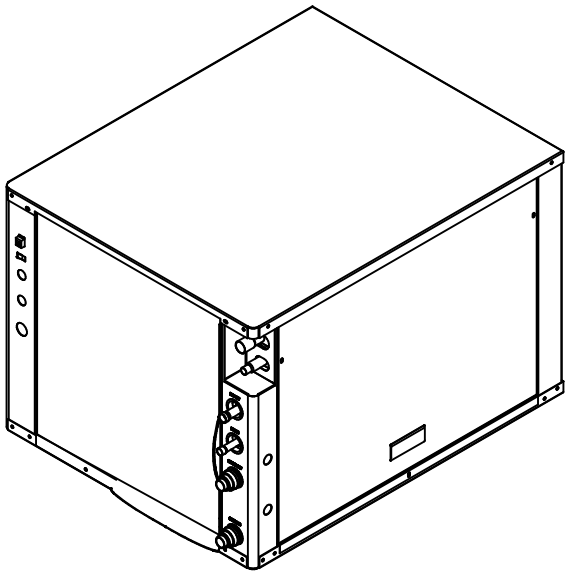
Model	024	036	048	060	066
Compressor (1 each)	**Dual Capacity Scroll**				
Factory Charge R-454B, oz [kg]	34 [0.96]	44 [1.25]	60 [1.70]	62 [1.76]	62 [1.76]
Coax and Water Piping					
Water Connections Size - Swivel- in [mm]	1 [25.4]				
HWG Connection Size - Stub - in [mm]	1/2" [12.7]				
Brass Service 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]

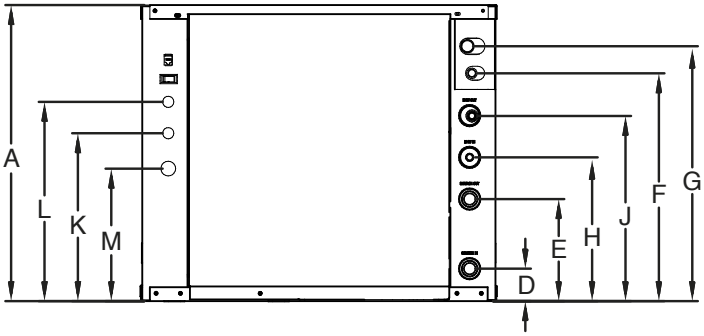
Notes: 9/23/24
All units have TXV expansion devices, and 1/2" [12.2mm] & 3/4" [19.1mm] electrical knockouts.
Brass service valves are sweat type valves.

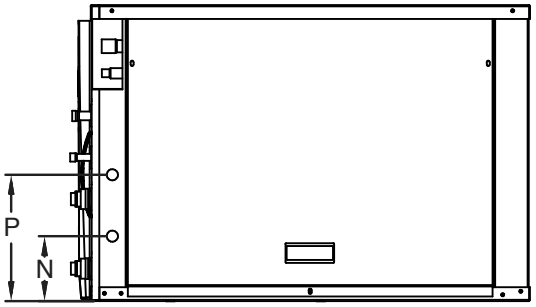
Dimensional Data

Cabinet Dimensions and Refrigerant Piping Connections









Models		Height	Width	Depth	Water In	Water Out	Service Valve		HWG In	HWG Out	Low Voltage	External Pump	Line Voltage	Knock Out	Knock Out
							Liquid	Gas							
		A	B	C	D	E	F	G	H	J	K	L	M	N	P
024	in.	19.30	22.50	26.50	1.93	6.93	15.20	16.80	9.40	11.90	12.10	14.30	9.50	4.60	8.20
	cm.	49.00	57.10	67.30	4.90	17.60	38.60	42.70	23.90	30.20	30.70	36.30	24.10	11.70	20.80
036-066	in.	21.25	25.62	31.60	2.30	7.21	16.40	18.30	10.30	13.30	12.10	14.30	9.50	4.70	9.10
	cm.	54.00	65.10	80.30	5.80	18.50	41.70	46.50	26.20	33.80	30.70	36.30	24.10	11.90	23.10

Dimensions are in inches.
Decorative molding and water connections extend 1.2 in. [30.5 mm] beyond the front of the cabinet.

Electrical Information

⚠ WARNING

During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

Sealed electrical components shall be replaced.

⚠ WARNING

Do not apply any permanent inductive or capacitance loads to the circuit with out ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components must be replaced.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

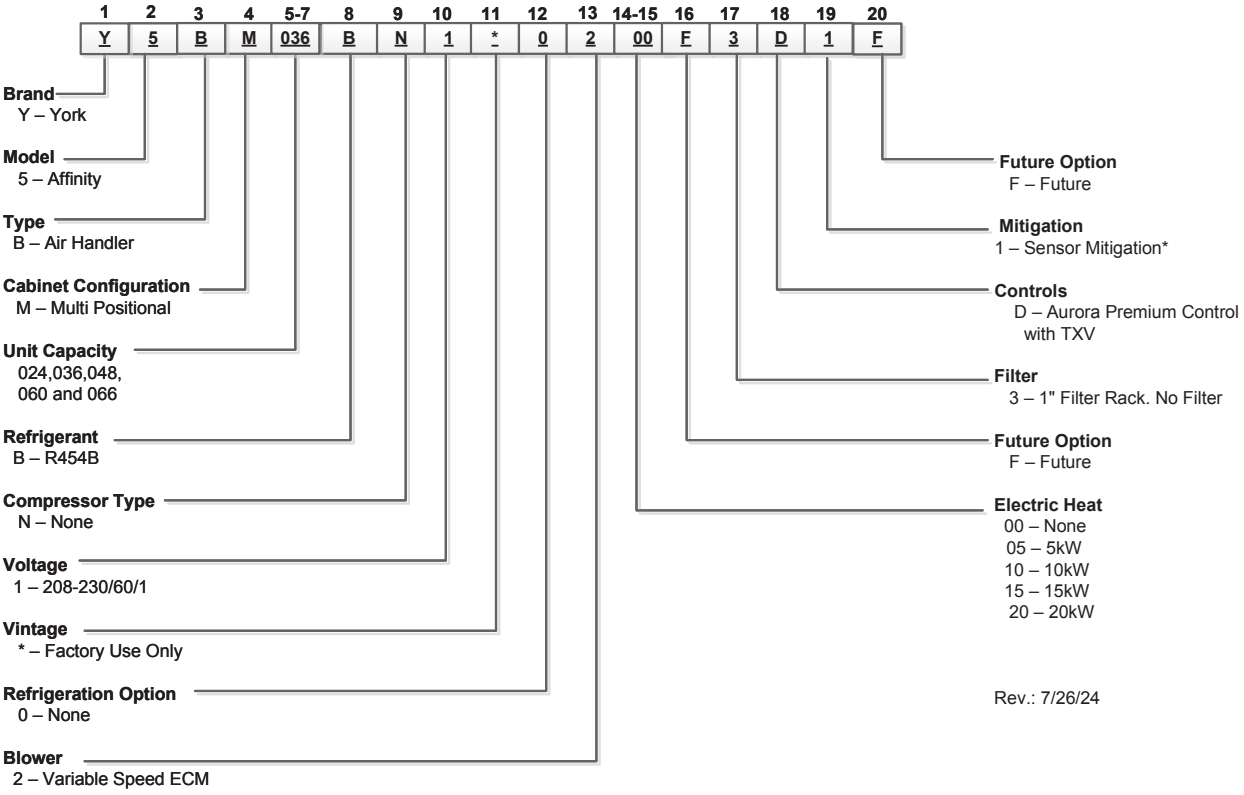
NOTE The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

Electrical Data

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA*					
024	208-230/60/1	187/253	16.0	10.2	62.0	21.7	0.4	5.4	16.0	18.6	30
036	208-230/60/1	187/253	22.7	14.5	90.0	32.4	0.4	5.4	20.3	24.0	40
048	208-230/60/1	187/253	28.6	18.3	138.0	49.7	0.4	5.4	24.1	28.7	50
060	208-230/60/1	187/253	39.3	25.2	147.3	51.5	0.4	5.4	31.0	37.2	70
066	208-230/60/1	187/253	43.7	28.0	160.0	56.0	0.4	5.4	33.8	40.8	70

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

Nomenclature - Air Handler



Rev.: 7/26/24

* Unit equipped with single refrigeration detection sensor only. ASB board is located in the compressor section.

Compatibility Table - Air Handler

Air Handler	Indoor Split Model	Outdoor Split Model	Rated Airflow (CFM)	Electric Heat (kW)
*5BM024	024	024	850	5
*5BM036	036	036	1200	5, 10
*5BM048	048	048	1500	10, 15
*5BM060	060	060	1800	10, 15, 20
*5BM066	066	066	2000	10, 15, 20

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Physical Data - Air Handler

Air Handler Model Number (Refrigerant)		024	036	048	060	066
Evaporator Coil	Air Coil Total Face Area, ft2 [m2]	3.89 [0.36]	4.86 [0.45]	5.83 [0.54]	6.81 [0.63]	6.81 [0.63]
	Tube outside diameter - in. [mm]	3/8 [9.52]	3/8 [9.52]	3/8 [9.52]	3/8 [9.52]	3/8 [9.52]
	Number of rows	3				
	Fins per inch	12				
	Suction line connection - in. [mm] sweat	5/8 [15.87]	3/4 [19.05]	3/4 [19.05]	7/8 [22.23]	
	Liquid line connection - in. [mm] sweat	3/8 [9.52]			1/2 [12.7]	
Refrigerant		R-454B				
Nominal cooling capacity - tons [kW]		2.1 [7.59]	3 [10.55]	4 [14.06]	5 [17.58]	5.5 [19.33]
Condensate drain connection - (FPT) in. [mm]		3/4 [19.05]				
Blower Wheel Size (Dia x W), in. [mm]		9 X 7 [229 x 178]	10 X 8 [254 x 203]	11 x 10 [279 x 254]		
Blower motor type/speeds		Variable Speed ECM				
Blower motor output - hp [W]		1/2 [373]		1 [746]		
Filter Standard - 1" [51mm] Field Supplied.		16 X 20 [406 X 508]	20 X 20 [508 x 508]	22 X 20 [559 x 508]		
Electrical characteristics (60hz)		208/230 - 1ph				
Shipping weight - lbs. [kg]		147 [66.7]	168 [76.2]	198 [89.6]	206 [93.4]	
Operating weight - lbs. [kg]		139 [63.0]	150 [68.0]	180 [81.6]	188 [85.3]	

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Line Set Sizes

Unit Size	Air Handler	20 feet		40 feet		60 feet		Factory Charge (oz.)	*Charge Amount with Air Handler (oz.)
		Suction	Liquid	Suction	Liquid	Suction	Liquid		
024	024	5/8" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	34	54
036	036	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	1/2" OD	44	68
048	048	3/4" OD	3/8" OD	7/8" OD	3/8" OD	7/8" OD	1/2" OD	60	82
060	060	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	62	91
066	066	7/8" OD	1/2" OD	7/8" OD	1/2" OD	1-1/8" OD	1/2" OD	62	107

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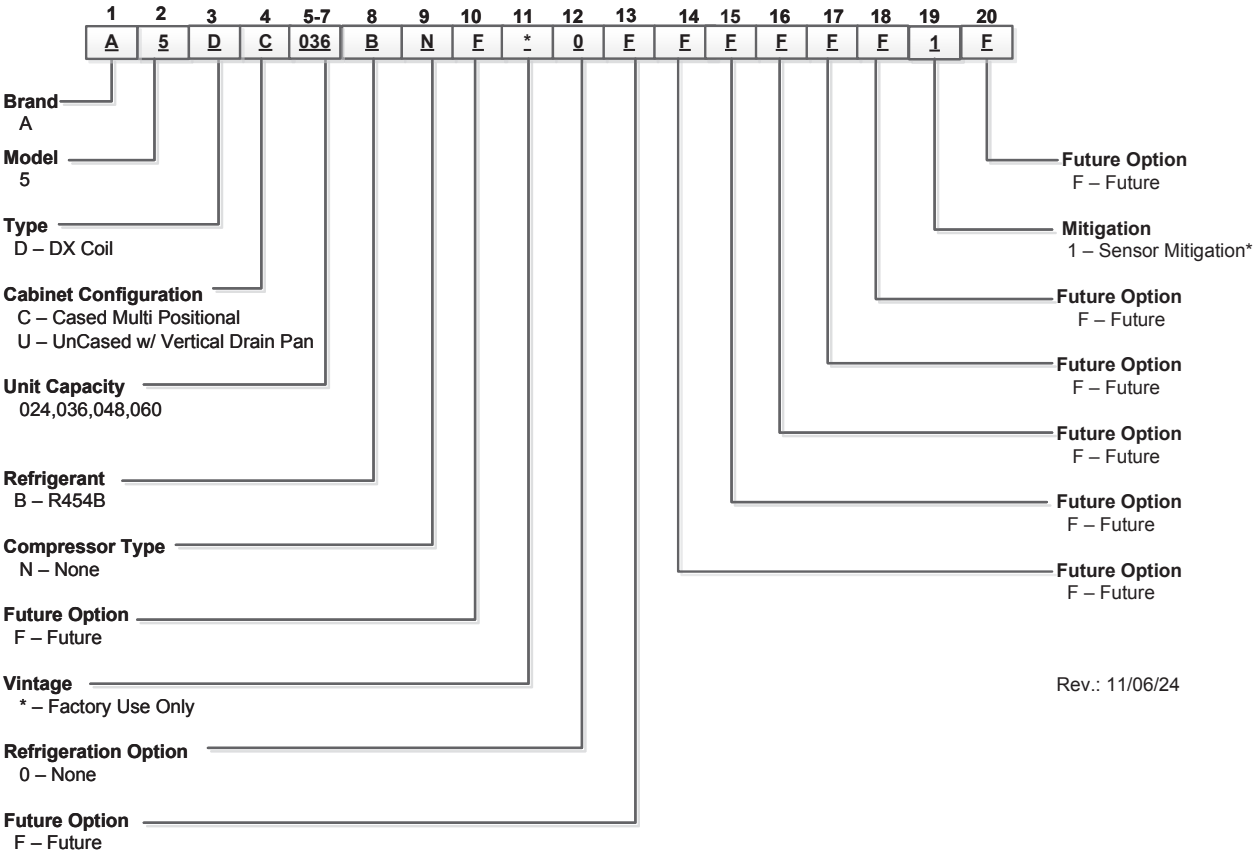
Notes: *The "Charge Amount with Air Handler" column is based on the charge amount for an Air Handler+Compressor Section/Split.
Additional charge will have to be added accordingly for lineset length.
After Charge is added adjustments can be made to get appropiate subcooling and superheat.
Additional charge for R-454B is 0.50 oz. per ft. for 3/8" and 1.0 oz. per ft. for 1/2" tube.

Electrical Data - Air Handler

Nomenclature - A5D



* Unit equipped with single refrigeration detection sensor only. ASB board is located in the compressor section.

Physical Data - A5D

Air Handler Model Number (Refrigerant)		024			036	048		060	
Evaporator Coil	Air Coil Total Face Area, ft2 [m2]	3.89 [0.36]			4.86 [0.45]	5.83 [0.54]		6.81 [0.63]	
	Tube outside diameter - in. [mm]	3/8 [9.52]							
	Number of rows	3							
	Fins per inch	12							
	Suction line connection - in. [mm] sweat	5/8 [15.87]			3/4 [19.05]			7/8 [22.23]	
	Liquid line connection - in. [mm] sweat	3/8 [9.52]						1/2 [12.7]	
Refrigerant		R-454B							
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]	5.5 [19.33]
Condensate drain connection - (FPT) in. [mm]		3/4 [19.05]							
Filter Standard - 1" [51mm] Field Supplied.		16 X 20 [406 X 508]			20 X 20 [508 x 508]	22 X 20 [559 x 508]			

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Refrigerant Coil Compatibility

Encased/ Uncased Coil	Indoor Split Model	Outdoor Split Model	Recommended Airflow (CFM)
A5D*024	024	024	850
A5D*036	036	036	1200
A5D*048	048	048	1500
A5D*060	060	060	1800
A5D*060	066	066	2000

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Antifreeze Corrections

Catalog performance can be corrected for antifreeze use. Please use the following table and note the example given.

Antifreeze Type	Antifreeze % by wt	Heating	Cooling	Pressure Drop
EWT - °F [°C]		**30 [-1.1]**	**90 [32.2]**	**30 [-1.1]**
Water	0	1.000	1.000	1.000
Ethylene Glycol	10	0.973	0.991	1.075
	20	0.943	0.979	1.163
	30	0.917	0.965	1.225
	40	0.890	0.955	1.324
	50	0.865	0.943	1.419
Propylene Glycol	10	0.958	0.981	1.130
	20	0.913	0.969	1.270
	30	0.854	0.950	1.433
	40	0.813	0.937	1.614
	50	0.770	0.922	1.816
Ethanol	10	0.927	0.991	1.242
	20	0.887	0.972	1.343
	30	0.856	0.947	1.383
	40	0.815	0.930	1.523
	50	0.779	0.911	1.639
Methanol	10	0.957	0.986	1.127
	20	0.924	0.970	1.197
	30	0.895	0.951	1.235
	40	0.863	0.936	1.323
	50	0.833	0.920	1.399

WARNING: Gray area represents antifreeze concentrations greater than 35% by weight and should be avoided due to the extreme performance penalty they represent.

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 5 Series NS*022.

The corrected cooling capacity at 90°F would be: 18,400 MBtu/h x 0.969 = 17,830 MBtu/h

The corrected heating capacity at 30°F would be: 14,900 MBtu/h x 0.913 = 13,604 MBtu/h

The corrected pressure drop at 30°F and 6 gpm would be: 7.1 feet of head x 1.270 = 9.01 feet of head

Correction Factor Tables

Air Flow Corrections (Dual Capacity Part Load)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.778	0.956	0.924	0.943	1.239	0.879
275	69	0.944	0.830	0.962	0.944	0.958	1.161	0.914
300	75	0.957	0.866	0.968	0.958	0.968	1.115	0.937
325	81	0.970	0.900	0.974	0.970	0.977	1.075	0.956
350	88	0.982	0.933	0.981	0.980	0.985	1.042	0.972
375	94	0.991	0.968	0.991	0.991	0.993	1.018	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.033	1.011	1.008	1.007	0.990	1.010
450	113	1.013	1.065	1.023	1.015	1.012	0.987	1.018
475	119	1.017	1.099	1.037	1.022	1.018	0.984	1.025
500	125	1.020	1.132	1.052	1.027	1.022	0.982	1.031
520	130	1.022	1.159	1.064	1.030	1.025	0.979	1.034

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Air Flow Corrections (Dual Capacity Full Load and Single Speed)

Airflow		Cooling				Heating		
cfm Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.922	0.786	0.910	0.920	0.943	1.150	0.893
275	69	0.944	0.827	0.924	0.940	0.958	1.105	0.922
300	75	0.959	0.860	0.937	0.955	0.968	1.078	0.942
325	81	0.971	0.894	0.950	0.967	0.977	1.053	0.959
350	88	0.982	0.929	0.964	0.978	0.985	1.031	0.973
375	94	0.992	0.965	0.982	0.990	0.993	1.014	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.034	1.020	1.010	1.007	0.990	1.011
450	113	1.012	1.065	1.042	1.018	1.013	0.983	1.020
475	119	1.017	1.093	1.066	1.026	1.018	0.980	1.028
500	125	1.019	1.117	1.092	1.033	1.023	0.978	1.034
520	130	1.020	1.132	1.113	1.038	1.026	0.975	1.038

1/5/17

Cooling Capacity Corrections

Entering Air WB °F	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB °F										Power Input	Heat of Rejection
		60	65	70	75	80	80.6	85	90	95	100		
55	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
60	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
63	0.945			0.768	0.960	1.150	1.175	*	*	*	*	0.996	0.954
65	0.976			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
66.2	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
67	**1.000**			0.616	0.806	**1.000**	1.023	1.193	1.330	1.480	*	**1.000**	**1.000**
70	1.053				0.693	0.879	0.900	1.075	1.205	1.404	*	1.003	1.044
75	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

NOTE: * Sensible capacity equals total capacity at conditions shown. 1/5/17

Heating Capacity Corrections

Ent Air DB °F	Heating Corrections		
	Htg Cap	Power	Heat of Ext
45	1.062	0.739	1.158
50	1.050	0.790	1.130
55	1.037	0.842	1.096
60	1.025	0.893	1.064
65	1.012	0.945	1.030
68	1.005	0.976	1.012
70	**1.000**	**1.000**	**1.000**
75	0.987	1.048	0.970
80	0.975	1.099	0.930

1/5/17

Heat of Extraction/Heat of Rejection - Dual Capacity

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
024	Part Load	3.0		12.3	16.3	19.4		23.3	22.2	20.8	
		5.0	9.5	12.9	17.0	20.7	19.2	23.6	22.3	21.2	19.4
		7.0	9.7	13.2	17.5	21.5	19.4	23.8	22.4	21.4	19.5
	Full Load	4.0		17.4	22.7	25.9		32.7	31.8	30.2	
		6.0	13.2	18.2	23.7	27.6	28.5	33.0	32.0	30.8	27.4
		8.0	13.5	18.7	24.4	28.6	28.7	33.3	32.2	31.0	27.5
036	Part Load	4.0		19.2	24.7	27.3		32.3	34.1	33.0	
		6.0	13.9	20.1	25.6	29.1	29.5	32.6	34.4	33.6	30.9
		8.0	14.3	20.6	26.5	30.1	29.7	32.8	34.6	33.8	31.0
	Full Load	5.0		25.8	33.2	33.8		41.3	44.2	43.5	
		7.0	20.3	27.0	33.0	36.1	38.0	41.7	44.4	44.3	43.2
		9.0	20.8	27.6	34.1	37.5	38.2	41.9	44.7	44.6	43.4
048	Part Load	5.0		25.5	30.8	38.9		42.7	42.6	41.7	
		8.0	17.3	26.6	33.1	41.2	37.4	43.1	43.2	41.8	40.3
		11.0	18.7	28.0	34.0	41.3	37.7	43.7	43.7	42..3	40.7
	Full Load	6.0		33.8	41.4	46.1		60.7	60.7	58.8	
		9.0	25.8	35.3	43.1	49.2	52.8	61.2	61.1	59.9	53.0
		12.0	26.4	36.2	44.5	51.0	53.2	61.6	61.2	60.2	55.2
060	Part Load	6.0		31.2	38.9	49.1		54.5	54.0	53.2	
		10.0	22.2	32.7	41.8	52.1	47.4	55.4	54.7	53.3	49.6
		14.0	24.0	34.4	42.9	52.2	47.8	56.2	54.8	54.0	50.1
	Full Load	8.0		42.4	54.3	62.5		74.1	75.1	74.3	
		12.0	33.3	44.3	56.3	66.6	63.1	74.8	75.4	74.4	71.5
		16.0	36.0	46.7	57.8	66.7	63.5	75.7	76.0	75.2	72.2
066	Part Load	10.0		36.9	48.7	55.2		58.1	61.7	59.4	
		13.0	25.2	38.6	50.1	58.7	57.5	62.7	62.2	59.5	62.8
		16.0	27.3	40.6	51.4	58.8	58.0	63.6	62.5	60.2	63.4
	Full Load	12.0		49.7	62.7	65.1		82.9	82.2	76.6	
		15.0	37.9	51.9	63.3	69.6	72.7	83.5	82.7	77.9	73.1
		18.0	38.8	53.2	64.8	72.2	73.2	84.0	82.8	78.2	75.7

Note: operation not recommended in shaded areas.

9/20/24

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. Failure to adhere to the guidelines in the water quality table could result in the loss of warranty.

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

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Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	105 - 120	140 - 155	20 - 35	9 - 17	17 - 21	17 - 23
	3.0	100 - 115	115 - 130	20 - 35	9 - 17	8 - 12	17 - 23
50	1.5	125 - 140	205 - 225	12 - 20	8 - 14	17 - 21	17 - 23
	3.0	115 - 135	170 - 200	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	135 - 145	280 - 290	10 - 16	8 - 14	16 - 20	17 - 23
	3.0	125 - 143	230 - 270	10 - 16	8 - 14	9 - 13	17 - 23
90	1.5	142 - 152	345 - 355	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	135 - 150	300 - 340	8 - 12	8 - 14	8 - 12	17 - 23
110	1.5	152 - 158	405 - 435	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	135 - 153	390 - 420	8 - 12	8 - 14	8 - 12	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	76 - 84	245 - 285	8 - 12	3 - 11	5 - 9	12 - 16
	3.0	75- 88	255 - 295	8 - 12	3 - 11	3 - 7	14 - 18
50	1.5	100 - 115	280 - 310	10 - 14	3 - 11	7 - 11	18 - 22
	3.0	105 - 120	295 - 325	10 - 14	3 - 11	5 - 9	20 - 24
70	1.5	135 - 150	310 - 325	12 - 16	3 - 11	8 - 12	24 - 28
	3.0	140 - 155	330 - 370	12 - 16	3 - 11	6 - 10	22 - 30
90	1.5	155 - 165	330 - 370	12 - 17	3 - 11	8 - 12	24 - 28
	3.0	165 - 175	380 - 410	12 - 17	3 - 11	6 - 10	22 - 30
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	115 - 125	150 - 170	20 - 35	10 - 17	17 - 22	17 - 23
	3.0	95 - 120	125 - 145	20 - 35	10 - 17	8 - 10	17 - 23
50	1.5	120 - 140	215 - 235	12 - 20	8 - 14	16 - 22	17 - 23
	3.0	110 - 138	170 - 210	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	138 - 148	280 - 310	10 - 16	10 - 16	15 - 21	17 - 23
	3.0	135 - 146	250 - 280	10 - 16	8 - 14	7 - 13	17 - 23
90	1.5	145 - 155	350 - 380	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	135 - 153	300 - 350	9 - 14	8 - 14	6 - 10	17 - 23
110	1.5	145 - 155	420 - 450	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	135 - 153	390 - 435	9 - 14	8 - 14	6 - 10	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	73 - 85	270 - 305	8 - 14	3 - 11	6 - 10	15 - 21
	3.0	77 - 90	280 - 315	8 - 14	3 - 11	4 - 8	17 - 23
50	1.5	97 - 110	290 - 325	10 - 16	3 - 11	9 - 13	22 - 28
	3.0	102 - 115	300 - 335	10 - 16	3 - 11	7 - 11	24 - 30
70	1.5	130 - 145	320 - 355	13 - 19	3 - 11	10 - 14	30 - 36
	3.0	135 - 150	325 - 360	13 - 19	3 - 11	8 - 12	32 - 38
90	1.5	150 - 160	340 - 390	13 - 21	3 - 11	10 - 14	30 - 36
	3.0	155 - 180	350 - 405	13 - 21	3 - 11	8 - 12	32 - 38
110	1.5						
	3.0						

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.

9/23/24

Pressure Drop

Dual Capacity

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
024 full load	4	1.2	1.2	1.1	1.0	1.0
	6	2.5	2.3	2.2	2.0	1.9
	8	4.8	4.6	4.3	4.0	3.7
	10	6.9	6.4	6.0	5.6	5.2
024 part load	3	0.7	0.6	0.6	0.6	0.5
	5	2.3	2.1	2.0	1.9	1.7
	7	3.9	3.6	3.4	3.2	2.9
	9	5.8	5.5	5.1	4.8	4.4
036 full load	5	1.1	1.1	1.0	0.9	0.9
	7	2.4	2.2	2.1	2.0	1.8
	9	3.6	3.4	3.2	3.0	2.8
	11	4.9	4.7	4.5	4.3	4.0
036 part load	4	0.8	0.7	0.7	0.7	0.6
	6	1.9	1.8	1.7	1.6	1.5
	8	3.0	2.8	2.6	2.4	2.2
	10	4.1	4.0	3.8	3.6	3.4
048 full load	6	1.0	1.0	0.9	0.8	0.8
	9	2.0	1.9	1.8	1.7	1.6
	12	3.1	2.9	2.7	2.5	2.3
	15	4.7	4.3	4.1	3.5	3.2
048 part load	5	0.6	0.5	0.4	0.3	0.3
	8	1.5	1.4	1.3	1.2	1.1
	11	2.6	2.5	2.3	2.1	2.0
	14	4.4	4.1	3.8	3.2	3.0
060 full load	8	1.4	1.3	1.2	1.1	1.0
	12	3.7	3.5	3.3	3.1	2.9
	16	6.1	5.8	5.4	5.0	4.7
	20	8.6	7.8	7.4	6.9	6.6
060 part load	6	0.8	0.7	0.5	0.5	0.4
	10	2.6	2.5	2.3	2.1	2.0
	14	4.8	4.5	4.2	3.9	3.6
	18	8.0	7.8	7.1	6.6	6.2
066 full load	12	2.6	2.5	2.3	2.1	2.1
	15	4.3	4.1	3.8	3.5	3.4
	18	6.0	5.7	5.3	4.9	4.8
	21	7.8	7.3	6.8	6.4	5.9
066 part load	10	1.6	1.5	1.4	1.3	1.2
	13	3.1	2.9	2.7	2.5	2.3
	16	4.5	4.3	4.0	3.7	3.5
	19	6.0	5.9	5.5	5.1	4.8

9/20/24

Compressor and Thermistor Resistance

Model	Compressor Model No.	208-230/60/1	
		Run	Start
024	YAS20K1E-PFV	0.99 - 1.14	1.54 - 1.77
036	YAS30K1E-PFV	0.67 -0.78	1.37 - 1.57
048	YAS40K1E-PFV	0.41 - 0.47	1.54 - 1.78
060	YAS51K1E-PFV	0.35 - 0.41	1.34 - 1.55
066	YAS60K1E-PFV	0.31 - 0.35	1.30 - 1.50

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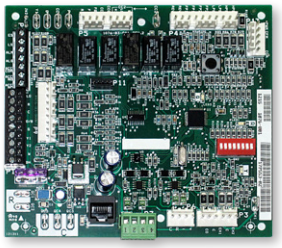
Thermistor Temperature (°F)	Microprocessor Resistance (Ohms)
5	75757-70117
14	57392-53234
23	43865-40771
32	33809-31487
41	26269-24513
50	20570-19230
59	16226-15196
68	12889-12093
77	10310-9688
86	8300-7812
95	6723-6337
104	5480-5172
113	4490-4246
122	3700-3504
131	3067-2907
140	2554-2424
149	2149-2019

Aurora Control System

Aurora 'Base' Control

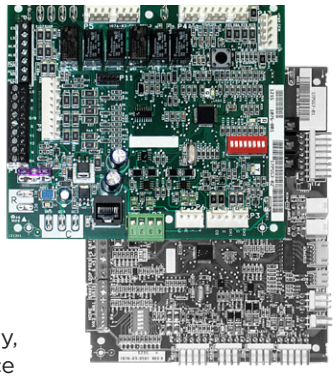


The Aurora 'Base' Control (ABC) System is a complete residential and commercial comfort system that brings all aspects of the HVAC system into one cohesive module network. The ABC features microprocessor control and HP, LP, condensate (with AHB in air handler) and freeze detection, over/under voltage faults, along with communicating thermostat capability for complete fault detection text at the thermostat.

Aurora uses the Modbus communication protocol to communicate between modules. Each module contains the logic to control all features that are connected to the module. The Aurora 'Base' Control (ABC) has two Modbus channels. The first channel is configured as a master for connecting to devices such as a communicating thermostat, expansion board, or other slave devices. The second channel is configured as a slave for connecting the Aurora Interface Diagnostics Tool (AID Tool).

NOTE: The software on the ABC and AXB control boards is unique to the operation of the Geo-Split. Refer to the AURORA Toolbox for the current software versions.

Aurora 'Advanced' Control



The Aurora 'Advanced' Control expands on the capability of the Aurora 'Base' Control (ABC) System by adding the Aurora Expansion Board (AXB). The additional features include compressor current monitoring, loop pump linking, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring factory installed add-on sensor kits. The AXB also features a second field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The Smart Grid input is AID configurable with many options to react to Utility controlled relay operation for ON Peak optimization. For IntelliZone2 compatibility the SAH Air Handler must have control option C (AHB Board) or the compressor section must have an AXB board. IntelliZone2 may be connected to P7 on either the AXB or AHB boards.

Aurora Control Features	Description	Aurora 'Base'	Aurora 'Advanced'
Microprocessor Compressor Control	Microprocessor control of compressor for timings with FP1, HP, LP, Condensate, assignable Acc relay	•	•
Advanced Microprocessor Features	Smart Grid, Home Automation Alarm Inputs, and Accessory2 Relay (HRV/ERV)	-	•
Base Hot Water Generator Operation	Compressor Contactor powers Hot Water Generator Pump with inline circuit breaker and thermostat limit.	•	See below
Advanced Hot Water Generator Control	Microprocessor and separate power relay for Hot Water Generator Pump with digital temperature monitoring and multiple HWG setpoint selection.	-	•
Base Loop Pump Control	Compressor Contactor powers Loop Pump with inline circuit breaker and no loop pump linking capability.	•	See below
Advanced Speed Pump Control	Microprocessor and separate power relay for loop pump and inline circuit breakers and loop pump linking.	-	•
Variable Speed Pump	Capable of setup, monitoring and controlling a variable speed flow center.	-	•
Compressor Monitoring	Control monitors compressor starts for high current, missing leg etc.	-	•
Smart Grid/Utility Input	Allows simple input to externally enable of occupied/ unoccupied mode for basic utility time of use programs.	-	Dry Contact x1
Home Automation Alarm Input	Allows simple input to signal sump, security, or smoke/CO sensor alarms from other home automation or security systems. The two inputs can be field configured to a number of options and logic.	-	Dry Contact x2
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	-	Optional AWL
IntelliZone2® Compatibility	IntelliZone2 communicates Modbus to the heat pump via the AXB or AHB boards.	With Optional AXB Kit and IntelliZone2	Optional IntelliZone2
IntelliZone2 • 24V Compatibility	Communicates to the heat pump via 24VAC (AXB and AHB not required)	•	-

Aurora Control System

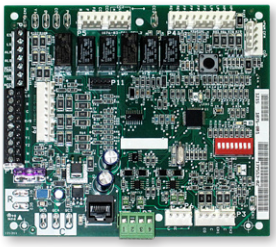
Service Device	Description	Aurora 'Advanced'
 **Aurora Interface and Diagnostics (AID) Tool**	Allows setup, monitoring and troubleshooting of any Aurora Control. **NOTE:** Although the ABC has basic compatibility with all Aurora, new product features may not be available on older AID Tools. To simplify the basic compatibility ensure the version of AID is at least the same or greater than the ABC software version.	For Service go to Aurora Toolbox for latest firmware version.

Add On Control Feature Kits (field or factory installed)	Description	Aurora 'Advanced'
Geo Energy Monitoring Kit	Monitors realtime power consumption of compressor, blower, aux heat and pump. Requires thermostat TPCM32UO3A*, TPCM32UO4A*, or TPCC32UO1*. AXB required. AHB required in air handler for blower and auxiliary heat power consumption monitoring.	Standard
Refrigeration Monitoring Kit	Monitors realtime pressures, temperatures, superheat, and subcooling. AXB required. AHB required in air handler for LAT (leaving air temperature).	Standard Premium Controls
Performance Monitoring Kit	Monitors air and water temperatures, and water flow rate and calculates heat of extraction/rejection. AXB required.	Standard Premium Controls
Data Logging (AWL) Kit	Allows data logging of up to 12 months. AXB required. Can also be temporarily installed.	Optional
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, HAN, and internet. AXB required.	Optional

Add On Thermostats and Zoning	Description	Aurora Advanced
 **TP32U03/04* MonoChrome Traditional Y1, Y2 Thermostat**	Elite Stat with full English fault codes and alerts, traditional Y1, Y2 thermostat. Not compatible with AWL.	Optional
 **TP32S01/02* Traditional Y1, Y2 Thermostat**	Traditional Y1, Y2 thermostat. Not compatible with AWL.	Optional
 **TPCM32U03A/04A* MonoChrome Communicating Thermostat**	Elite Stat with full English fault codes and alerts, communicating thermostat. Monochrome thermostat allows instantaneous energy measurement only. Compatible with AWL.	Optional
 **TPCC32U02 Color Touchscreen Communicating Thermostat**	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts. Color thermostat allows instantaneous, monthly, and yearly energy history.	Optional
 **TPCC32U03*WAT Color Touchscreen Communicating Thermostat**	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts. Color thermostat allows instantaneous energy measurement. Compatible with AWL.	Optional
IntelliZone2 • 24V Zoning Compatibility	IntelliZone2 • 24V is a non-communicating zoning system requiring Y1, Y2 signals that controls up to 4 zones (dual capacity) and 2 zones (single speed.) For systems without the optional AXB and AHB boards.	Optional (IntelliZone2 Preferred)
 **IntelliZone2® Zoning**	IntelliZone2® is a communicating zoning system that includes color main thermostat and up to 6 zones (with variable speed, 4 zones (with dual capacity), and 2 zones (with single speed). There are 4 thermostat options (MasterStat, TPCC32U01*, SensorStat, ZoneStat). Compatible with AWL. System must have either AXB or AHB board.	Optional (IntelliZone2 Preferred)

Aurora Control System

Aurora 'Base' Control



NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

Control Features

Software ABC Geo-Split Version 3.0

Single or Dual Capacity Compressors

Either single or dual capacity compressors can be operated.

Other Control Features

- Random start at power up
- Anti-short cycle protection
- High and low pressure cutouts
- Loss of charge
- Water coil freeze detection
- Over/under voltage protection
- Load shed
- Dehumidification (where applicable)
- Emergency shutdown
- Hot gas reheat operation (where applicable)
- Diagnostic LED
- Test mode push button switch
- Two auxiliary electric heat outputs
- Alarm output
- Accessory output with N.O. and N.C.
- Modbus communication (primary)
- Modbus communication (secondary)

Field Selectable Options via Hardware

DIP Switch (SW1) – Test/Configuration Button (See SW1 Operation Table)

Test Mode

The control is placed in the test mode by holding the push button switch SW1 for 2 - 5 seconds. In test mode most of the control timings will be shortened by a factor of sixteen (16). LED3 (green) will flash at 1 second on and 1 second off. Additionally, when entering test mode LED1 (red) will flash the last lockout one time. Test mode will automatically time out after 30 minutes. Test mode can be exited by pressing and holding the SW1 button for 2 to 5 seconds or by cycling the power. **NOTE:** Test mode will automatically be exited after 30 minutes.

Reset Configuration Mode

The control is placed in reset configuration mode by holding the push button switch SW1 for 50 to 60 seconds. This will reset all configuration settings and the EEPROM back to the factory default settings. LED3 (green) will turn off when entering reset configuration mode. Once LED3 (green) turns off, release SW1 and the control will reset.

DIP Switch (SW2)

SW2-1 FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.
SW2-2 FP2 Selection – On = 30°F; Off = N/A
SW2-3 RV – O/B - thermostat type. Heat pump thermostats with "O" output in cooling or "B" output in Heating can be selected. On = O; Off = B.
SW2-4 and 2-5 Access Relay Operation (P2)

Access Relay Operation	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

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Cycle with Blower - The accessory relay will cycle with the blower output.

Cycle with Compressor - The accessory relay will cycle with the compressor output.

Water Valve Slow Opening - The accessory relay will cycle and delay both the blower and compressor output for 90 seconds.

SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity
SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed
SW2-8 *Future Use*

Alarm Jumper Clip Selection

From the factory, ALM is connected to 24 VAC via JW2. By cutting JW2, ALM becomes a dry contact connected to ALG.

Safety Features

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Fuse – a 3 amp automotive type plug-in fuse provides protection against short circuit or overload conditions.

Anti-Short Cycle Protection – 4 minute anti-short cycle protection for the compressor.

Random Start – 5 to 80 second random start upon power up.

Fault Retry – in the fault condition, the control will stage off the outputs and then "try again" to satisfy the thermostat Y input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat Y input call, then the control will go to Lockout mode.

Lockout – when locked out, the blower will operate continuously in "G" speed, and PSC blower motor output will remain on. The Alarm output (ALM) and Lockout output (L) will be turned on. The fault type identification display LED1 (Red) shall flash the fault code. To reset lockout conditions with SW2-8 On, thermostat inputs "Y1", "Y2", and "W" must be removed for at least 3 seconds. To reset lockout conditions with SW2-8 Off, thermostat inputs "Y1", "Y2", "W", and "DH" must be removed for at least 3 seconds. Lockout may also be reset by turning power off for at least 30 seconds or by enabling the emergency shutdown input for at least 3 seconds.

Lockout With Emergency Heat - if the control is locked out in the heating mode, and a Y2 or W input is received, the control will operate in the emergency heat mode while the compressor is locked out. The first emergency heat output will be energized 10 seconds after the W input is received, and the blower will shift to high speed. If the control remains locked out, and the W input is present, additional stage of emergency heat will stage on after 2 minutes. When the W input is removed, all of the emergency heat outputs will turn off, and the ECM blower will shift to "G" speed and PSC blower motor output will remain on.

High Pressure – fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hard-wired limit switch if an overpressure condition should occur.

Low Pressure - fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

Loss of Charge – fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

Freeze Detection (Coax) - set points shall be either 30°F or 15°F. When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault. This fault will be ignored for the initial 2 minutes of the compressor run time.

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Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

Operation Description

Power Up - The unit will not operate until all the inputs and safety controls are checked for normal conditions. The unit has a 5 to 80 second random start delay at power up. Then the compressor has a 4 minute anti-short cycle delay after the random start delay.

Standby In standby mode, Y1, Y2, W, DH, and G are not active. Input O may be active. The blower and compressor will be off.

Heating Operation

Heating, 1st Stage (Y1) -
(Single/Dual Capacity Compressor and Variable Speed ECM) The blower is started on “G” speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

Heating, 1st Stage (Y1) -
(Single/Dual Capacity Compressor and 5 Speed ECM) The blower is started on “Y1” speed immediately and the compressor is energized 10 seconds after the Y1 input is received.

Heating, 2nd Stage (Y1, Y2)
(Single/Dual Capacity Compressor and Variable Speed ECM) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

Heating, 2nd Stage (Y1, Y2)
(Single/Dual Capacity Compressor and 5 Speed ECM) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The 5 speed ECM blower will shift to Y2 speed immediately.

Heating, 3rd Stage (Y1, Y2, W)
(Single/Dual Capacity Compressor and Variable Speed ECM) - The hot water pump is de-energized and the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage of electric heat will be energized after 5 minutes.

Heating, 3rd Stage (Y1, Y2, W)
(Single/Dual Capacity Compressor and 5 Speed ECM) - The first stage of electric heat is energized 10 seconds after the W command is received. Blower will increase to "W' speed immediately. If the demand continues the second stage of electric heat will be energized after 5 minutes.

Emergency Heat (W) - The blower will be started on “G” speed, 10 seconds later the first stage of electric heat will be turned on. 5 seconds after the first stage of electric heat is energized the blower will shift to Aux speed. If the emergency heat demand is not satisfied after 2 minutes the second electric heat stage will be energized.

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.

Cooling, 1st Stage (Y1, O)
(Single/Dual Capacity Compressor and Variable Speed ECM) - The blower is started on “G” speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

Cooling, 1st Stage (Y1, O)
(Single/Dual Capacity Compressor and 5 Speed ECM) - The blower is started on “Y1” speed immediately and the compressor is energized 10 seconds after the Y1 input is received.

Cooling, 2nd Stage (Y1, Y2, O)
(Single/Dual Capacity Compressor and Variable Speed ECM) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

Cooling, 2nd Stage (Y1, Y2, O)
(Single/Dual Capacity Compressor and 5 Speed ECM) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The 5 speed ECM blower will shift to Y2 speed immediately.

Emergency Shutdown - Four (4) seconds after a valid ES input, P2-7 is present, all control outputs will be turned off and remain off until the emergency shutdown input is no longer present. The first time that the compressor is started after the control exits the emergency shutdown mode, there will be an anti-short cycle delay followed by a random start delay. Input must be tied to common to activate.

Load Shed - The LS input disables all outputs with the exception of the blower output. When the LS input has been cleared, the anti-short cycle timer and random start timer will be initiated. Input must be tied to common to activate.

Aurora Control System

Aurora 'Base' Control LED Displays

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool.

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
(Future Use)	Flash Code 3
(Future Use)	Flash Code 4
Load Shed	Flash Code 5
ESD	Flash Code 6
(Future Use)	Flash Code 7

Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	Flashing ECM Setting
DIP Switch was Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash

Fault LED (LED1, Red)

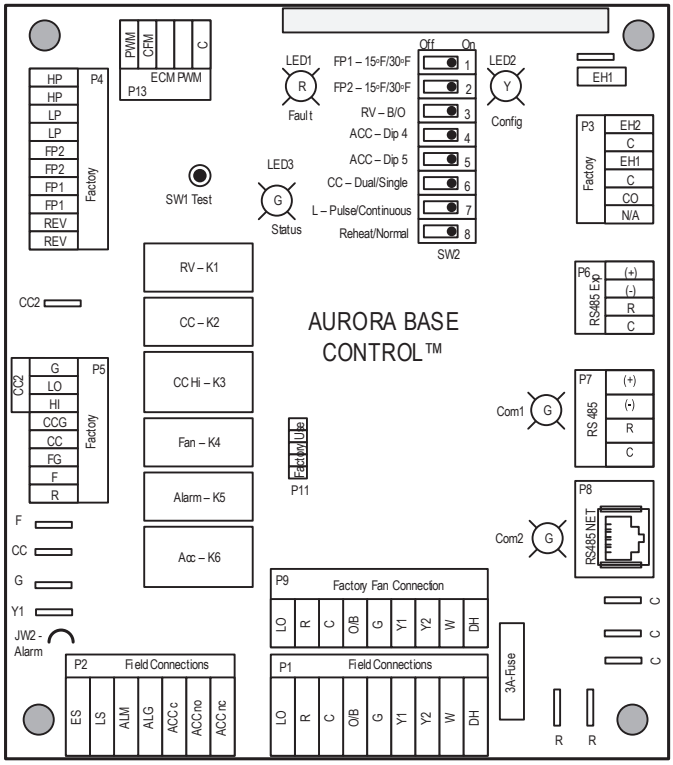
	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove
ABC Basic Faults	Normal - No Faults	OFF	–	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 Sensor Error	11	Yes	Hard or Soft
	Fault - CritComErr	19	NO	Auto

NOTE: All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

Aurora Interface and Diagnostics (AID) Tool

The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics, fault management, variable speed ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is recommended, although not required, for ECM airflow settings. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

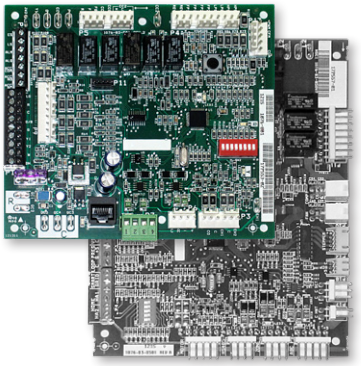
ABC Control Board Layout



Aurora Control System

Aurora 'Advanced' Control Features

The Aurora 'Advanced' Control system expands on the capability of the Aurora 'Base' Control (ABC) by adding the Aurora Expansion Board (AXB).



All of the preceding features of the Aurora 'Base' Control are included. The following control description is of the additional features and capability of the Aurora advanced control.

It is highly recommended the installing/servicing contractor obtain an Aurora Interface and Diagnostic Tool (AID) and specialized training before attempting to install or service an Aurora 'Advanced' control system.

The additional AXB features include the following:

AXB DIP Switch

DIP 1 - ID: This is the AXB ModBus ID and should always read On.

DIP 2 & 3 - Future Use

DIP 4 & 5 - Accessory Relay2: A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2 , blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with Fan or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-6
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

Advanced Hot Water Generator Control (Domestic Hot Water Option)

In lieu of the 'Base Hot Water Generator Control', the Advanced features an AID Tool selectable temperature limit and microprocessor control of the process. This will maximize hot water generation and prevent undesirable energy use. An alert will occur when the hot water input temperature is at or above setpoint (100°F - 140°F) for 30 continuous seconds (130°F is the default setting). This alert will appear as an E15 on the AID Tool and the hot water pump de-energizes. Hot water pump operations resume on the next compressor cycle or after 15 minutes of continuous compressor operation during the current thermostat demand cycle. Since compressor hot gas temperature is dependent on loop temperature in cooling mode, loop temperatures may be too low to allow proper heating of water. The control will monitor water and refrigerant temperatures to determine if conditions are satisfactory for heating water. LED1 (red LED) will flash code 15 when the DHW limit is reached and when conditions are not favorable for water heating. Error code 15 will also be displayed on the AID Tool in the fault screen. This flash code is a noncritical alert and does not necessarily indicate a problem.

Compressor Monitoring

The AXB includes two current transducers to monitor the compressor current and starting characteristics. Open circuits or welded contactor faults will be detected. A fault will produce an E10 code.

IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is necessary. With the split systems using the Aurora controls this can be accomplished by connecting the IZ2 to P7 on the compressor section AXB or P7 on the Air Handler AHB. These ports are dedicated for communicating proprietary ModBus protocol and only one of these boards is necessary for compatibility with the IZ2.

AWL – Aurora Weblink (optional accessory)

AWL is an add-on WiFi router that connects to the ABC and offers many features:

- Remote access to thermostat settings, schedules, etc. with your smartphone, tablet or laptop
- Receive Lockout/Fault info via text or e-mail
- View heat pump energy usage from the Internet for the day, week, month, year or real-time
- Internet AID Tool capability allows remote troubleshooting for the technician
- Remote AID Tool capability at the heat pump with smartphone, tablet or laptop for the technician
- Allows data acquisition of the heat pump through the Internet, see graphs of performance and chart historical data for the technician
- Stores historical data on SD card

Variable Speed Pump

This input and output are provided to drive and monitor a variable speed pump. The VS pump output is a PWM signal to drive the variable speed pump. The minimum and maximum level are set using the AID Tool. 75% and 100% are the default settings respectively. The VS data input allows a separate PWM signal to return from the pump giving fault and performance information. Fault received from the variable speed pump will be displayed as E16.

Aurora Control System

Modulating Water Valve

This output is provided to drive a modulating water valve (only compatible with our 4MWVK or WWKVS) Through advanced design the 0-10VDC valve can be driven directly from the VS pump output. The minimum and maximum level are set in the same way as the VS pump using the AID Tool. 75% and 100% are the default settings respectively.

Loop Pump Linking

This input and output are provided so that two units can be linked together with a common flow center. When either unit has a call for loop pump, both unit's loop pump relays and variable speed pumps are energized. The flow center then can simply be wired to either unit. The output from one unit should be routed to the input of the other. If daisy chained up to 16 heat pumps can be wired and linked together in this fashion.

Advanced Communication Ports

Communication ports P6 and P8 will provide future expansion via dedicated protocols. These are for future use.

Smart Grid-On Peak (SG) Input

The 'On Peak' input was designed to allow utilities to utilize simple radio controlled switches to control the On Electric Peak behavior of the Geothermal Heat Pumps. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by one of the below selections. The AID Tool will allow configuration of this input for the action of:

- No Action
- Disable compressor operation until removed
- Go to On Peak thermostat settings until removed [Requires Com T-Stat] (Future Release)
- Compressor limited to 50% or low cap until removed [dual capacity or variable speed only] (Future Release)
- Disable compressor operation for 1/2 hr (can be removed immediately) (Future Release)

Then Flash Code 7 on the Green LED for the 'On Peak' mode. And On Peak will display on communicating thermostats.

Home Automation 1 and 2 Inputs

The Home automation inputs are simple closed contact inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs two different sensors can be selected. The selected text will then be displayed on the AID Tool and communicating thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only.

Home Automation 1 - E23 HA1

With a closed dry contact signal, this input will cause an alarm and Alert Code 23 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] - Output from home automation system
- Security Alarm [no lockout info only] - Output from home security
- Sump Alarm Fault [no lockout info only] - Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] - Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] - Output from dirty filter sensor

Home Automation 2 – E24 HA2

With a closed dry contact signal, this input will cause an alarm and Alert Code 24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- No Action
- Home Automation Fault [no lockout info only] - Output from home automation system
- Security Alarm [no lockout info only] - Output from home security
- Sump Alarm Fault [no lockout info only] - Switch output from sump sensor
- Smoke/CO Alarm Fault [no lockout info only] - Switch output from Smoke/CO sensor
- Dirty Filter Alarm [no lockout info only] - Output from dirty filter sensor

Monitoring Sensor Kits

Energy Monitoring (Standard Sensor Kit)

The Energy Monitoring Kit uses the existing two compressor sensors so that the power usage of the heat pump can be measured. Control option 'C' in the SAH Series Air handier has the necessary sensors for measuring power consumption of the blower motor and auxiliary heat. So for viewing total power usage the compressor section will need control options B, C, or D and the SAH Series Air Handler will need to be ordered with control option C. The AID Tool provides configuration detail for the power adjustment and a line voltage calibration procedure to improve the accuracy, and a power adjustment setting that allows the compressor power to be adjusted to match the unit's line voltage using the provided tables. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U03A*/04A* will display instantaneous energy use while the color touchscreen TPCC32U01* will in addition display a 13 month history in graph form. Refer to Unit Start Up Energy Monitoring for configuration details.

Aurora Control System

Dual Capacity Power Adjustment

Model	Unit Capacity	Voltage		
		208	230	250
024	Full Load	0.99	0.99	0.96
024	Part Load	0.99	0.99	0.93
036	Full Load	0.99	0.97	0.91
036	Part Load	0.99	0.94	0.83
048	Full Load	0.94	0.91	0.85
048	Part Load	0.91	0.84	0.75
060	Full Load	0.95	0.91	0.79
060	Part Load	0.92	0.83	0.71
066	Full Load	0.94	0.86	0.73
066	Part Load	0.92	0.81	0.65

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Refrigerant Monitoring (Standard Premium Controls)

The optional Refrigerant Monitoring Kit includes two pressure transducers, and two temperature sensors, heating liquid line, suction temperature and existing cooling liquid line (FP1). These sensors allow the measurement of discharge and suction pressures, suction and liquid line temperatures as well as superheat and subcooling. This information will only be displayed on the AID Tool.

Performance Monitoring (Standard Premium Controls)

The optional Performance Monitoring Kit includes two temperature sensors, entering and leaving water and a water flow rate sensor. With this kit heat of extraction and rejection will be calculated. This requires configuration using the AID Tool for selection of water or antifreeze. The SAH Air Handler when ordered with control option C will include the LAT (leaving air temperature) sensor.

Special Modes and Applications

Communicating Digital Thermostats

The Aurora controls system also features either mono-chromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English. Many of the features discussed here may not be applicable without these thermostats.

Aurora 'Advanced' Control LED Displays

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool.

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
Load Shed	Flash Code 5
Emergency Shutdown	Flash Code 6
On Peak Mode	Flash Code 7
(Future Use)	Flash Code 8
(Future Use)	Flach Code 9

Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	ECM Setting
DIP Switch Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash
Reset Configuration Mode	OFF

	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove	Fault Condition Summary
ABC & AXB Basic Faults	Normal - No Faults	Off			
	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.
	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi)
	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi for 30 continous sec.)
	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Loss of Charge	6	Yes	Hard or Soft	Low Pressure Switch open prior to compressor start (UPC Only)
	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.
	Fault-Over/Under Voltage	8	No**	Auto	Instantaneous Voltage is out of range. **Controls shut down until resolved.
	Fault-Compressor Monitor	10	Yes	Hard or Soft	Open Crkt, Run, Start or welded cont
	Fault-FP1 & 2 Snsr Error	11	Yes	Hard or Soft	If FP1 or 2 Sensor Err
	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Err
	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Err for EEV or HW
	Alarm-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.
	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.
	Non-CritComErr	18	No	Auto	Any non-critical com error
	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal
	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes
	Alarm - Home Automation 1	23	No	Auto	Closed contact input is present on Dig 2 input - Text is configurable
	Alarm - Home Automation 2	24	No	Auto	Closed contact input is present on Dig 3 input - Text is configurable
	Fault - AXB EEV Error	25	Yes	Auto	AXB EEV Error
ASB	ASB High Gas Concentration	81	Yes	Auto	High refrigerant gas concentration detected by ASB and gas sensor.
	ASB Sensor Problem	82	Yes	Auto	Gas sensor has issued a fault, lost communication, internal error
	Invalid System Config	97	Yes	Auto	ABC has not been configured for Refrigerant type, disch pr sensor type, or suct press sens.

Note: *All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. will be skipped!
Alert' is a noncritical sensor or function that has failed. Normal operation of the heat pump is maintained but service is desired at some point.

Aurora Control System

Aurora now expands the Fault/Alarms in to several groups. Faults are system critical faults to the heat pump and will cause a Lockout. Some are retried 3 times before locking out while others lockout out immediately. Consult the Fault Retries table before lockout for details. Alarms are designed solely to alert the customer and the dealer to alarms designed as an input only to the Aurora system. These alarms are not system critical. Errors are sensor/hardware errors that although may not be system critical, may need serviced for optimal features.
SafeMode - the system is still operational during safemode.

Summary Table of Faults, Alarm, and Errors

All lockouts and alarms are shown in the Status LED (LED1, Red) table with the associated codes visible on the thermostat, ABC Fault LED, and in text in the AID Tool.

Aurora Fault Codes (ABC-Red LED)

These fault codes generally will affect the operation of the heat pump and will cause a lockout.

E1, Fault Input - A Y1/Y2 style thermostat is providing a non-normal sequence of signals possibly caused by a bad thermostat wire or connection.

E2, High Pressure - Fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hardwired limit switch if an overpressure condition should occur.

E3, Low Pressure - Fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

E3, Loss of Charge - Fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

E4, Freeze Detection-Air Coil - Air Coil Freeze Detection will use the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

E5, Freeze Detection-Coax - Set points shall be either 30°F or 15°F. When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault. This fault will be ignored for the initial 2 minutes of the compressor run time.

E7, Condensate Overflow - Fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

E8, Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

E10, Compressor Monitoring - Fault is recognized when the compressor has an open circuit, potential welded contactor.

E11, FP1 Sensor Error - Fault is recognized when the impedance between this line and 24 VAC common or chassis.

E14, Critical AXB Sensor Error - Fault is recognized when a sensor faults that is critical to heat pump operation. These sensors would include the HW Temperature limit sensor.

E15, Alarm Hot Water - Fault is recognized when the hot water temperature sensor is either over the configured limit or the Aurora has determined the current conditions should disengage the hot water generation capability.

E16, Variable Speed Pump - Fault is recognized when the variable speed pump returns a fault code from its PWM feedback signal.

E19, Critical Communication Error - A critical communication error has occurred with a board that previously had been configured but now is not available for communication.
Since this is critical to unit operation, the heat pump will be locked out with this fault displayed on the ABC board and the thermostat. The AID Tool should be used to view the configuration window and ascertain the status of all
appropriate board communication. The fault displayed will be removed when the problem has been resolved or the unit is soft or hard reset.

E52, Suction Pressure Invalid - The reading of the suction pressure transmitter is not within the specified sensor range of 0 to 16bar (0 to 232psi). Possible causes are faulty wiring or a defective transmitter.

E81, ASB Leak Detected - The gas sensor has detected a leak. The ABS will communicate the leak to the ABC control board. Compressor and auxiliary heat will be deactivated, and blower will come on.

Aurora Control System

E82, ASB Sensor Problem - The gas sensor has lost communication with the ASB board or has an internal error.

E97, Invalid System Configuration - ABC has not been configured for sensor or refrigeration type.

Aurora Error Codes

NOTE: The system is operating normally, but a sensor or communication issue is preventing full features of the system. Since these can be deemed non-critical to system operation, such as internet access boards etc., they may simply cause errors/alerts that signal the user to the situation but may not effect normal operation.

E13, Non Critical AXB Sensor Error - Fault is recognized when a sensor faults that is not critical to heat pump operation. These sensors would include the performance, energy monitoring and refrigeration sensors.

E18, Error Non-Critical Communication Error - A non-critical communication error has occurred such as communication to the internet access board. Since this is not critical to unit operation, the heat pump will continue operating normally with this error displayed on the ABC board and the thermostat. The AID Tool should be used to view the configuration window and ascertain the status of all appropriate board communication. The Error displayed will be removed when the problem has been resolved.

Aurora SafeMode Codes

NOTE: The system is still operational during safemode. It is possible for some situations to progress from Derating to SafeMode to finally locking out due to a fault.

E72, SafeMode EEV - Suction Temperature Invalid - The reading of the suction temperature sensor is not within the specified sensor range of -60 to +200°C (-76 to +392°F). The EEV will be positioned at 50%. Possible causes are faulty wiring or a defective sensor.

E73, SafeMode EEV – Leaving Air Temperature (LAT) Invalid - The reading of the leaving air temperature sensor is not within the specified sensor range of -60 to +200°C (-76 to +392°F). Normal operation will continue with an Error 73 display on the thermostat to notify the user of the issue. Possible causes are faulty wiring or a defective sensor. The Error displayed will be removed when the problem has been resolved.

E74, SafeMode EEV - Maximum Operating Pressure (MOP) - The reading of the suction pressure is above the recommended limit. If this condition persists more than 90 seconds, the Drive will revert to a Fault – Out of Envelope Code 35.

Aurora Alarm Codes

These alarms are planned to alert the homeowner and the service personnel but will NOT effect system operation and are for information only. These would be available on the thermostat, AID Tool and the internet access for remote monitoring capability.

E21, Loop Pressure Alarm - Fault is recognized when the loop pressure sensor is installed and the loop pressure falls below the setpoint.

E23 and E24, Home Automation 1 and 2 Inputs - The Home automation inputs are simple 24VAC inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs, two different sensors can be selected. The selected text will then be displayed on the AID Tool and com thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only. With a closed dry contact signal, this input will cause an alarm E23 or E24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of these two inputs independently between the following selections:

- *No Action*
- *Home Automation Fault [no lockout, info only]* - Output-from home automation system

Refrigerant Circuit Guideline

Symptom	Head Pressure	Suction Pressure	Compressor Amp Draw	Superheat	Subcooling	Air Temp. Differential	Water Temp. Differential
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 Temperature Heating	Low	Low	Low	Normal	High	Normal	Normal/High
Low Indoor Air Temperature Cooling	Low	Low	Low	Normal/Low	High	Low	Low
High Indoor Air Temperature Heating	High	High	High	Normal/High	Normal/Low	Low	Normal
High Indoor Air Temperature 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

Electrical Connections

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.

Unit Power Connection

Connect the incoming line voltage wires to L1 and L2 of the contactor as shown in Figure 10C for single-phase unit. Consult the unit's serial plate data for correct fuse sizes.

Note: A disconnection must be incorporated in the fixed wiring in accordance with the wiring rules/NEC.

Open lower front access panel. Remove ground fastener from bottom of control box (Figure 10B). Swing open control box (Figure 10A). Insert power wires through knockouts on lower left side of cabinet. Route wires through left side of control box and connect to contactor and ground (Figure 10C). Close control box and replace grounding fastener before unit start-up.

Accessory Relay

A set of "dry" contacts has been provided to control accessory devices, such as water solenoid valves on open loop installations, electronic air cleaners, humidifiers, etc. This relay contact should be used only with 24 volt signals and not line voltage power. The relay has both normally open and normally closed contacts and can operate with either the fan or the compressor. Use DIP switch SW2-4 and 5 to cycle the relay with blower, compressor, or control a slow opening water valve. The relay contacts are available on terminals #2 and #3 of P2.

When powering high VA draw components such as electronic air cleaners or VM type open loop water valves, R should be taken 'pre-fuse' from the 'R' quick connect on the ABC board and not the 'post-fuse' 'R' terminal on the thermostat connection. If not, blown ABC fuses might result.

Figure 10A:
Wire access (control box open)

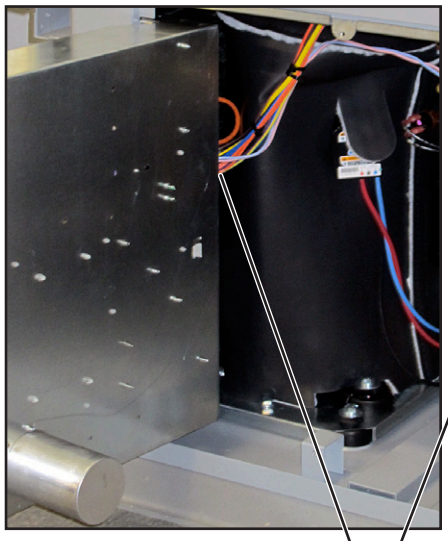


Figure 10B:
Wire access (control box closed)

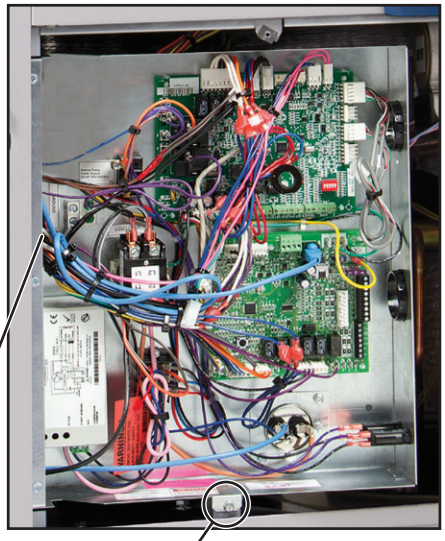
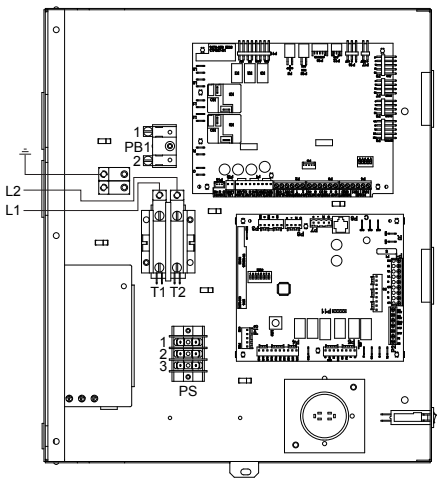


Figure 10C:
Line Voltage 208-230/60/1 control box



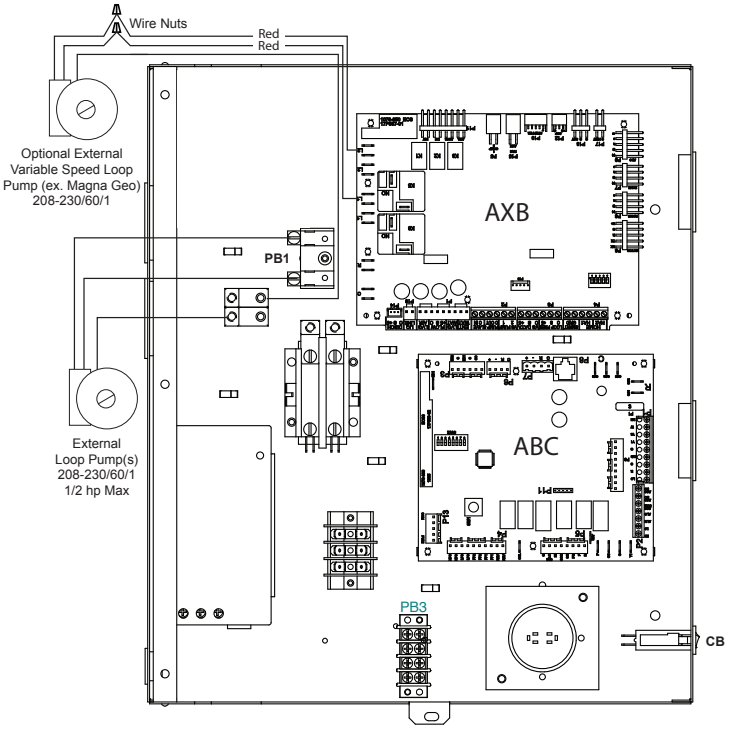
Electrical Connections

Pump Power Wiring

See Figure 14 for electrical connections from control box to pumps.

FC1/FC2 style flow centers with fixed speed pumps connect to PB1 in the control box. If using a variable speed pump it should be connected to L1 and L2 on the AXB.

Figure 11: Pump Wiring 208-230/60/1



Electronic Thermostat Installation

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat wire must be 8-conductor (4 or 5 counductor for communicating thermostats), 20-AWG (minimum) wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions enclosed in the thermostat for detailed installation and operation information.

NOTE: Aurora Base Control (ABC) DIP switch SW2-7 is required to be in the “OFF” position for the control to operate with FaultFlash or ComforTalk thermostats. SW2-7 in the “ON” position configures the control to operate with typical thermostats (continuous lockout signal). There must be a wire connecting Y2 on the Aurora controller to 2nd stage compressor on the thermostat for proper operation. SW2-7 DIP switch position is not relevant with communicating thermostats.

Electronic Thermostat Installation cont.

Field low voltage point to point wiring: AHB Controls

From Communicating Thermostat	To Air Handler AHB P9 Connection	To Compressor Section ABC P7 Connection
C	C	C
R	R	R
-	-	-
+	+	+

Air Handler transformer must be 100VA. 1/17/17

Field low voltage point to point wiring: ASB Board to RDS

Compressor Section ASB P1 Connection	Air Handler Refrigeration Leak Detection Sensor
C	C
+24	+24
-	-
+	+

Air Handler transformer must be 100VA. 9/19/24

Reference Calculations

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

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, MBtu/h
TC = total cooling capacity, MBtu/h
SC = sensible cooling capacity, MBtu/h
kW = total power unit input, kilowatts
HR = total heat of rejection, MBtu/h
HE = total heat of extraction, MBtu/h
HWC = hot water generator capacity, MBtu/h
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, MBtu/h
LC = latent cooling capacity, MBtu/h
S/T = sensible to total cooling ratio

Hot water generator capacity based on 0.4 gpm flow per nominal unit ton at 90°F entering hot water temperature. Performance Data tables do not include water pumping watts and are based upon 15% (by volume) methanol antifreeze solution. Multiple Flow Rates (for EWT) are shown in the Performance Data tables. The lowest flow rate shown is used for geothermal open loop/well water systems with a minimum 50° F. The second flow rate shown is the minimum geothermal closed loop flow rate. The third flow rate shown is optimum for geothermal closed loop and the suggested flow rate for boiler tower applications. Interpolation between EWT, gpm and cfm data is permissible. Extrapolation for heating data down to 25°F is permissible. Catalog illustrations cover the general appearance of products at time of publication. We reserve the right to make changes in design and construction at any time without notice.

Preventative 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.

NOTE: 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

ECM blower motors are equipped with sealed ball bearings and require no periodic oiling.

Hot Water Generator Coil

See Water Coil Maintenance section above.

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 (with a brush attachment) 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.

Troubleshooting Checklist

Equipment will not start or operate

- Follow the troubleshooting flow charts to find root cause.

High pressure lockout in the heating mode

- Check for air flow interruption from one or more of the following: inoperative blower, dirty filters or air coil, blocked return air grill, closed or blocked supply registers, restricted supply or return duct, zone dampers, etc. If airflow is suspected as being a problem, make a quick check using the following example: Velocity in a supply duct should not exceed 1000 fpm and 700 fpm in return ducts. For this example we will use a Variable Speed 036 which has a maximum rating of 1575 cfm at 0.50 static (Refer to the blower performance tables in the install manual for your particular piece of equipment). Using the formula: Area in square feet equals quantity in cfm divided by velocity in fpm (A=cfm/fpm), 1.57 sq. ft. is needed for the supply duct and 2.25 sq. ft. is needed for the return duct. Refer to the troubleshooting flow charts if a problem with the blower motor or logic board is suspected.
- Check for EEV operation. EEV opening percentage should change as compressor speed changes.
- Make sure the discharge pressure is within the operating range shown in the product install manual.
- The unit may be overcharged; check superheat and sub cooling. If this problem is verified, recharge using approved methods.

High pressure lockout in the cooling mode

- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in product install manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop). Variable speed pump may not be setup properly.
- Water to refrigerant heat exchanger may be fouled with debris. If so, back flush with at least 20 psi of water pressure.
- If mineral accumulation is evident, clean the heat exchanger with acid.
- Entering air temperature may be too high. Equipment is designed for a maximum of 85°F DB and 71°F WB.
- Check for EEV operation. EEV opening percentage should change as compressor speed changes.
- The unit may be overcharged; check superheat and sub cooling. If this problem is verified, recharge using approved methods.

Low pressure lockout in heating mode

- If equipment is installed in a low temperature area (below 50°F), install a crankcase heater, then protect the unit from the elements.
- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in product install manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop). Variable speed pump may not be setup properly.
- Check for EEV operation. EEV opening percentage should change as compressor speed changes.
- Return air temperature may be below 50°F. Block off air coil temporarily to improve flow of refrigerant through the system. Air below 50°F cannot be tolerated on a continuing basis. Correct the problem.
- Refrigerant may be low. Check for leaks, reclaim refrigerant, repair if necessary, recharge using approved methods.

Low pressure lockout in the cooling mode

- Check for inadequate air flow. Follow the same procedure as shown for a high pressure lockout in the heating mode.
- Check for EEV operation. EEV opening percentage should change as compressor speed changes.
- Refrigerant charge may be low.

Freeze detection lockout in either the heating or cooling mode

- Water flow may be restricted or inadequate. Verify in accordance with the pressure drop tables shown in product install manual. Also, look for the following: solenoid valve may not be opening on well water units, pump(s) may be inoperative in the flow center, debris may be blocking coil (back flush using at least 20 PSI), or air may be in the loop (flush loop). Variable speed pump may not be setup properly.
- Disconnect freeze sensor from control and measure the resistance. Cross reference with the Thermistor Data table.
- Airflow may be inadequate.

Condensate over flow lockout in either the heating or cooling mode

- Make sure the drain line pitches away from the unit. Install a vertical vent on horizontal drain lines over six feet long. Clean condensate pan and be sure outlet and drain line from the condensate pan is clear.

Reversing valve does not operate

- Disconnect solenoid and check for continuity across coil. Replace coil if continuity is not found.
- If stuck reversing valve is suspected, restrict airflow in heating mode (to build pressure), then switch immediately to the cooling mode.

Control Board Troubleshooting Steps

1) General Check

- If any new device was installed, or any wiring was changed, check the connections to ensure the wiring is correct, and all the wires are in good condition.
- Verify all the plugs are securely connected and in good condition.
- Check the DIP switch (SW2) positions are correct.
- Measure 24 VAC between R and C. (The actual reading may be from 18 to 30 VAC). Check the incoming power and the power transformer if the R and C voltage reading is not correct.

2) No LEDs are On

- Check 24 VAC on board.
- Check the 3 amp fuse. Replace the fuse if needed.
- Verify transformer circuit breaker has not tripped if no low voltage is present.
- Disconnect the thermostat connection P1.
- Replace the Aurora base control board.

3) Red LED Flash Code

Input Fault (Code 1) – Indicates that both O and W input signals are present. Disconnect the thermostat connector from the ABC board and then cycle power to the board. If the fault does not reappear, then the problem is between the thermostat and the thermostat connector. Otherwise, replace the ABC board.

High Pressure Fault (Code 2) – Indicates the system pressure has exceeded 600 psi (R-454B) which may have been caused by low water flow in cooling, (check coaxial heat exchanger for mineral build-up) or low air flow in heating (check filters and coil for dirt build-up). Measure P4-9 and C is 24 VAC. If not, replace ABC. Check the heat pump refrigeration system. Cycle the power to reset the system. Measure P4-10 and C is 24 VAC. If not, replace the high pressure sensor.

Low Pressure Fault (Code 3) – Indicates low pressure switch has opened which may indicate a loss of system charge, system restriction, or frozen heat exchanger. Measure P4-7 and C is 24 VAC. If not, replace ABC. Check the heat pump refrigeration system. Cycle the power to reset the system. Measure P4-8 and C is 24 VAC. If not, replace the low pressure sensor. Refrigerant may be low. Check for leaks, reclaim refrigerant, repair if necessary, pump down and recharge the system to the quantity of refrigerant shown on the unit nameplate.

Freeze Detection 1 Fault (Code 5) – Indicates low or no water flow; low system charge; or faulty EEV in heating mode. Make sure the DIP switch FP1 (SW2-1) selection matches the application. Measure the temperature on the refrigerant line next to the freeze detection thermistor. Disconnect the connector P4. Measure the resistance reading between P4-3, P4-4. Refer to the Thermistor Data table, find the corresponding temperature data. Compare the data with the temperature measurement from the refrigerant line. The temperature should be within +/- 2° F. If not, replace the thermistor.

Other items to check when troubleshooting a water flow lockout are superheat, water flow through the coaxial heat exchanger and antifreeze composition. High superheat in heating will lower the refrigerant line temperature where the freeze detection thermistor is located. In this case, check the EEV. Closed loop systems are rated at 3 gpm/ton. If a closed loop system is running at less than 3 gpm/ton, the temperature difference between the refrigerant line and the actual leaving water temperature will be greater and could lead to possible water flow lockouts.

Condensate Fault (Code 7) – Indicates condensate water in the drain pan fills up and touches the spade terminal. Make sure the drain line pitches away from the unit. Install a vertical vent on horizontal drain lines over six feet long. Clean and be sure outlet and drain line from the condensate pan is clear. Start the system in cooling Observe the water level in the drain pan. If the unit is locking out on condensate and the drain pan is dry, remove the condensate wire from the drain pan and tape it out of the way. Be careful to not ground the wire out because that will cause the unit to lockout on drain overflow. If the unit is still locking out, check the brown wire all the way back to the ABC for a short to ground. Remember that the condensate sensor is just a wire looking for a ground. If it touches any metal in the cabinet, the unit will see that as a drain fault. If removing the wire from the drain pan stopped the false drain lockouts, put the condensate sensor back in place in the drain pan. Pay close attention to how far the spade terminal sits down in the drain pan. If the terminal is pushed all the way down so that it is touching the bottom of the drain pan, this will cause a drain lockout if there is any trace of water. If the spade terminal fits loosely in the drain pan, spread the terminal open to make it fit snugly in the drain pan.

Over/Under Voltage Shutdown Fault (Code 8) – Indicates the control voltage is or had been outside the range of 18 to 30 VAC for more than 15 minutes. Using a voltage meter, check the incoming power line voltage is within + or – 25%. If not, there is a power line issue. Check the secondary of the control transformer with a voltage meter. The voltage should be 18 to 30 VAC. If not, replace the control transformer.

Freeze Detection FP1 Sensor Fault (Code 11) – Indicates the freeze detection sensor is out of range. Disconnect the connector P4. Measure the resistance reading between P4-3, P4-4. Refer to the Thermistor Data table, find the corresponding temperature data. Compare the data with the temperature measurement from the refrigerant line. The temperature should be within +/- 2°F. If not, replace the thermistor.

Control Board Troubleshooting Steps cont.

4) Other Faults

ECM Motor Will Not Start

1. Measure the voltage output between P13-1 and P13-5. Reference the following table for blower speed vs. voltage.

Blower Speed Selection Number	DC Volts
1	0.6 VDC
2	2.7 VDC
3	4.6 VDC
4	7.5 VDC
5	9.8 VDC
6	12.5 VDC
7	14.4 VDC
8	16.3 VDC
9	18.5 VDC
10	21.2 VDC
11	22.3 VDC
12	23.4 VDC

2. Measure the voltage from C to F terminals (P5-2). The reading should be 24VAC.

Compressor First Stage Will Not Start - *See the Flow Chart.*

No Alarm Output - Measure the voltage output between P2-4 and C. The reading should be 24 VAC or a pulsed 24 VAC dependent on the selection of SW2-7.

Accessory Relay Does Not Operate - Measure the continuity between P2-2 and P2-3. It should read closed when relay is engaged. If this is not correct, check SW2-4 and SW2-5 settings.

No Lockout Output - Measure the voltage output between P1-1 and C. The reading should be 24 VDC or a pulsed 24 VDC dependent on the selection of SW2-7. If voltage is not present, make sure the unit is in lockout and not fault retry.

Auxiliary Heater Does Not Function - Measure the voltage output between P3-1, P3-2, and P3-3, P3-4. The output should be 24 VDC. If voltage is not present, check thermostat operation and wiring.

Loop Pump Does Not Start - The loop pump is controlled by the AXB board. Check to make sure the control board is powered by taking a voltage reading across R and C to check for 24VAC. If 24VAC is not present check the wiring connections, 24VAC is supplied to the AXB through the harness connected to P9. Next check to make sure the ABC is attempting to run the compressor, the loop pump will only run when the ABC is commanding CC on, the pump slave input is active, or the AXB has lost communication with the ABC. Please refer to troubleshooting flow charts for additional checks on the loop pump.

5) Thermistor

Disconnect the thermistor from the board and measure ohms. Compare the ohms reading to the thermistor data chart in this manual. If the thermistor reads open or shorted the thermistor is bad and should be replaced.

6) Pressure Transducer

Check to make sure the board is powering the transducer by checking for 5VDC between the brown and blue wires. If the reading is 0VDC the transducer is not being powered and the board should be replaced. If there is 5VDC present the transducer is powered and the output should be checked. To check the output, measure the DC voltage between the brown and black wires. The value should be between 0.3VDC and 4.5VDC. If it is outside of this range the transducer should be replaced.

7) Flow Meter

Check to make sure the board is powering the transducer by checking for 5VDC between the brown and green wires. If the reading is 0VDC the transducer is not being powered and the board should be replaced. If there is 5VDC present the transducer is powered and the output should be checked. To check the output, measure the DC voltage between the brown and white wires. The value should be between 0.3VDC and 3.3VDC. If it is outside of this range the transducer should be replaced.

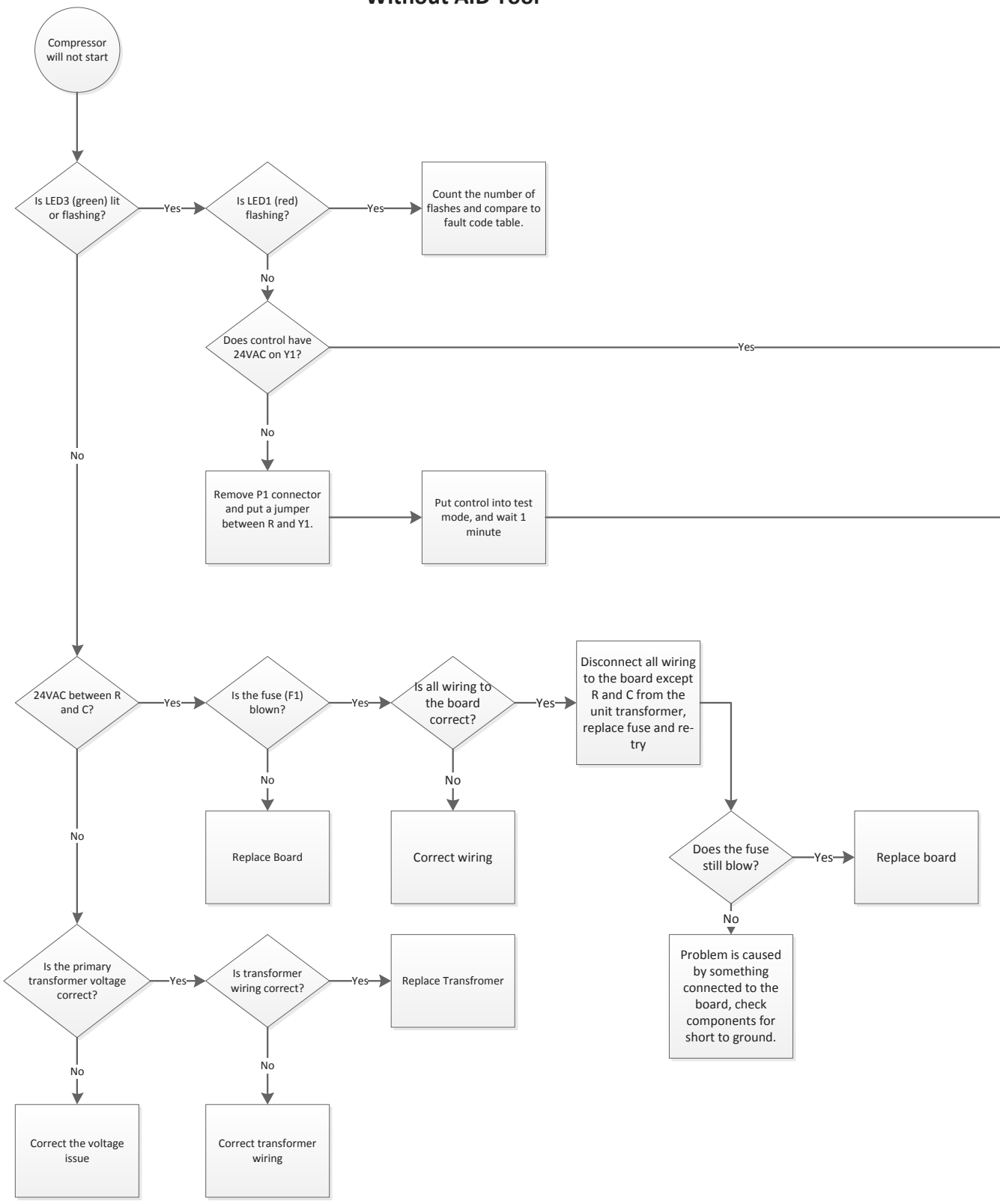
8) Current Transducer

Disconnect the current transducer from the board and measure ohms across the two wires. The ohms reading should be approx. 22 ohms.

Control Board Troubleshooting Flow Charts

Use the following flow charts to aid in troubleshooting the control board.

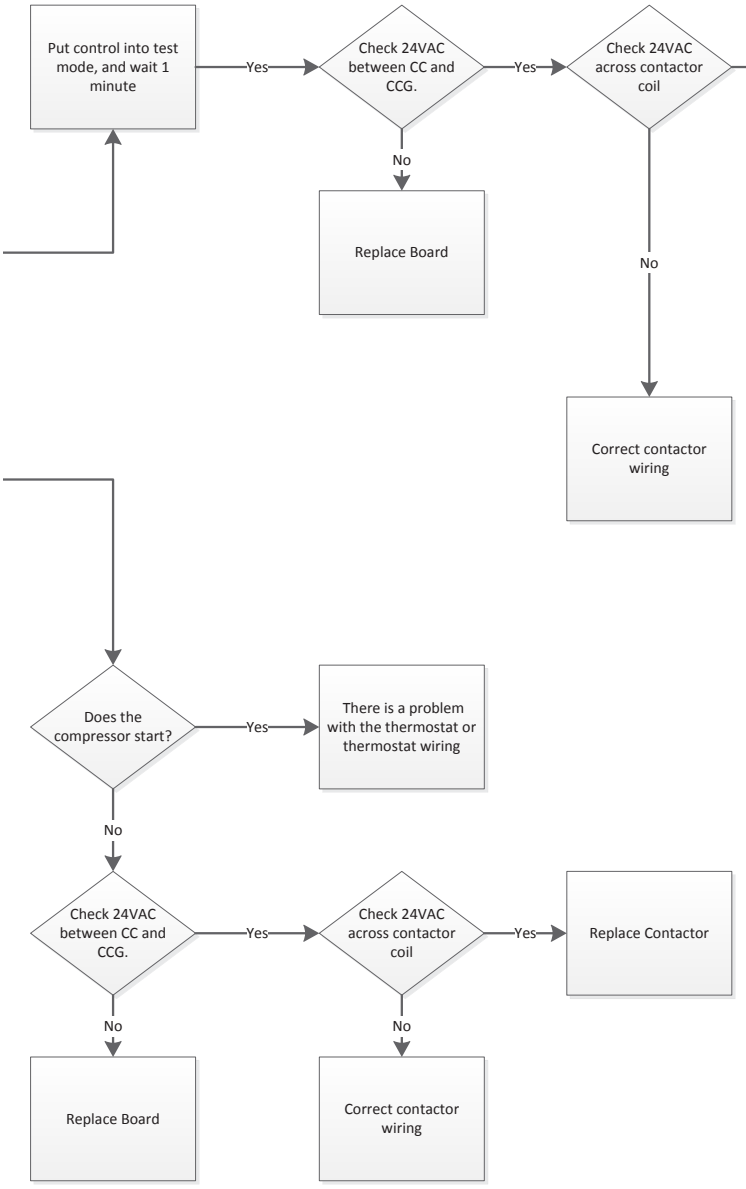
Compressor Will Not Start
Without AID Tool



Control Board Troubleshooting Flow Charts cont.

Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.



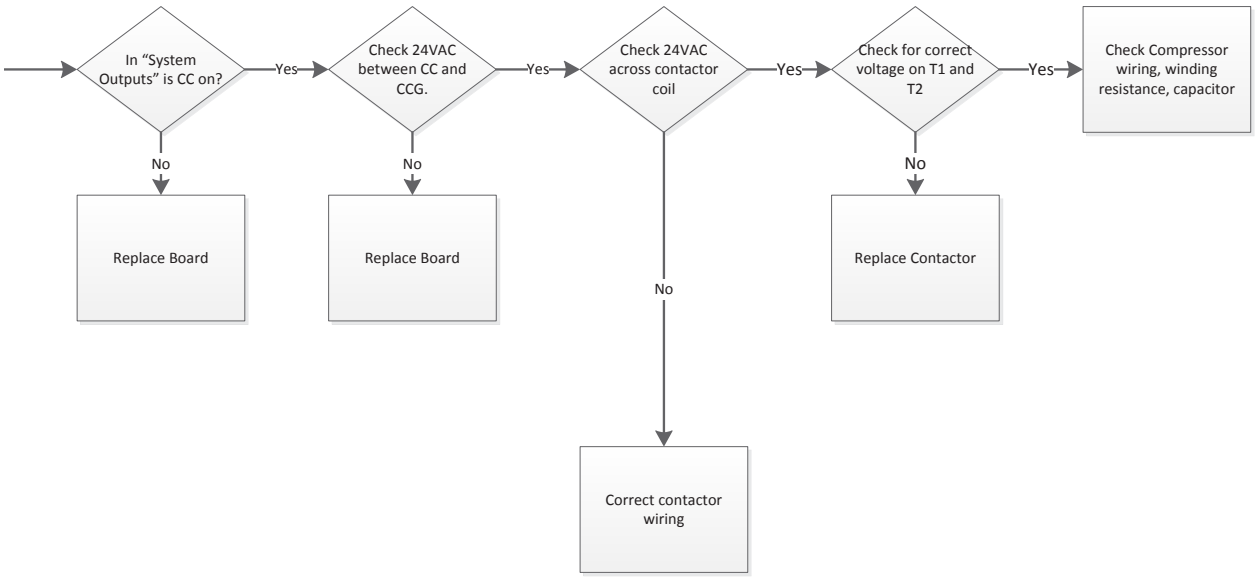
Fault Code	
Fault Description	**Flash Code**
Normal Mode	OFF
Input Fault	Code 1
High Pressure	Code 2
Low Pressure	Code 3
Freeze Detection 2	Code 4
Freeze Detection 1 (Coax)	Code 5
Reserved	Code 6
Condensate	Code 7
Over/Under Voltage	Code 8
Not Used	Code 9
Freeze Detection Sensor Error	Code 11

Control Board Troubleshooting Flow Charts cont.

Control Board Troubleshooting Flow Charts cont.

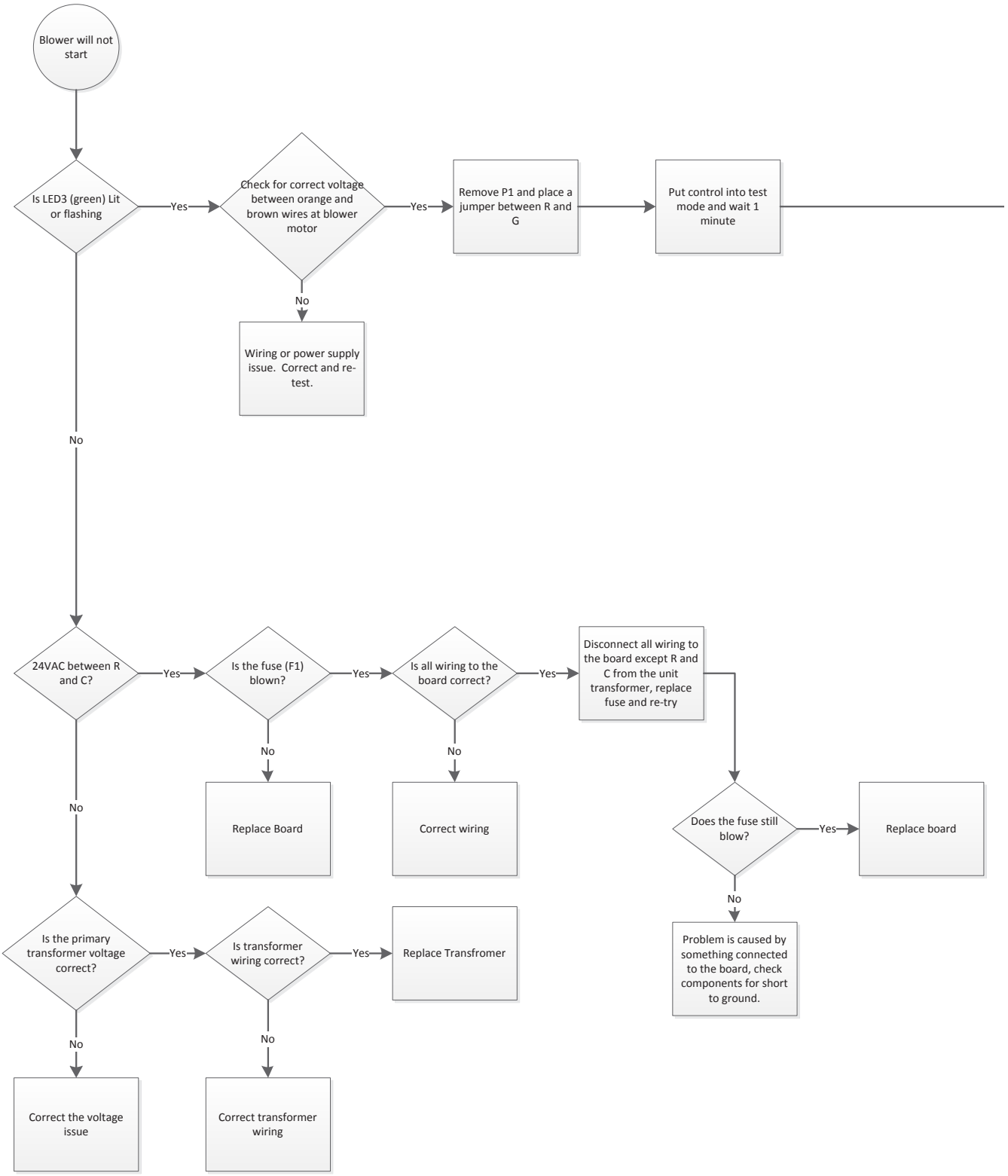
Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.



Control Board Troubleshooting Flow Charts cont.

ECM Blower Will Not Start
Without AID Tool



Control Board Troubleshooting Flow Charts cont.

Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.

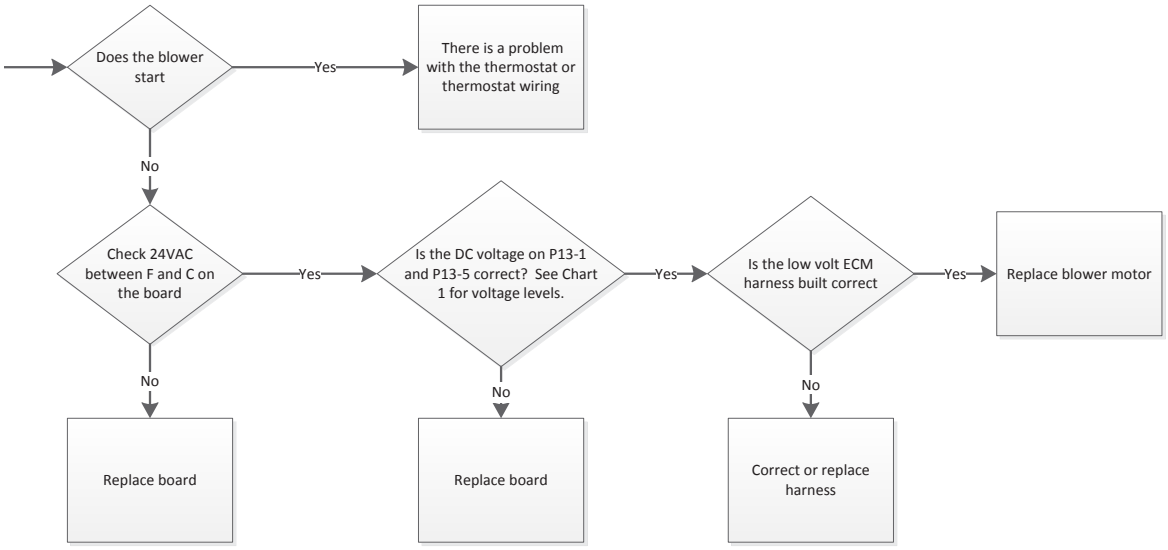


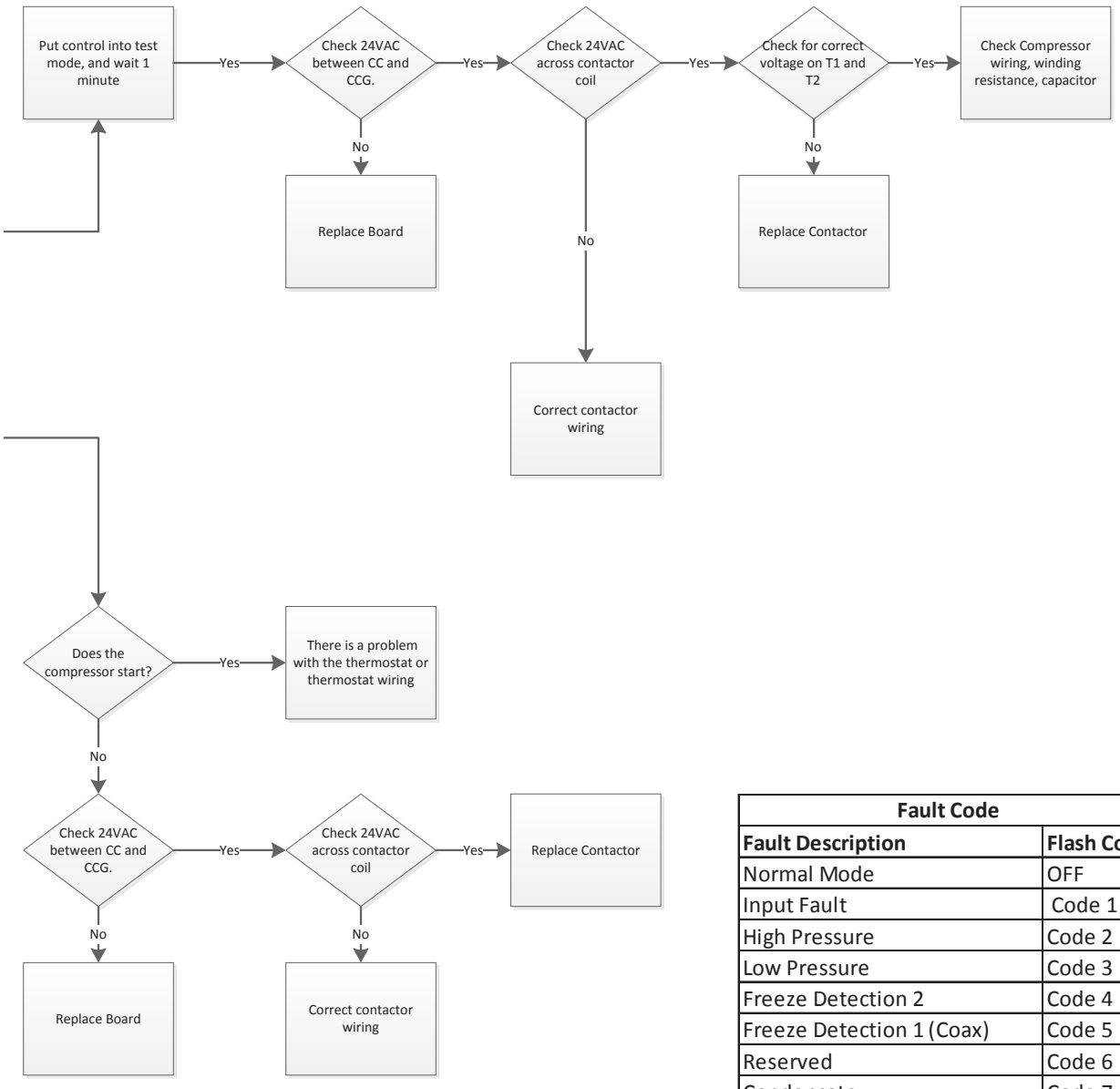
Chart 1

Blower Speed Selection Number	DC Volts
1	0.6VDC
2	2.7VDC
3	4.6VDC
4	7.5VDC
5	9.8VDC
6	12.5VDC
7	14.4VDC
8	16.3VDC
9	18.5VDC
10	21.2VDC
11	22.3VDC
12	23.4VDC

Control Board Troubleshooting Flow Charts cont.

Control Board Troubleshooting Flow Charts cont.

Notes:
1. When measuring 24VAC actual value may be between 18 and 30VAC.

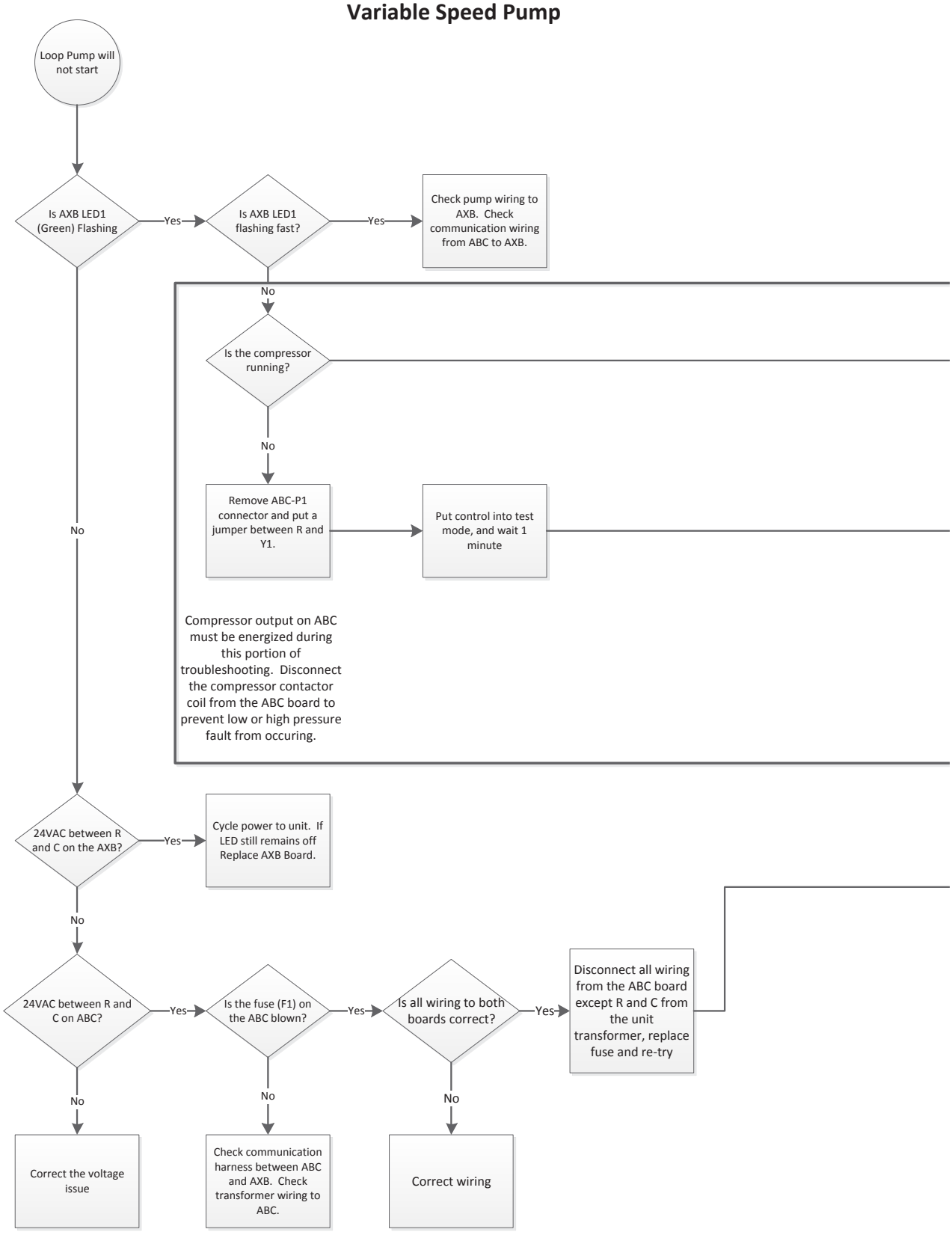


Fault Code	
Fault Description	**Flash Code**
Normal Mode	OFF
Input Fault	Code 1
High Pressure	Code 2
Low Pressure	Code 3
Freeze Detection 2	Code 4
Freeze Detection 1 (Coax)	Code 5
Reserved	Code 6
Condensate	Code 7
Over/Under Voltage	Code 8
Not Used	Code 9
Freeze Detection Sensor Error	Code 11

Control Board Troubleshooting Flow Charts cont.

Loop Pump Will Not Start

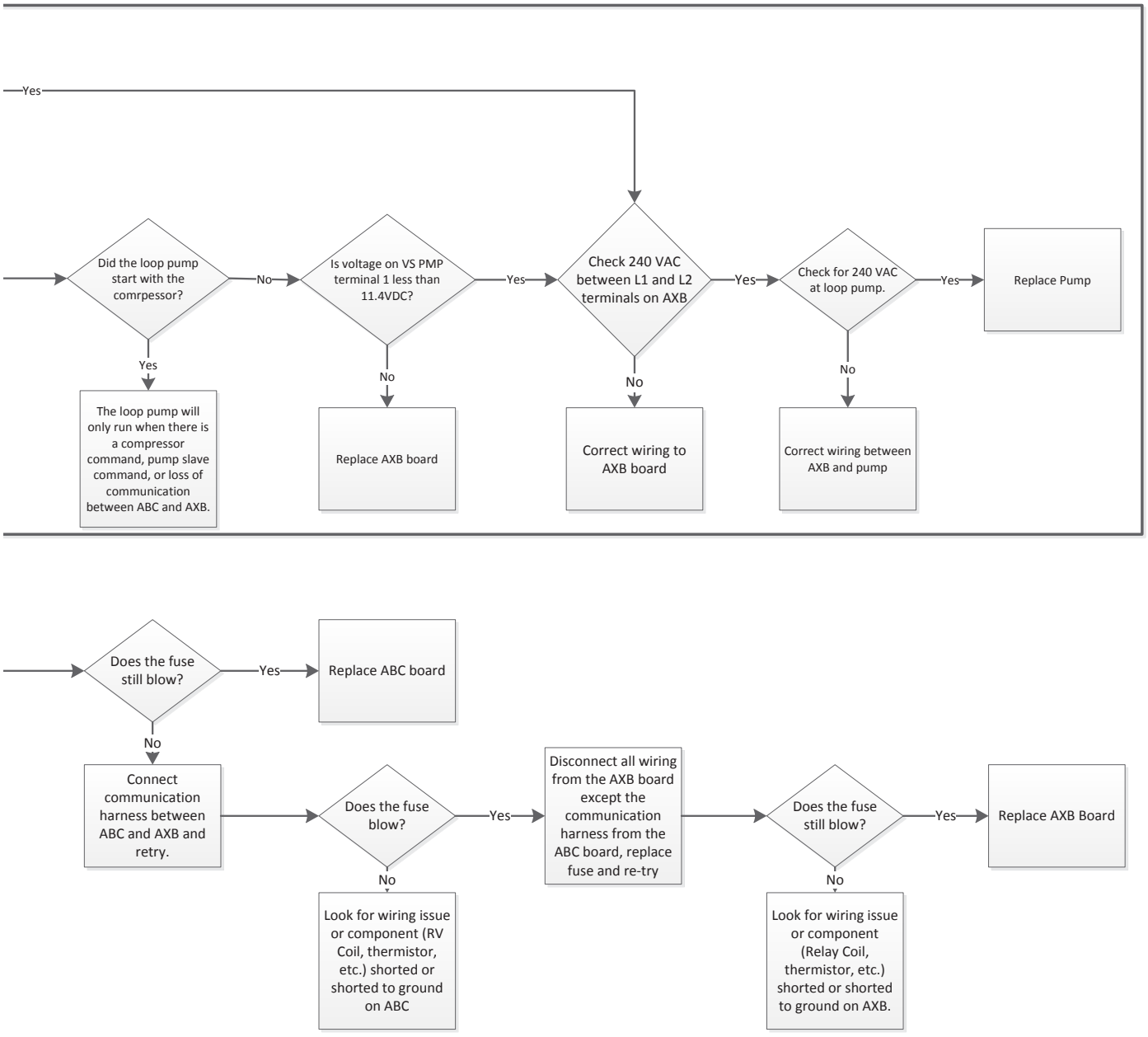
Variable Speed Pump



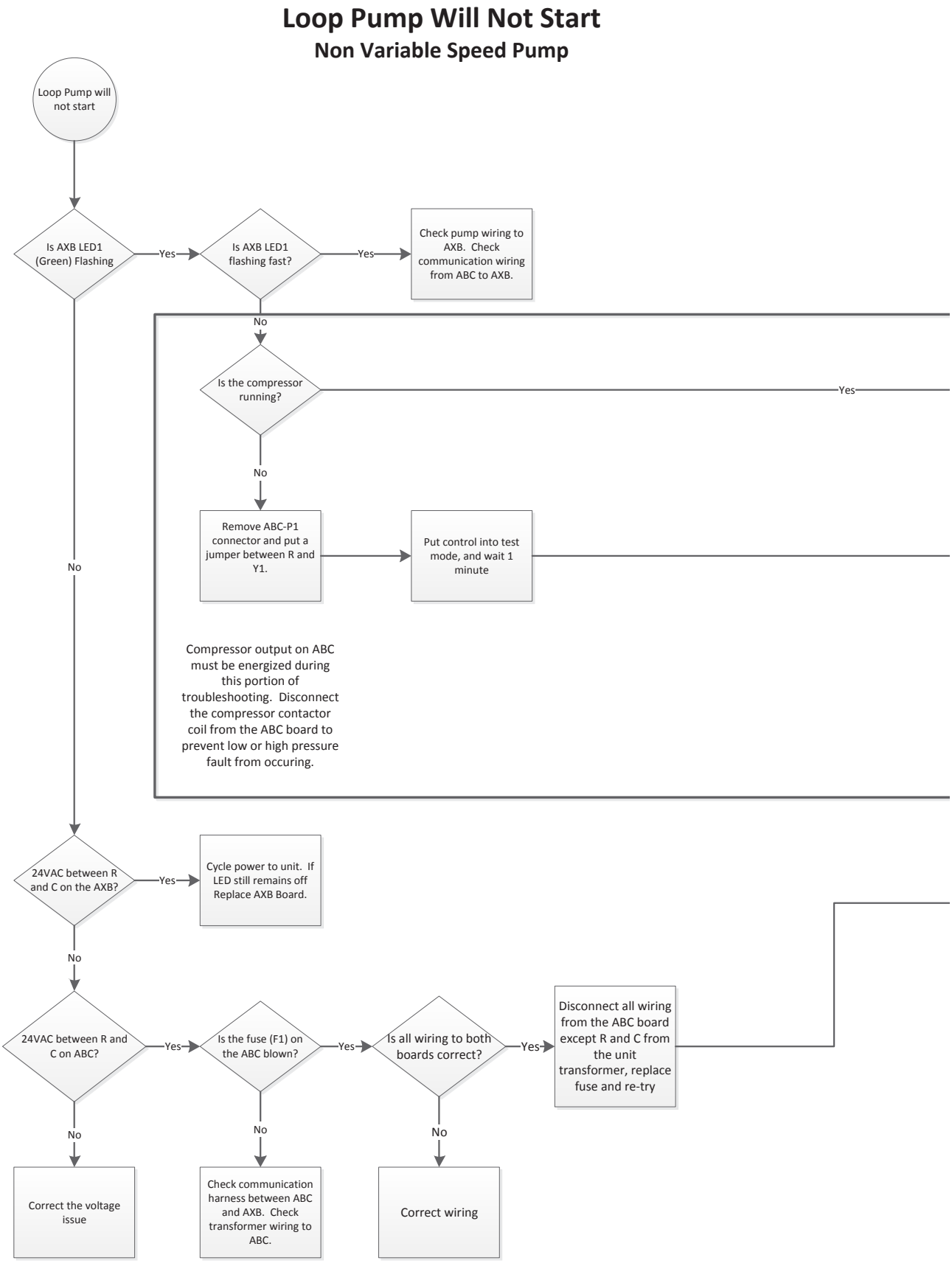
Control Board Troubleshooting Flow Charts cont.

Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.
2. When measuring 240VAC actual value may be between 190 and 250 VAC.



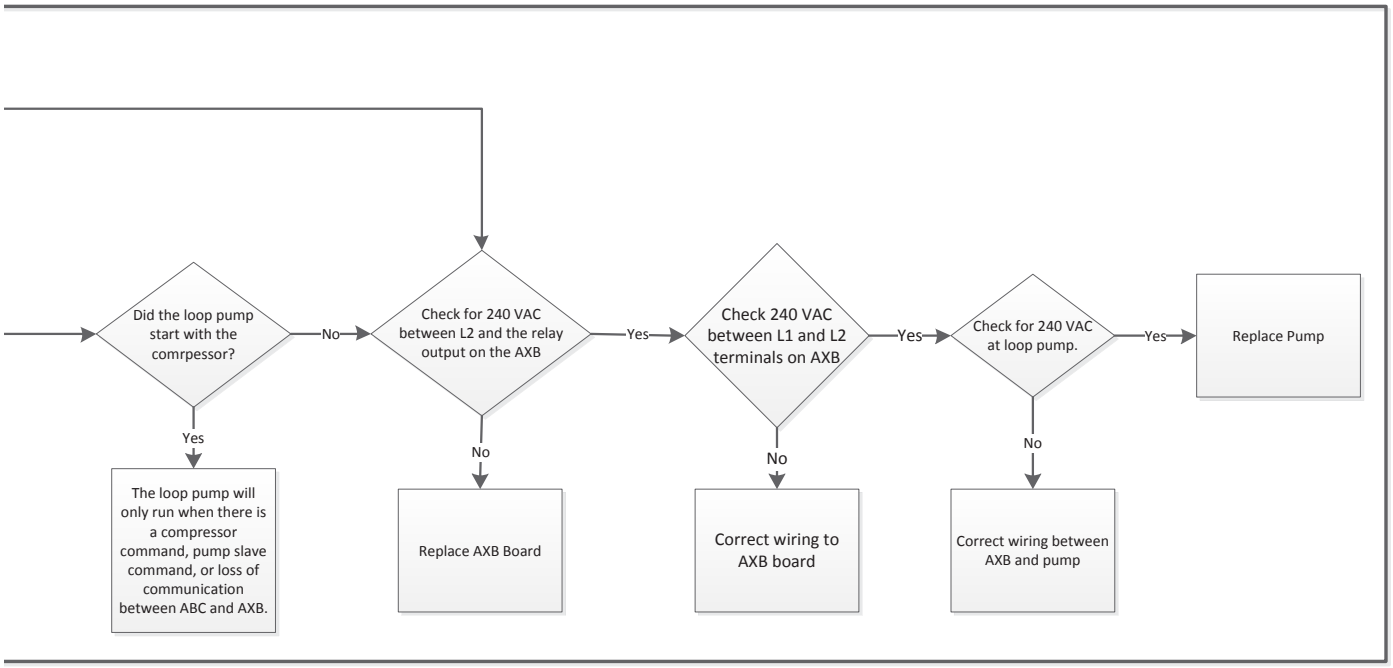
Control Board Troubleshooting Flow Charts cont.

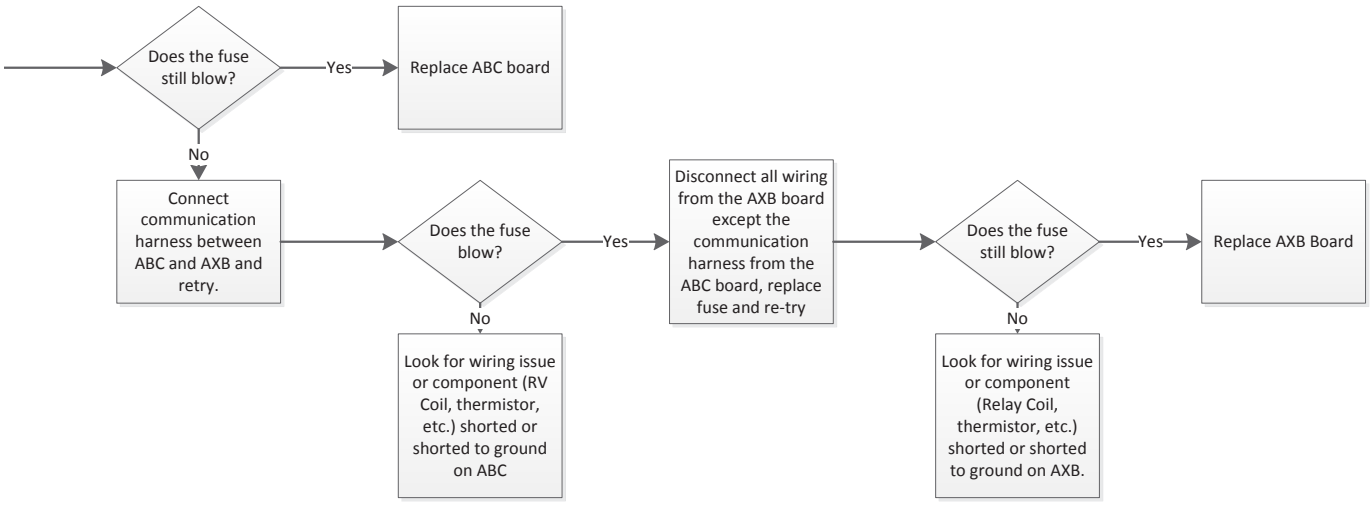


Control Board Troubleshooting Flow Charts cont.

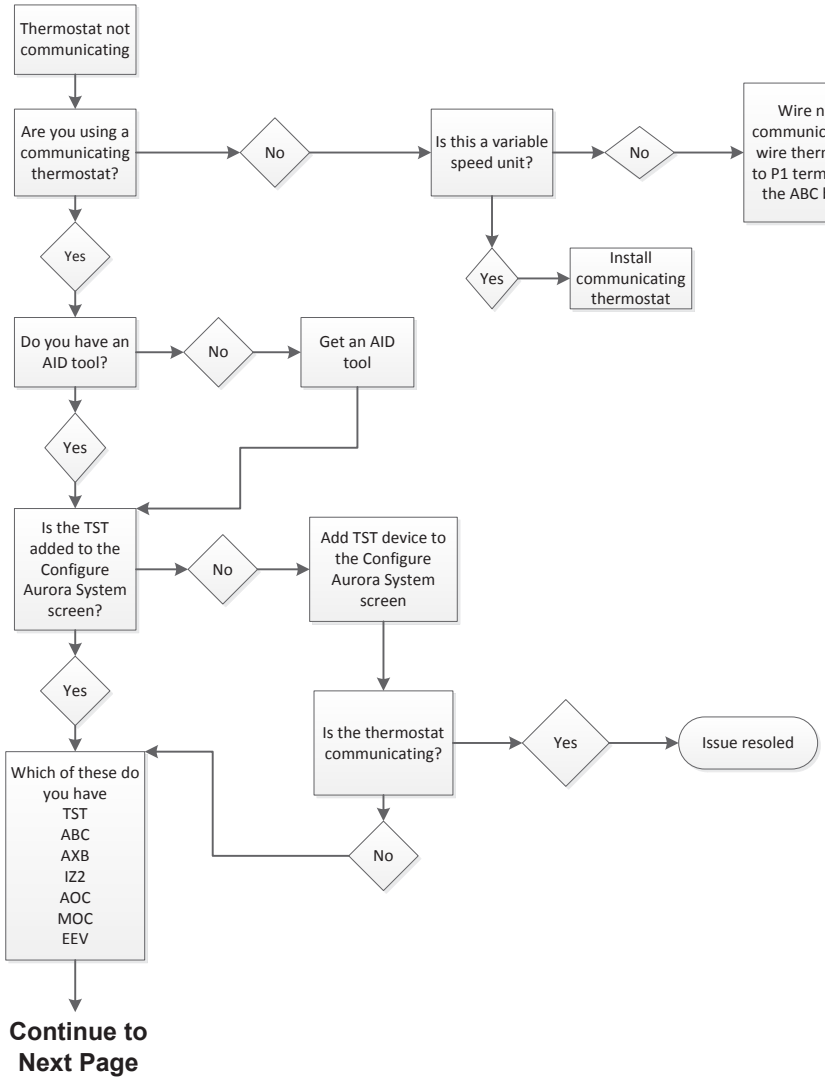
Notes:

1. When measuring 24VAC actual value may be between 18 and 30VAC.
2. When measuring 240VAC actual value may be between 190 and 250 VAC.

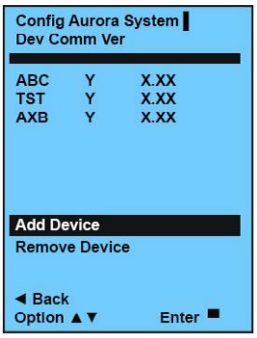




Communicating Thermostat Troubleshooting Guide



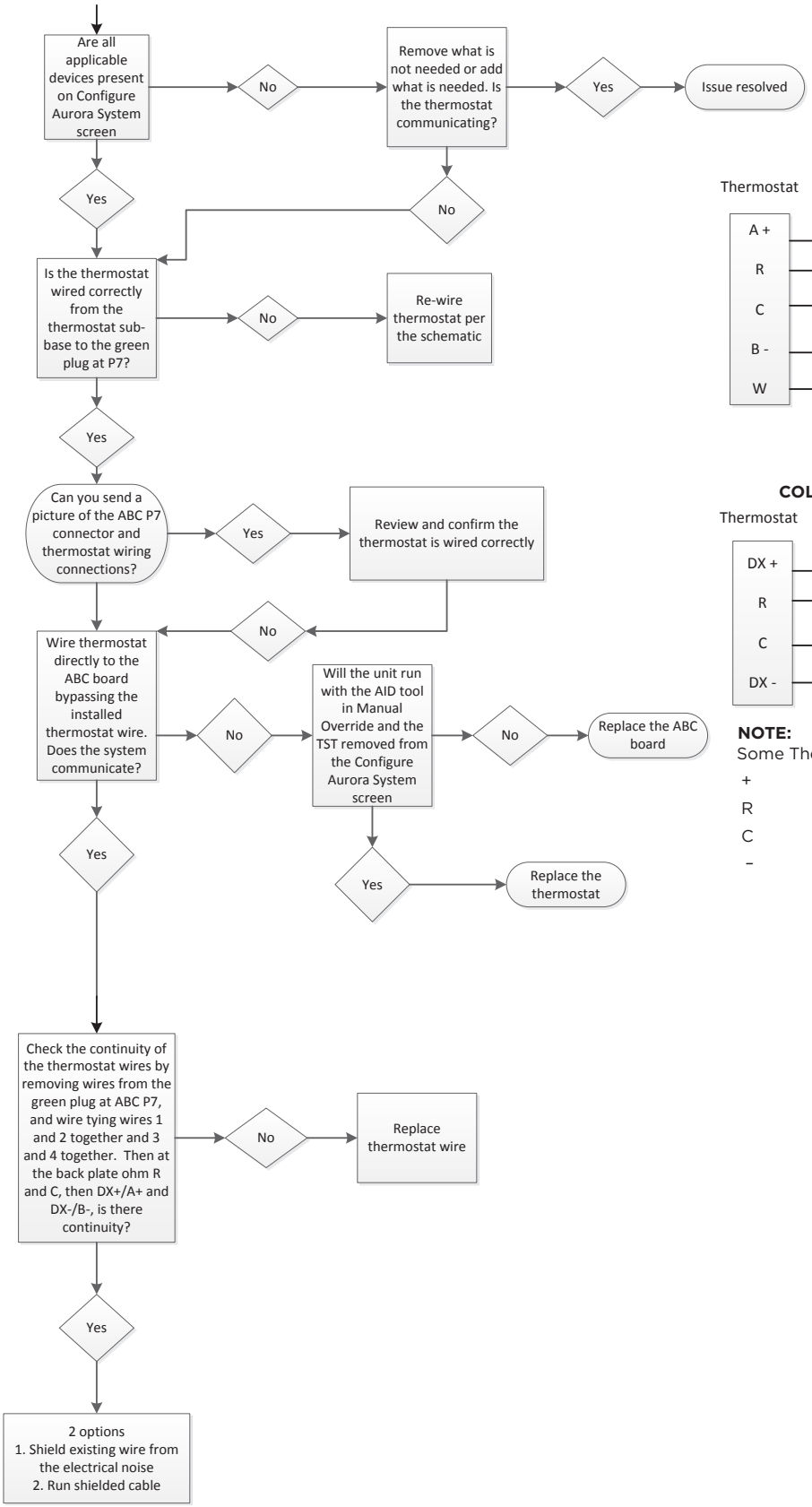
Configure Aurora System Screen



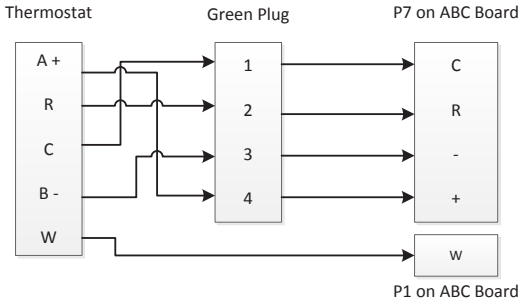
Single and Dual Capacity unit

Y – Active Communication
N – Device has been found, but communication has failed.

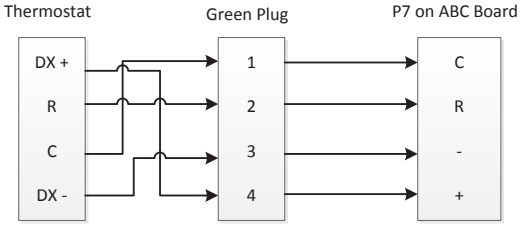
Communicating Thermostat Troubleshooting Guide cont.



TPCM32U03A*/TPCM32U04A*



TPCC SERIES
COLOR TOUCHSCREEN THERMOSTAT

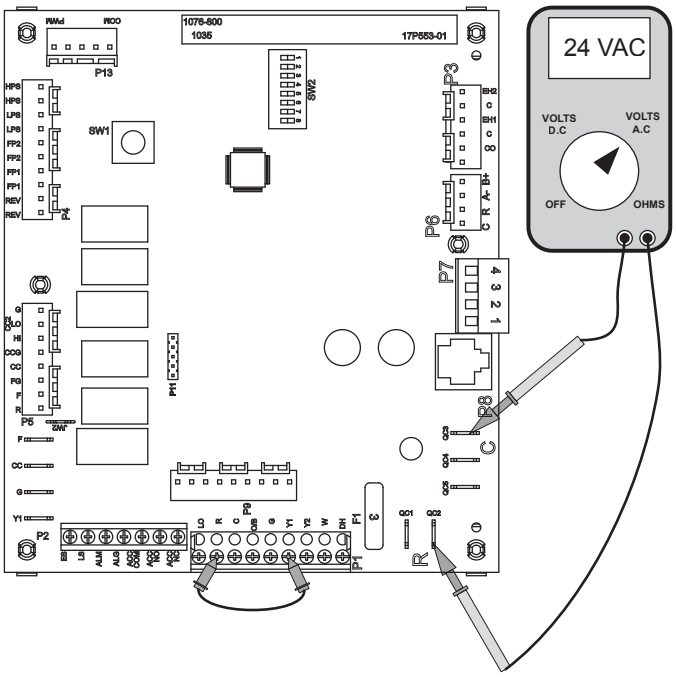


NOTE:
Some Thermostats will be:

\+
R
C
–

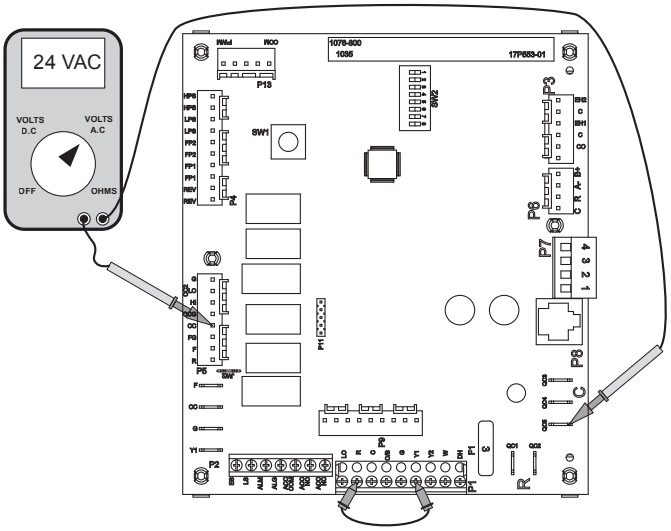
Control Board Signals

To Check for 24VAC between R and C



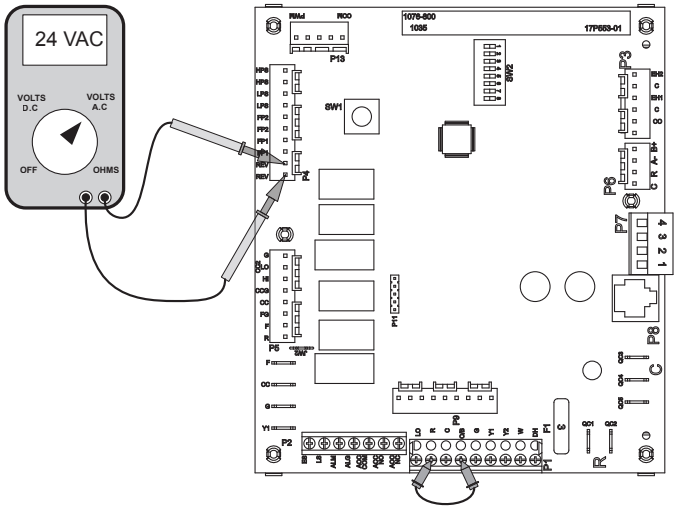
With power applied to the unit connect your Volt meter leads to “R” and “C” on the control board where the yellow and black/white transformer wires connect. The reading should be between 18VAC and 30VAC.

To Check for 24VAC to Compressor Contactor



With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “Y1” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Volt meter leads to “CC” and “C”. After 1 minute the reading should be between 18 and 30VAC. If you have a signal and the contactor is not pulled in, check voltage across the contactor coil. If you have voltage across the contractor coil, replace the contactor. If there is no voltage across the contactor coil, verify all wiring between the board and contactor. If you have no voltage between CC and C and the fault LED is not flashing, then replace the board.

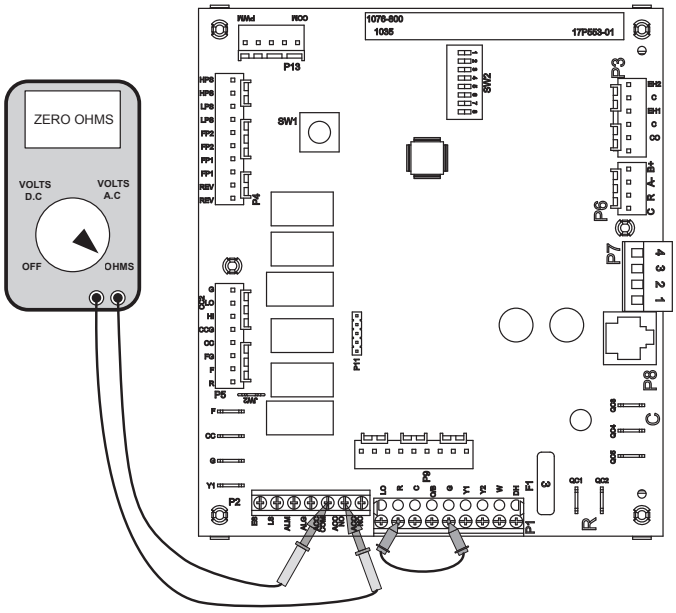
To Check Operation of the Reversing Valve Output



Make sure that SW2-3 is set to “ON”. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “O” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “O” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Volt meter leads to the two “REV” pins on P4. The reading should be between 18 and 30VAC. If you have voltage and the reversing valve is not shifting, check voltage across the coil. If you have voltage across the reversing valve coil, but the valve does not shift the reversing valve coil may be bad. If there is no voltage across the coil, verify all wiring between the board and reversing valve. If no voltage is present on the two REV terminals then replace the board.

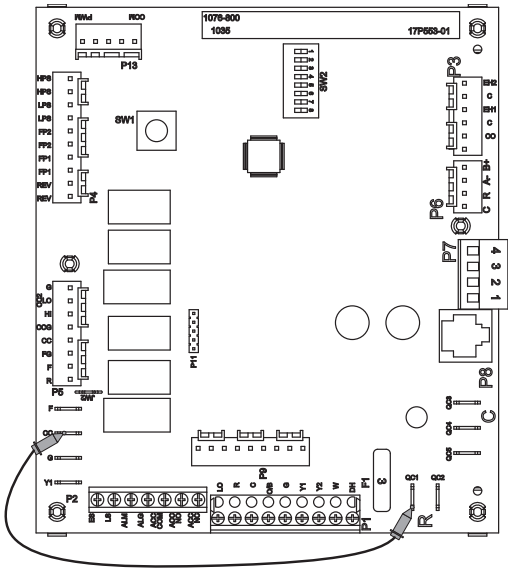
Control Board Signals cont.

To Check Operation of the Accessory Relay



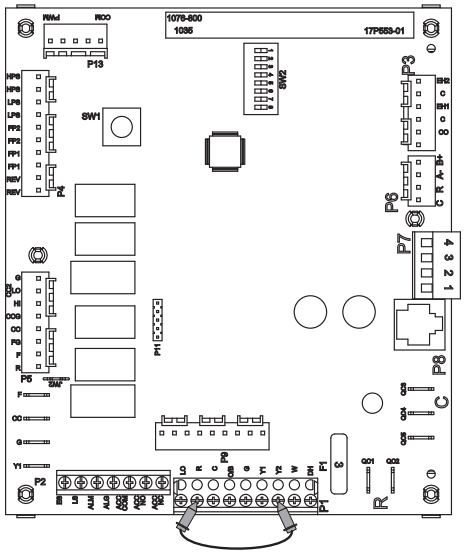
Make sure that SW2-4 and SW2-5 are both set to “ON”. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R” and “G” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Connect your Ohm meter leads to the two “ACC COM” and “ACC NO” on P2. A reading of zero ohms indicates that the relay is switching and operating normally. A reading of infinity or open line indicates that the relay did not close and the board should be replaced.

To Bypass the Safety Circuit and Engage the Compressor Contactor



Put gauges on the unit to monitor high/low pressure. Place a jumper between “R” and “CC” as shown. **This will bypass the safety circuit and the compressor will run whether the board is calling for it or not.**

To Check the Freeze Detection Thermistor (AID Tool Required)

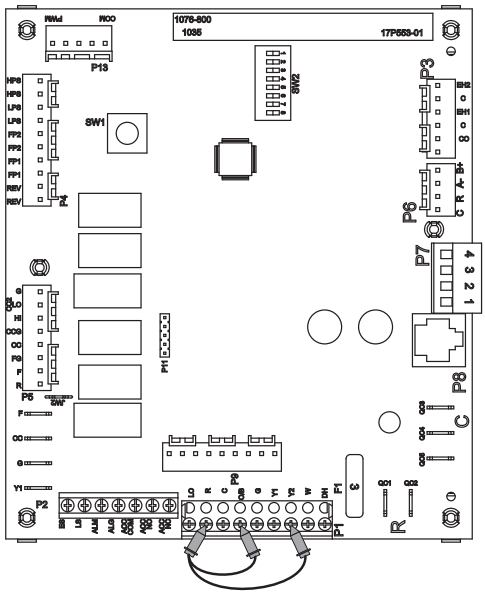


Disconnect the loop pumps so they will not run. Place a thermocouple on the refrigerant line next to the freeze detection thermistor. With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y2” input to ON. If an AID Tool is not available remove the plug on P1 to disconnect the thermostat from the board. Place a jumper on “R” and “Y2” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. As the unit runs in second stage heating with the loop pump(s) not working, the lack of water flow will quickly bring down the temperature of the refrigerant line where the freeze detection thermistor is located. Watch the FP1 temperature reading on the AID Tool and compare it with the thermocouple reading. The thermocouple reading and FP1 reading should be within 2 degrees F of each other. If the thermistor is found to be out of calibration, replace the thermistor. Allowing the unit to continue to run will cause a freeze detection fault to occur. Remember, there is a two minute bypass delay and a 30 second recognition delay on the freeze detection input. This means that the compressor will not shut down during the first 2.5 minutes of run time regardless of how low the freeze thermistor reads.

Other items to check when troubleshooting a freeze detection lockout are superheat, water flow through the coaxial heat exchanger, and antifreeze composition. High superheat in heating will lower the refrigerant line temperature where the freeze protection thermistor is located. In this case, check the expansion device. Closed loop systems are rated at 3 gpm/ton. If a closed loop system is running at less than 3 gpm/ton, the temperature difference between the refrigerant line and the actual leaving water temperature will be greater and could lead to possible freeze detection lockouts.

Control Board Signals cont.

To Check the Condensate Sensor

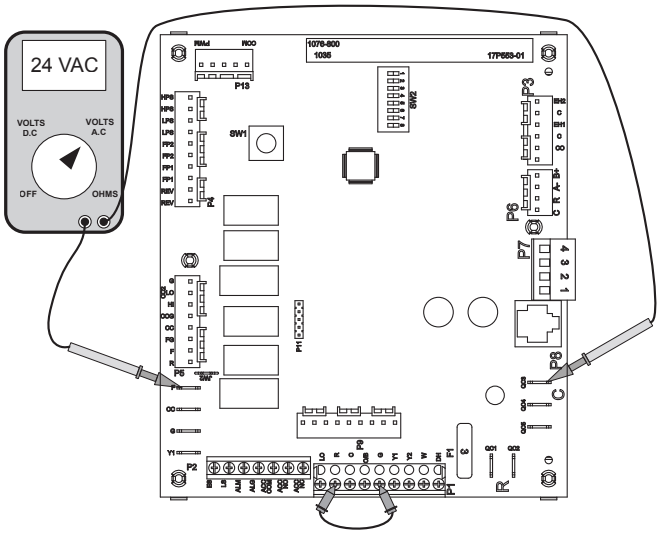


How it works: The condensate sensor is a three part system: a wire, air coil, and water in the drain pan. The wire (spade terminal) and air coil act like a normally open contact and the water acts as the switch. When water in the drain pan fills up and touches the spade terminal, the unit will fault on condensate.

Checking the Sensor: With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “O” and “Y2” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper wire between “R”, “Y2”, and “O” as shown. Apply power and put the board into test mode by holding SW1 for 2-5 seconds, the green LED will begin a slow flash. Observe the water level in the drain pan. If the unit is locking out on condensate and the drain pan is dry, remove the condensate wire from the drain pan and tape it out of the way. Be careful not to ground the wire out because that will cause the unit to lockout on condensate over flow. If the unit is still locking out, check the brown wire all the way back to the logic board for a short to ground. Remember that the condensate sensor is just a wire looking for a ground. If it touches any metal in the cabinet, the unit will see that as a condensate fault.

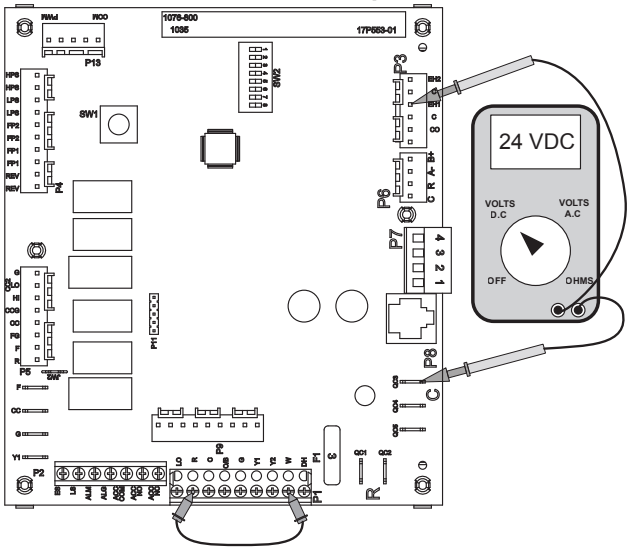
If removing the wire from the drain pan stopped the false drain lockouts, put the condensate sensor back in place in the drain pan. Pay close attention to how far the spade terminal sits down in the drain pan. If the terminal is pushed all the way down so that it is touching the bottom of the drain pan, this will cause a condensate lockout if there is any trace of water in the drain pan. If the spade terminal fits loosely in the drain pan, spread the terminal open to make it fit snugly in the drain pan.

To Check the ECM Blower Motor Enable Signal



With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper between “R” and “G” as shown. Put the board into test mode by holding SW1 for 2-5 seconds. The blower will come on and run in the “G” speed setting. To check the enable signal to the motor, measure 24VAC between the F and C terminals.

To Check the Electric Heat Outputs



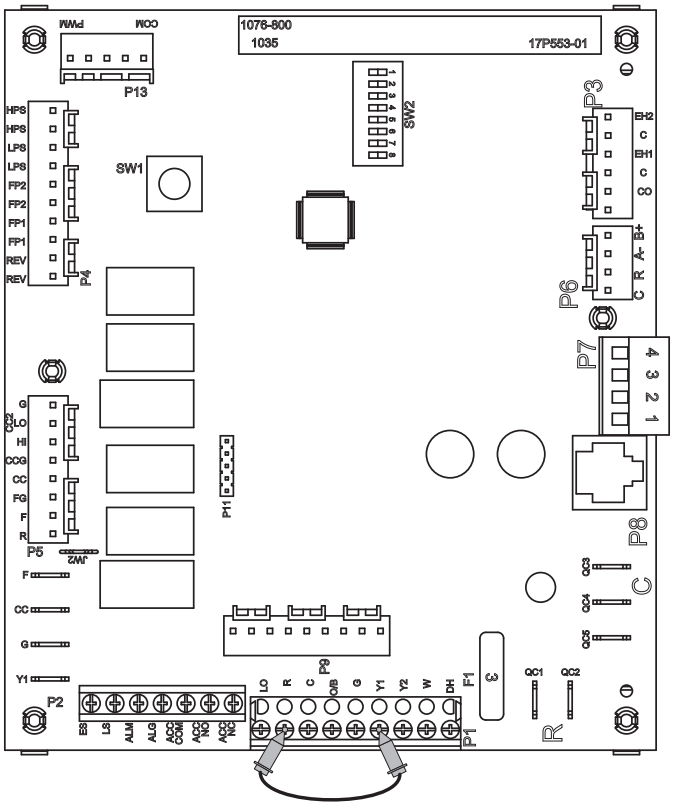
With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “W” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board and place a jumper between “R” and “W” as shown. Put the board into test mode by holding SW1 for 2-5 seconds. The blower will come on and run in high speed. 10 seconds later electric heat output 1 (EH1) will be enabled followed by electric heat output 2 (EH2) in 7.5 seconds. Check EH1 by measuring DC volts between “C” and “EH1” and check EH2 by measuring DC volts between “C” and “EH2”.

Jumping the Control Board

Stage 1 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “Y1” terminals as shown.

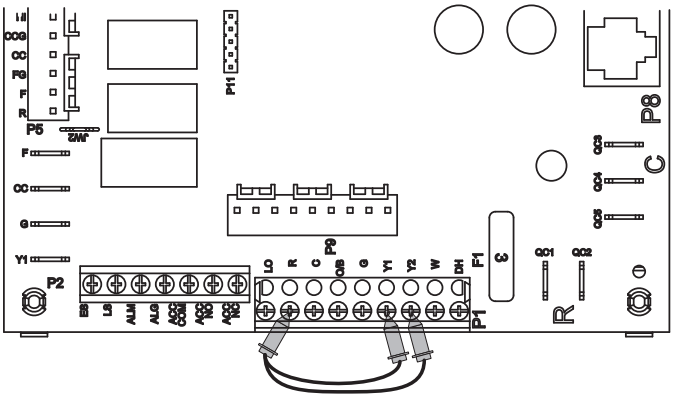
The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input.



Stage 2 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” and “Y2” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, Y1, and Y2 terminals as shown.

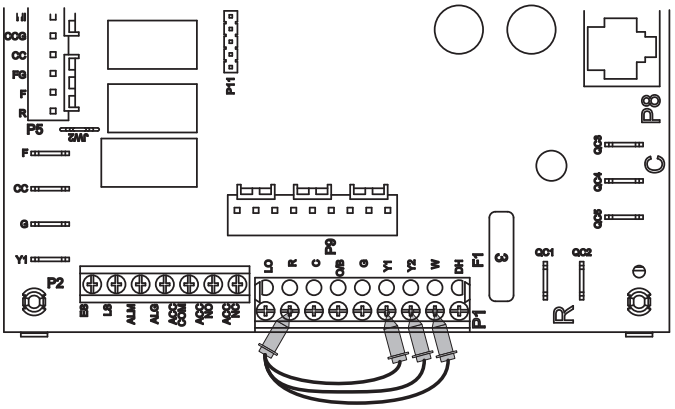
The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed.



Stage 3 Heating

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1”, “Y2”, and “W” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, Y1, Y2 and W terminals as shown.

The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed. The first stage of resistance heat is energized and with continuous third stage demand the second stage of resistance heat will engage in 5 minutes.

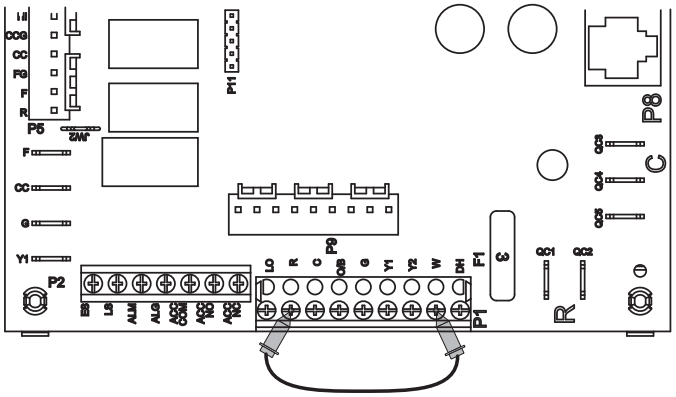


Jumping the Control Board cont.

Emergency Heat

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “W” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “W” terminals as shown.

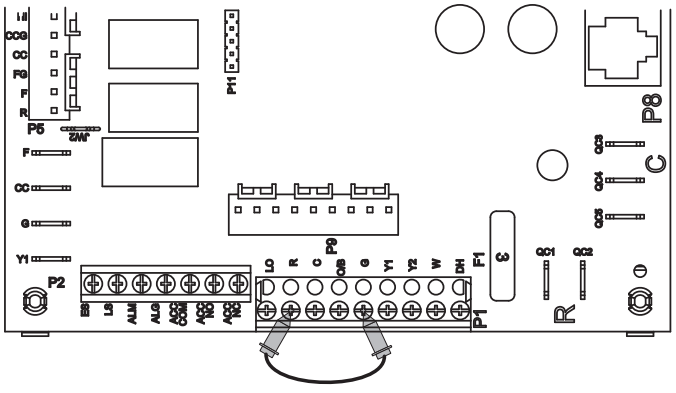
The blower will start on high speed and after 20 seconds the first stage of resistance heat is energized. Continuing demand will engage the second stage after 2 minutes.



Blower Only

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “G” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the “R” and “G” terminals as shown.

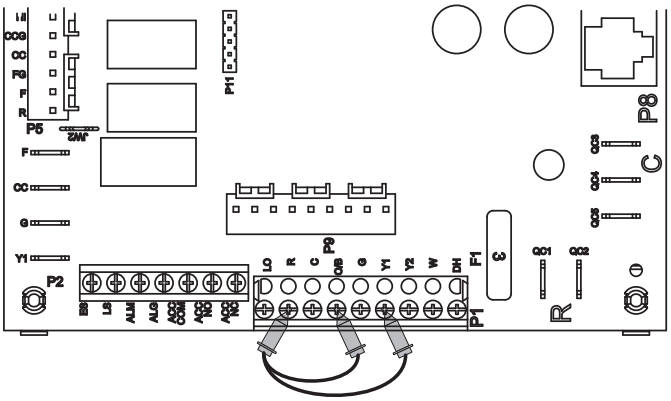
The blower will start on the “G” speed setting. Also, regardless of blower speed setting, the blower will remain on for 30 seconds at the end of each heating, cooling, emergency heat, or reheat cycle.



Stage 1 Cooling

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1” and “O” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, O, and Y1 terminals as shown.

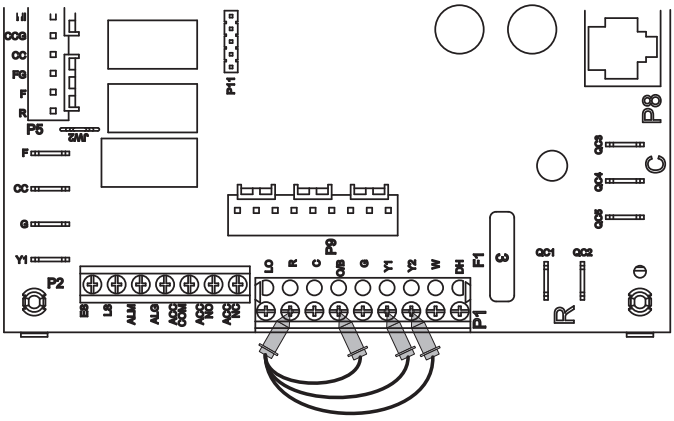
The blower motor will start in “G” blower speed setting immediately, the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input.



Stage 2 Cooling

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “Y1”, “Y2”, and “O” inputs to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R, O, Y1, and Y2 terminals as shown.

The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the Y1 input. The compressor will stage to full capacity 20 seconds after the compressor starts, and the blower will change to high speed.

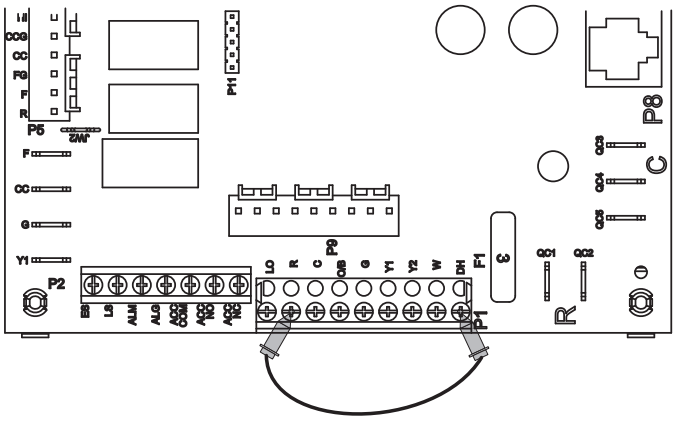


Jumping the Control Board cont.

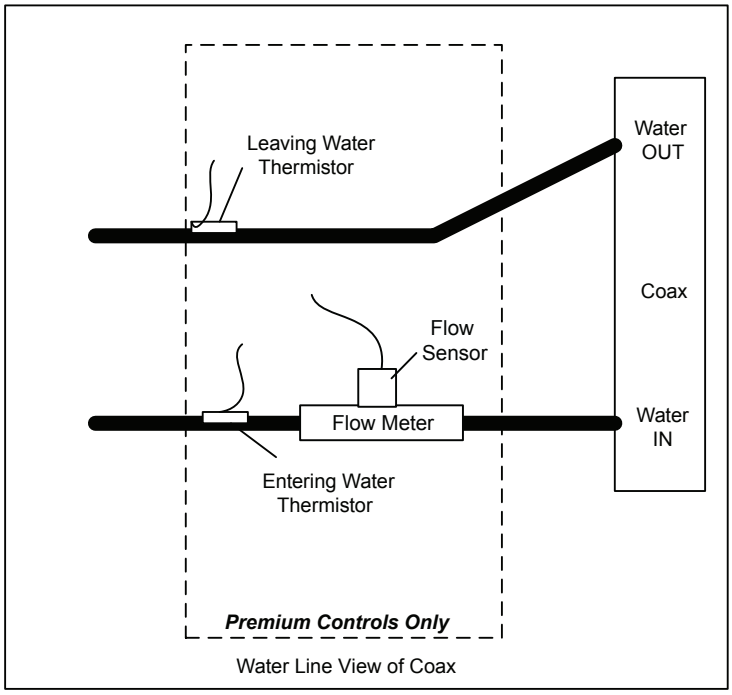
Reheat Mode

With the AID Tool go to the “Thermostat Inputs” Menu under “Diagnostics” and over-ride the “DH” input to ON. If an AID Tool is not available remove the P1 connector to disconnect the thermostat from the board. Place a jumper between the R and DH terminals as shown.

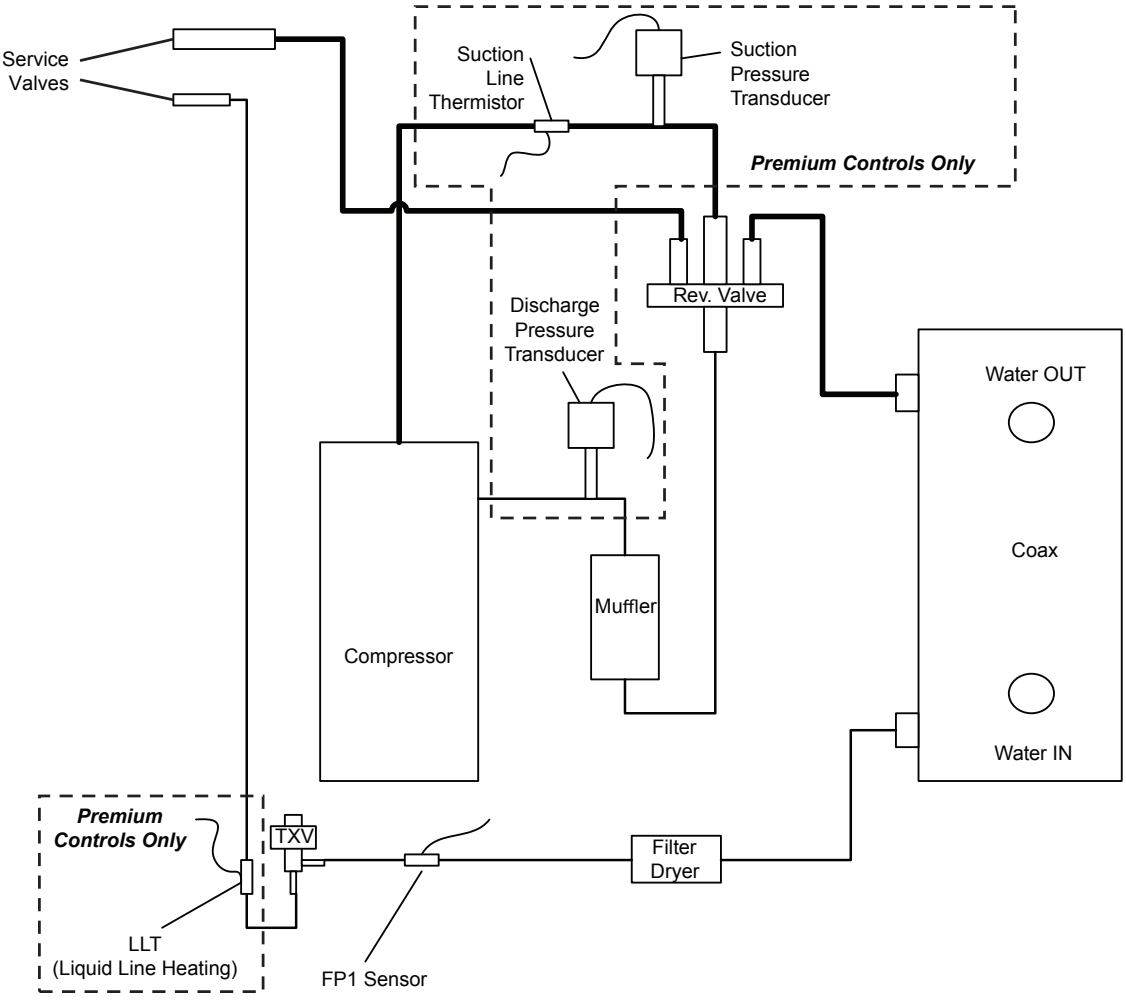
The blower motor will start in “G” blower speed setting immediately the compressor will start 10 seconds later. If the unit is equipped with an ECM blower motor it will switch to low speed 15 seconds after the DH input. 20 seconds after the DH input is received the compressor will switch to full capacity and the blower motor will switch to dehumidification high speed. 30 seconds after the compressor starts the alarm/reheat output will energize.



Troubleshooting



Water Line View of Coax



Troubleshooting cont.

Aurora Control System

NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

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 correct.
    - Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

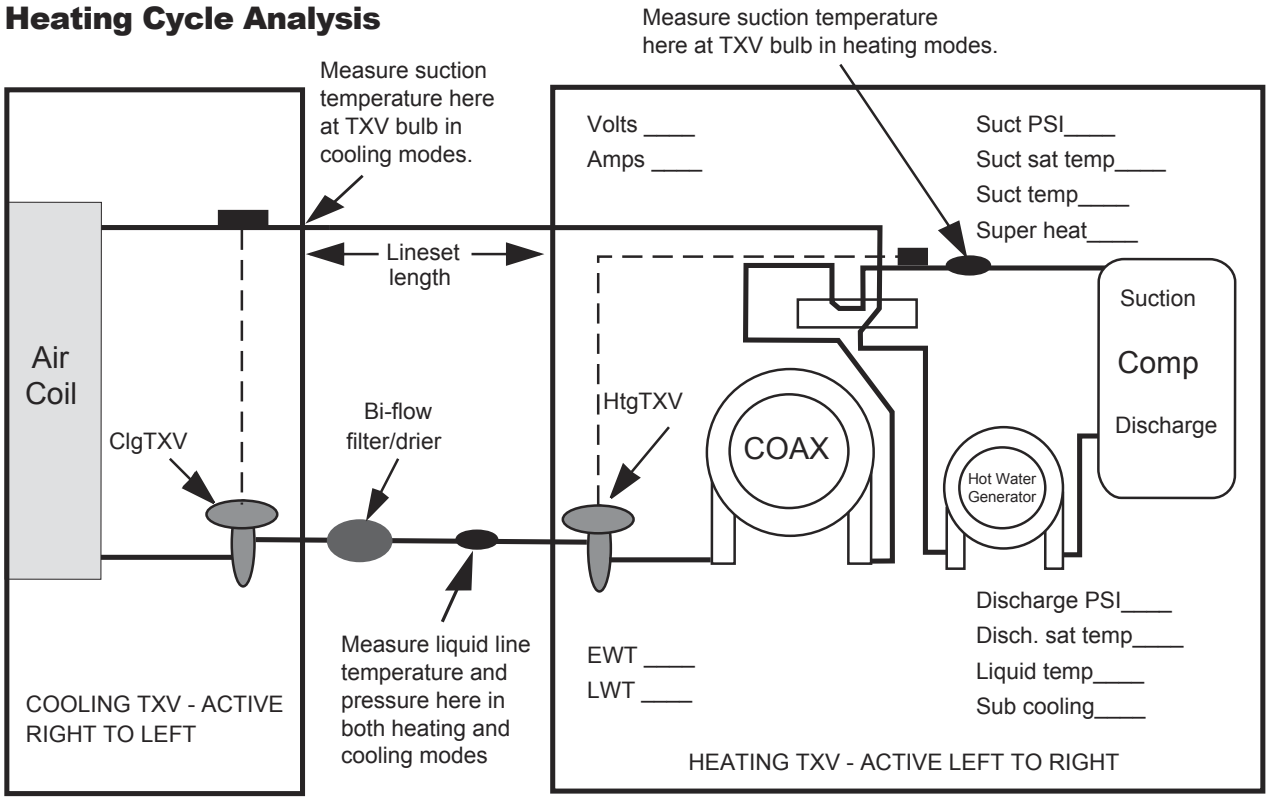
Refrigerant Systems

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 Unit 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.

NOTE: 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.

Troubleshooting cont.

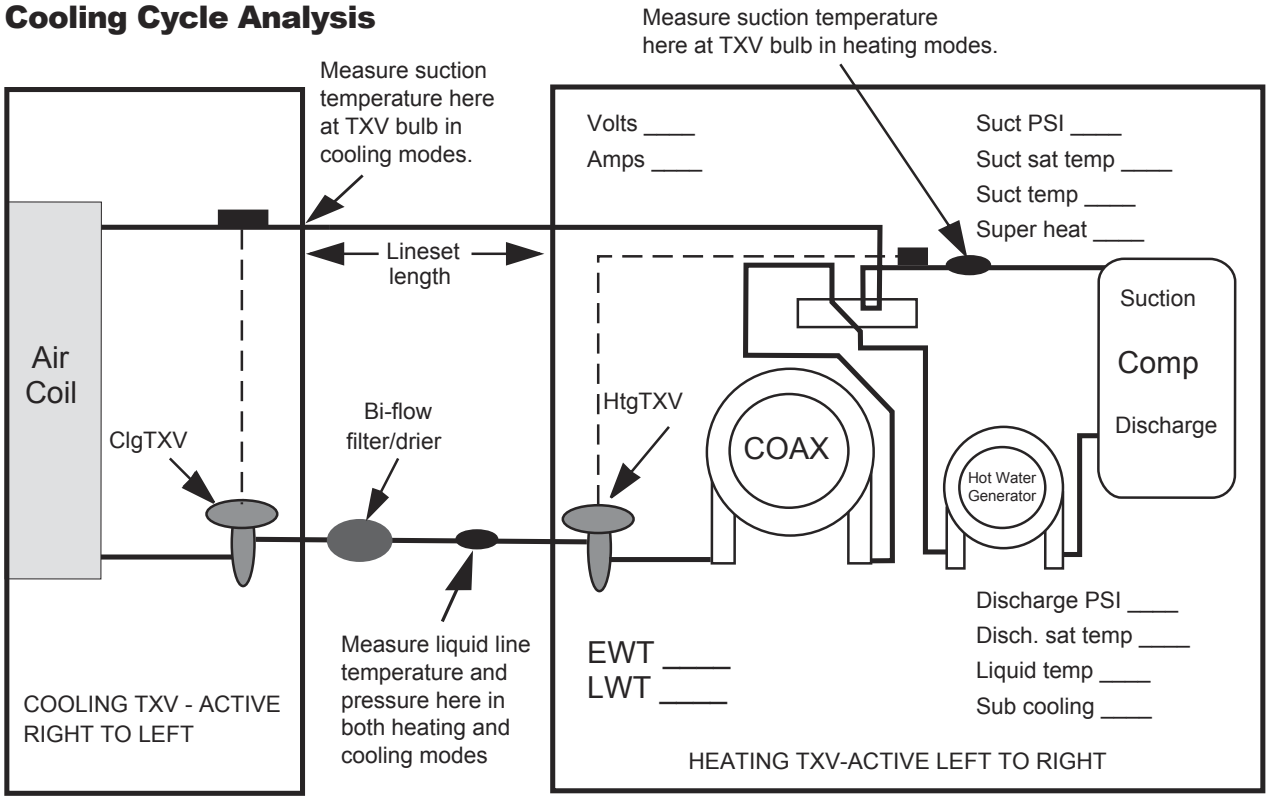
Heating Cycle Analysis



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

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

Cooling Cycle Analysis



Troubleshooting cont.

Single Speed/Dual Capacity Startup/Troubleshooting Form

1. Job Information

Model # _____ Job Name: _____ Loop: Open / Closed

Serial # _____ Install Date: _____ Hot Water Generator: Y / N

2. Flow Rate in gpm	**SOURCE COAX**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
WATER IN Pressure:	a. _____ psi	a. _____ psi	a. _____ psi	a. _____ psi
WATER OUT Pressure:	b. _____ psi	b. _____ psi	b. _____ psi	b. _____ psi
Pressure Drop: a - b	c. _____ psi	c. _____ psi	c. _____ psi	c. _____ psi
Look up flow rate in table:	d. _____ gpm	d. _____ gpm	d. _____ gpm	d. _____ gpm

3. Temp. Rise/Drop Across Air Coil[1]		
	HEATING	COOLING
SUPPLY AIR Temperature:	e. _____ °F	e. _____ °F
RETURN AIR Temperature:	f. _____ °F	f. _____ °F
Temperature Difference:	g. _____ °F	g. _____ °F

4. Temp. Rise/Drop Across Coaxial Heat Exchanger	**SOURCE COAX**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
WATER IN Temperature:	h. _____ °F	h. _____ °F	h. _____ °F	h. _____ °F
WATER OUT Temperature:	i. _____ °F	i. _____ °F	i. _____ °F	i. _____ °F
Temperature Difference:	j. _____ °F	j. _____ °F	j. _____ °F	j. _____ °F

5. Heat of Rejection (HR)/Heat of Extraction (HE)

Brine Factor[2]: k. _____

	HEATING	COOLING
HR/HE = d x g x k	l. _____ Btu/h	l. _____ Btu/h

STEPS 6-9 NEED ONLY BE COMPLETED IF A PROBLEM IS SUSPECTED.

6. Watts	ENERGY MONITOR	
	HEATING	COOLING
Volts:	m. _____ Volts	m. _____ Volts
Total Amps (Comp. + Blower)[3]:	n. _____ Amps	n. _____ Amps
Watts = m x n x 0.85:	o. _____ Watts	o. _____ Watts

7. Capacity

	HEATING	COOLING
Cooling Capacity = l - (o x 3.413): Heating Capacity = l + (o x 3.413):	p. _____ Btu/h	p. _____ Btu/h

8. Efficiency

	HEATING	COOLING
Cooling EER = p / o: Heating COP = p / (o x 3.413):	q. _____ Btu/h	q. _____ Btu/h

9. Superheat (S.H.)/Subcooling (S.C.)

	HEATING	COOLING
Suction Pressure:	r. _____ psi	r. _____ psi
Suction Saturation Temperature:	s. _____ °F	s. _____ °F
Suction Line Temperature:	t. _____ °F	t. _____ °F
S.H. = t - s	u. _____ °F	u. _____ °F
Head Pressure:	v. _____ psi	v. _____ psi
High Pressure Saturation Temp:	w. _____ °F	w. _____ °F
Liquid Line Temperature[4]:	x. _____ °F	x. _____ °F
S.C. = w - x	y. _____ °F	y. _____ °F

Software Version
ABC: _____
AXB: _____
IZ2: _____
T'STAT: _____

NOTES: [1] Steps 3-9 should be conducted with the hot water generator disconnected.

[2] Use 500 for pure water, 485 for methanol or Environol™. (This constant is derived by multiplying the weight of one gallon of water (8.34) times the minutes in one hour (60) times the specific heat of the fluid. Water has a specific heat of 1.0.

[3] If there is only one source of power for the compressor and blower, amp draw can be measured at the source wiring connection.

[4] Liquid line is between the coax and the expansion device in the cooling mode; between the air coil and the expansion device in the heating mode.

Performance Data

024 Part Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	3.0	0.7	1.6	**Operation not recommended**							**Operation not recommended**							
	5.0	2.3	5.4															
	7.0	4.0	9.2	500	11.4	1.19	7.4	91.1	2.81	1.4								
				700	11.5	1.10	7.7	85.2	3.06	1.6								
30	3.0	0.7	1.6	**Operation not recommended**							**Operation not recommended**							
	5.0	2.3	5.3	500	12.8	1.05	9.2	93.6	3.57	1.7	500	17.0	11.9	0.70	0.54	18.8	31.5	-
				700	13.1	1.08	9.5	87.4	3.57	1.6	700	17.3	13.0	0.75	0.57	19.2	30.4	-
	7.0	3.9	8.9	500	13.3	1.18	9.3	94.6	3.30	1.8	500	17.1	11.9	0.70	0.52	18.9	32.6	-
				700	13.4	1.09	9.7	87.7	3.60	1.7	700	17.5	13.0	0.74	0.55	19.4	31.8	-
40	3.0	0.7	1.5	**Operation not recommended**							**Operation not recommended**							
	5.0	2.2	5.1	500	14.5	1.10	10.8	96.9	3.89	1.7	500	18.3	13.1	0.72	0.59	20.3	31.3	-
				700	15.0	1.12	11.2	89.8	3.92	1.6	700	18.7	14.4	0.77	0.61	20.8	30.4	-
	7.0	3.7	8.7	500	14.8	1.11	11.1	97.5	3.93	1.8	500	18.5	13.1	0.71	0.57	20.4	32.5	-
				700	15.3	1.13	11.4	90.2	3.97	1.7	700	18.9	14.4	0.76	0.60	20.9	31.8	-
50	3.0	0.6	1.5	500	15.7	1.12	11.9	99.1	4.12	1.8	500	19.9	13.1	0.66	0.66	22.2	30.0	0.7
				700	16.2	1.13	12.3	91.4	4.19	1.7	700	20.9	14.5	0.69	0.70	23.3	30.0	0.8
	5.0	2.1	4.9	500	16.3	1.14	12.4	100.2	4.18	1.8	500	20.3	13.2	0.65	0.62	22.4	32.5	0.7
				700	16.8	1.16	12.9	92.3	4.25	1.8	700	21.4	14.7	0.69	0.66	23.6	32.6	0.7
	7.0	3.6	8.4	500	16.7	1.15	12.7	100.9	4.23	2.0	500	20.5	14.1	0.69	0.61	22.6	33.7	0.6
				700	17.2	1.17	13.2	92.8	4.31	1.8	700	21.6	15.7	0.73	0.64	23.8	33.8	0.7
60	3.0	0.6	1.4	500	17.6	1.15	13.7	102.6	4.48	2.0	500	19.0	12.9	0.68	0.73	21.5	26.0	0.9
				700	18.2	1.16	14.2	94.0	4.60	1.8	700	20.0	14.4	0.72	0.77	22.6	26.1	0.9
	5.0	2.1	4.8	500	18.4	1.18	14.3	104.0	4.56	2.0	500	19.5	13.1	0.67	0.70	21.9	28.0	0.8
				700	19.0	1.19	14.9	95.1	4.67	1.9	700	20.4	14.5	0.71	0.73	22.9	28.1	0.9
	7.0	3.5	8.1	500	18.8	1.20	14.8	104.9	4.62	2.1	500	19.7	13.8	0.70	0.68	22.0	29.0	0.7
				700	19.5	1.20	15.4	95.7	4.75	1.9	700	20.7	15.3	0.74	0.71	23.1	29.1	1.0
70	3.0	0.6	1.4	500	19.5	1.18	15.4	106.0	4.83	2.2	500	18.2	12.8	0.70	0.80	20.9	22.7	1.3
				700	20.4	1.20	16.3	97.0	4.98	2.0	700	19.2	14.8	0.77	0.87	22.2	22.1	1.4
	5.0	2.0	4.6	500	20.5	1.22	16.3	107.9	4.91	2.2	500	18.7	12.9	0.69	0.77	21.3	24.3	1.3
				700	21.1	1.22	17.0	97.9	5.07	2.0	700	19.5	14.3	0.74	0.80	22.2	24.5	1.4
	7.0	3.4	7.9	500	19.0	1.16	15.0	105.2	4.80	2.3	500	18.9	13.5	0.71	0.75	21.4	25.2	1.2
				700	21.7	1.23	17.5	98.7	5.17	2.1	700	19.7	14.9	0.76	0.78	22.4	25.3	1.3
80	3.0	0.6	1.3	500	21.1	1.20	17.0	109.1	5.13	2.4	500	17.3	12.6	0.73	0.95	20.5	18.2	1.8
				700	21.8	1.20	17.8	98.9	5.36	2.2	700	18.0	14.0	0.78	0.98	21.3	18.4	1.9
	5.0	1.9	4.5	500	22.3	1.25	18.0	111.3	5.22	2.4	500	17.8	12.7	0.72	0.92	20.9	19.4	1.8
				700	23.1	1.24	18.8	100.5	5.45	2.3	700	18.5	14.1	0.76	0.94	21.7	19.6	1.9
	7.0	3.3	7.6	500	23.0	1.27	18.6	112.5	5.30	2.6	500	18.0	13.0	0.73	0.90	21.0	20.0	1.7
				700	23.8	1.25	19.5	101.4	5.57	2.4	700	18.7	14.5	0.77	0.93	21.9	20.2	1.9
90	3.0	0.6	1.3	500	22.7	1.23	18.6	112.1	5.43	2.8	500	16.4	12.4	0.75	1.10	20.1	14.9	2.5
				700	23.6	1.21	19.4	101.2	5.71	2.5	700	17.0	13.7	0.81	1.12	20.8	15.1	2.6
	5.0	1.9	4.3	500	24.2	1.28	19.8	114.8	5.52	2.9	500	16.9	12.5	0.74	1.07	20.5	15.8	2.4
				700	25.0	1.26	20.7	103.1	5.82	2.6	700	17.5	13.9	0.79	1.09	21.2	16.0	2.5
	7.0	3.2	7.3	500	24.9	1.30	20.5	116.2	5.61	2.9	500	15.6	11.0	0.71	1.18	19.6	13.2	2.2
				700	25.8	1.27	21.5	104.1	5.95	2.6	700	17.7	14.0	0.79	1.07	21.4	16.5	2.4
100	3.0	0.5	1.2	**Operation not recommended**							**Operation not recommended**							
	5.0	1.8	4.2								500	15.2	11.6	0.76	1.33	19.8	11.4	3.0
											700	15.7	12.9	0.82	1.35	20.4	11.6	3.3
	7.0	3.1	7.1								500	15.4	11.6	0.75	1.31	19.9	11.8	2.9
											700	15.9	12.9	0.81	1.33	20.4	12.0	3.2
110	3.0	0.5	1.2								**Operation not recommended**							
	5.0	1.7	4.0								500	13.6	10.7	0.79	1.60	19.1	8.5	3.9
											700	14.0	11.9	0.86	1.61	19.5	8.7	4.0
	7.0	2.9	6.8								500	13.7	10.6	0.77	1.57	19.1	8.7	3.6
											700	14.1	11.7	0.83	1.59	19.5	8.9	4.1
120	3.0	0.5	1.2								**Operation not recommended**							
	5.0	1.7	3.8								500	12.9	11.0	0.85	1.65	18.5	7.8	4.7
											700	13.1	11.9	0.91	1.70	18.9	7.7	5.1
	7.0	2.8	6.5								500	13.0	11.0	0.84	1.60	18.5	8.1	4.3
											700	13.3	11.9	0.89	1.65	18.9	8.1	4.9

Performance capacities shown in thousands of Btuh.

8/9/24

Performance Data cont.

024 Full Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	4.0	1.3	3.0	**Operation not recommended**							**Operation not recommended**							
	6.0	2.6	5.9															
	8.0	5.0	11.6	700 900	16.0 16.3	1.42 1.45	11.2 11.4	91.2 86.8	3.31 3.29	2.1 2.0								
30	4.0	1.2	2.9	**Operation not recommended**							**Operation not recommended**							
	6.0	2.5	5.8	700 900	18.0 18.5	1.51 1.55	12.9 13.2	93.8 89.1	3.50 3.49	2.3 2.1	700 900	24.5 24.9	15.6 17.0	0.64 0.68	1.00 1.06	27.9 28.5	24.4 23.6	- -
	8.0	4.9	11.3	700 900	18.6 18.9	1.54 1.57	13.3 13.5	94.6 89.4	3.54 3.53	2.3 2.2	700 900	24.6 25.2	15.6 17.0	0.63 0.67	0.97 1.02	27.9 28.7	25.3 24.7	- -
40	4.0	1.2	2.8	**Operation not recommended**							**Operation not recommended**							
	6.0	2.4	5.6	700 900	20.4 21.1	1.53 1.57	15.2 15.7	97.0 91.7	3.91 3.94	2.5 2.3	700 900	25.5 26.0	17.1 18.7	0.67 0.72	1.09 1.14	29.2 29.9	23.4 22.8	- -
	8.0	4.7	11.0	700 900	20.8 21.5	1.55 1.58	15.6 16.1	97.6 92.1	3.95 3.99	2.6 2.4	700 900	25.7 26.3	17.1 18.7	0.67 0.71	1.06 1.11	29.3 30.1	24.3 23.8	- -
50	4.0	1.2	2.7	700 900	22.0 22.7	1.52 1.54	16.9 17.4	99.2 93.4	4.25 4.32	2.7 2.5	700 900	26.9 28.3	17.0 18.9	0.63 0.67	1.23 1.30	31.1 32.7	21.8 21.8	1.3 1.4
	6.0	2.3	5.4	700 900	22.9 23.6	1.56 1.58	17.5 18.2	100.2 94.3	4.31 4.39	2.8 2.6	700 900	27.5 28.9	17.2 19.1	0.63 0.66	1.16 1.22	31.4 33.0	23.6 23.7	1.3 1.2
	8.0	4.6	10.6	700 900	23.4 24.1	1.57 1.59	18.0 18.7	100.9 94.8	4.36 4.44	2.9 2.6	700 900	27.7 29.2	18.4 20.4	0.66 0.70	1.13 1.19	31.6 33.3	24.5 24.5	1.3 1.3
60	4.0	1.1	2.6	700 900	24.6 25.4	1.60 1.61	19.2 19.9	102.6 96.2	4.51 4.63	3.0 2.8	700 900	26.1 27.4	17.1 19.0	0.65 0.69	1.35 1.41	30.7 32.2	19.4 19.4	1.6 1.7
	6.0	2.3	5.3	700 900	25.8 26.6	1.65 1.66	20.1 20.9	104.1 97.4	4.59 4.71	3.0 2.8	700 900	26.7 28.0	17.3 19.2	0.65 0.69	1.28 1.33	31.1 32.5	20.9 21.0	1.5 1.6
	8.0	4.4	10.3	700 900	26.4 27.3	1.66 1.67	20.7 21.6	104.9 98.0	4.65 4.78	3.2 2.9	700 900	27.0 28.3	18.2 20.2	0.68 0.71	1.25 1.31	31.2 32.8	21.6 21.7	1.4 1.6
70	4.0	1.1	2.5	700 900	27.3 28.6	1.68 1.72	21.5 22.7	106.1 99.4	4.75 4.87	3.2 3.0	700 900	25.3 26.9	17.2 19.7	0.68 0.73	1.37 1.44	30.0 31.8	18.5 18.7	2.0 2.1
	6.0	2.2	5.1	700 900	28.7 29.6	1.74 1.74	22.7 23.7	107.9 100.5	4.84 5.00	3.4 3.1	700 900	26.0 27.1	17.4 19.2	0.67 0.71	1.40 1.45	30.7 32.0	18.6 18.7	1.9 2.0
	8.0	4.3	9.9	700 900	29.4 30.4	1.76 1.75	23.4 24.4	108.9 101.3	4.90 5.09	3.5 3.2	700 900	26.2 27.4	18.1 20.0	0.69 0.73	1.36 1.42	30.9 32.2	19.2 19.3	1.7 1.9
80	4.0	1.1	2.5	700 900	29.0 30.0	1.73 1.72	23.1 24.2	108.4 100.9	4.91 5.13	3.6 3.3	700 900	24.2 25.2	16.9 18.8	0.70 0.74	1.63 1.68	29.8 30.9	14.9 15.0	2.5 2.7
	6.0	2.1	4.9	700 900	30.7 31.7	1.80 1.78	24.5 25.7	110.6 102.6	5.00 5.22	3.7 3.5	700 900	24.9 25.9	17.1 18.9	0.69 0.73	1.57 1.62	30.3 31.4	15.9 16.0	2.3 2.5
	8.0	4.2	9.6	700 900	31.6 32.7	1.82 1.80	25.4 26.5	111.8 103.6	5.08 5.33	3.9 3.6	700 900	25.2 26.2	17.5 19.4	0.70 0.74	1.54 1.59	30.4 31.6	16.4 16.5	2.2 2.4
90	4.0	1.0	2.4	700 900	30.8 31.9	1.78 1.75	24.7 25.9	110.7 102.8	5.07 5.33	3.9 3.7	700 900	23.2 24.0	16.6 18.4	0.72 0.77	1.79 1.84	29.3 30.2	12.9 13.0	2.5 2.7
	6.0	2.0	4.7	700 900	32.7 33.9	1.86 1.83	26.4 27.6	113.3 104.8	5.15 5.43	4.1 3.8	700 900	23.8 24.7	16.8 18.7	0.71 0.75	1.74 1.79	29.8 30.8	13.7 13.8	2.4 2.6
	8.0	4.0	9.3	700 900	33.7 34.9	1.89 1.84	27.3 28.6	114.6 105.9	5.24 5.56	4.3 4.0	700 900	22.0 25.0	15.3 18.8	0.70 0.75	1.62 1.75	27.5 31.0	13.6 14.3	2.7 3.0
100	4.0	1.0	2.3	**Operation not recommended**							**Operation not recommended**							
	6.0	2.0	4.6								700 900	21.6 22.3	15.5 17.2	0.72 0.77	1.97 2.00	28.3 29.1	11.0 11.2	3.6 3.9
	8.0	3.9	8.9								700 900	21.8 22.6	15.5 17.1	0.71 0.76	1.93 1.97	28.4 29.3	11.3 11.5	3.3 3.7
110	4.0	1.0	2.2								**Operation not recommended**							
	6.0	1.9	4.4								700 900	19.4 19.9	14.1 15.7	0.73 0.79	2.20 2.21	26.9 27.4	8.8 9.0	4.4 4.7
	8.0	3.7	8.6								700 900	19.6 20.1	14.0 15.4	0.71 0.77	2.16 2.18	26.9 27.5	9.1 9.2	4.1 4.5
120	4.0	0.9	2.1								**Operation not recommended**							
	6.0	1.8	4.2								700 900	18.7 19.1	14.6 15.9	0.78 0.83	2.38 2.45	26.9 27.4	7.9 7.8	5.3 5.7
	8.0	3.6	8.2								700 900	18.9 19.3	14.6 15.9	0.78 0.82	2.31 2.38	26.8 27.4	8.2 8.1	4.9 5.6

Performance capacities shown in thousands of Btuh.

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Performance Data cont.

036 Part Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	4.0	0.8	1.9	Operation not recommended							Operation not recommended							
	6.0	2.0	4.6															
	8.0	3.0	7.0	800	17.6	1.56	12.3	90.4	3.31	2.3								
				1000	17.5	1.65	11.9	86.2	3.11	2.1								
30	4.0	0.8	1.8	Operation not recommended							Operation not recommended							
	6.0	1.9	4.5	800	19.3	1.70	13.5	92.4	3.33	2.4	800	25.8	18.0	0.70	0.89	28.9	28.9	-
				1000	19.9	1.75	13.9	88.4	3.33	2.2	1000	26.3	19.7	0.75	0.94	29.5	27.9	-
	8.0	3.0	6.8	800	20.4	1.67	14.7	93.6	3.58	2.5	800	26.0	18.0	0.69	0.87	28.9	30.0	-
				1000	20.3	1.77	14.3	88.8	3.36	2.3	1000	26.6	19.7	0.74	0.91	29.7	29.2	-
40	4.0	0.8	1.8	Operation not recommended							Operation not recommended							
	6.0	1.9	4.3	800	22.3	1.73	16.4	95.8	3.79	2.5	800	27.1	18.6	0.69	0.96	30.4	28.2	-
				1000	23.0	1.76	17.0	91.3	3.83	2.3	1000	27.6	20.3	0.73	1.01	31.1	27.4	-
	8.0	2.9	6.6	800	22.8	1.74	16.8	96.4	3.83	2.6	800	27.3	18.6	0.68	0.93	30.5	29.3	-
				1000	23.5	1.78	17.4	91.8	3.87	2.4	1000	28.0	20.3	0.73	0.98	31.3	28.7	-
50	4.0	0.7	1.7	800	24.4	1.71	18.6	98.3	4.18	2.6	800	27.0	17.4	0.65	1.08	30.7	25.0	0.9
				1000	25.2	1.74	19.2	93.3	4.25	2.4	1000	28.4	19.4	0.68	1.13	32.3	25.1	1.0
	6.0	1.8	4.2	800	25.3	1.75	19.3	99.3	4.24	2.7	800	27.6	17.6	0.64	1.02	31.0	27.2	0.9
				1000	26.1	1.77	20.1	94.2	4.32	2.5	1000	29.0	19.6	0.68	1.06	32.6	27.2	0.9
	8.0	2.8	6.4	800	25.9	1.77	19.9	100.0	4.30	2.8	800	27.8	18.8	0.68	0.99	31.2	28.1	0.8
				1000	26.7	1.79	20.6	94.7	4.37	2.5	1000	29.3	20.9	0.71	1.04	32.8	28.2	0.9
60	4.0	0.7	1.7	800	26.9	1.73	20.9	101.1	4.54	2.9	800	27.2	18.6	0.68	1.23	31.5	22.1	1.3
				1000	27.7	1.75	21.8	95.7	4.66	2.7	1000	28.6	20.7	0.72	1.29	33.0	22.2	1.4
	6.0	1.8	4.1	800	28.1	1.78	22.0	102.5	4.61	3.0	800	27.9	18.8	0.67	1.17	31.9	23.8	1.2
				1000	29.0	1.79	22.9	96.8	4.73	2.8	1000	29.2	20.9	0.71	1.22	33.4	23.9	1.3
	8.0	2.7	6.2	800	28.8	1.80	22.6	103.3	4.68	3.1	800	28.2	19.8	0.70	1.14	32.1	24.6	1.1
				1000	29.7	1.81	23.5	97.5	4.81	2.9	1000	29.6	22.0	0.74	1.20	33.6	24.7	1.2
70	4.0	0.7	1.6	800	29.3	1.76	23.3	103.9	4.89	3.3	800	27.5	19.8	0.72	1.39	32.3	19.8	1.9
				1000	30.9	1.81	24.7	98.6	5.00	3.0	1000	29.6	23.0	0.78	1.48	34.1	20.0	2.1
	6.0	1.7	3.9	800	30.8	1.82	24.6	105.7	4.98	3.2	800	28.2	20.1	0.71	1.33	32.8	21.2	1.8
				1000	31.8	1.82	25.6	99.5	5.14	2.9	1000	29.4	22.2	0.75	1.38	34.4	21.4	2.0
	8.0	2.6	6.0	800	31.6	1.84	25.4	106.6	5.04	3.3	800	28.5	20.9	0.73	1.30	32.9	22.0	1.7
				1000	32.7	1.83	26.5	100.3	5.24	3.0	1000	29.8	23.1	0.78	1.35	34.6	22.1	1.9
80	4.0	0.7	1.6	800	30.7	1.78	24.7	105.6	5.05	3.5	800	26.6	19.7	0.74	1.61	32.1	16.5	2.6
				1000	31.8	1.77	25.8	99.5	5.27	3.2	1000	27.6	22.0	0.79	1.66	33.3	16.6	2.8
	6.0	1.6	3.8	800	32.5	1.85	26.2	107.6	5.14	3.6	800	27.3	20.0	0.73	1.56	32.6	17.6	2.5
				1000	33.6	1.84	27.4	101.1	5.37	3.3	1000	28.4	22.2	0.78	1.60	33.9	17.7	2.3
	8.0	2.5	5.8	800	33.5	1.88	27.0	108.7	5.22	3.7	800	27.6	20.5	0.74	1.52	32.8	18.1	3.0
				1000	34.6	1.85	28.3	102.0	5.48	3.4	1000	28.8	22.7	0.79	1.57	34.1	18.3	2.6
90	4.0	0.7	1.5	800	32.2	1.81	26.0	107.2	5.21	3.8	800	25.7	19.7	0.77	1.83	31.9	14.0	3.6
				1000	33.3	1.78	27.3	100.9	5.48	3.5	1000	26.6	21.9	0.82	1.88	33.0	14.1	3.8
	6.0	1.6	3.7	800	34.2	1.89	27.8	109.6	5.30	4.0	800	26.4	20.0	0.76	1.78	32.5	14.8	3.4
				1000	35.4	1.86	29.1	102.8	5.59	3.6	1000	27.4	22.1	0.81	1.83	33.6	15.0	3.6
	8.0	2.4	5.6	800	35.3	1.92	28.7	110.8	5.39	4.1	800	26.1	20.9	0.80	1.71	31.9	15.3	3.2
				1000	36.5	1.87	30.1	103.8	5.72	3.8	1000	27.7	22.3	0.81	1.79	33.8	15.5	3.5
100	4.0	0.6	1.5	Operation not recommended							Operation not recommended							
	6.0	1.5	3.5								800	24.7	19.6	0.79	1.94	31.4	12.7	4.3
											1000	25.5	21.7	0.85	1.97	32.3	12.9	4.7
	8.0	2.3	5.4								800	25.0	19.5	0.78	1.91	31.5	13.1	4.0
											1000	25.8	21.6	0.84	1.94	32.4	13.3	4.4
110	4.0	0.6	1.4								Operation not recommended							
	6.0	1.5	3.4								800	23.0	19.2	0.83	2.11	30.2	10.9	5.3
											1000	23.7	21.3	0.90	2.12	30.9	11.2	5.8
	8.0	2.2	5.2								800	23.3	18.9	0.81	2.07	30.3	11.3	4.9
											1000	23.9	20.9	0.87	2.09	31.0	11.4	5.5
120	4.0	0.6	1.3								Operation not recommended							
	6.0	1.4	3.3								800	21.1	18.9	0.90	2.61	30.0	8.1	6.6
											1000	21.4	20.5	0.96	2.67	30.6	8.0	7.1
	8.0	2.2	5.0								800	21.2	18.9	0.89	2.52	29.8	8.4	6.1
											1000	21.7	20.5	0.94	2.60	30.6	8.3	6.8

Performance capacities shown in thousands of Btuh.

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Performance Data cont.

036 Full Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	5.0	1.2	2.7	**Operation not recommended**							**Operation not recommended**							
	7.0	2.5	5.7															
	9.0	3.7	8.7	1000	25.5	2.13	18.2	93.6	3.50	3.0								
				1200	25.4	2.22	17.8	89.6	3.35	2.8								
30	5.0	1.1	2.6	**Operation not recommended**							**Operation not recommended**							
	7.0	2.4	5.5	1000	27.3	2.22	19.8	95.3	3.61	3.1	1000	32.5	22.4	0.69	1.37	37.2	23.8	-
				1200	28.1	2.29	20.3	91.7	3.61	2.8	1200	33.1	24.5	0.74	1.44	38.0	23.0	-
	9.0	3.6	8.4	1000	28.8	2.22	21.2	96.7	3.80	3.2	1000	32.7	22.4	0.69	1.32	37.2	24.7	-
				1200	28.7	2.31	20.8	92.1	3.64	2.9	1200	33.5	24.5	0.73	1.39	38.2	24.1	-
40	5.0	1.1	2.5	**Operation not recommended**							**Operation not recommended**							
	7.0	2.3	5.3	1000	30.6	2.28	22.9	98.4	3.94	3.3	1000	33.8	21.4	0.63	1.53	39.0	22.1	-
				1200	31.6	2.33	23.6	94.4	3.98	3.0	1200	34.4	23.4	0.68	1.60	39.9	21.5	-
	9.0	3.5	8.2	1000	31.3	2.30	23.4	98.9	3.98	3.4	1000	34.0	21.4	0.63	1.48	39.1	23.0	-
				1200	32.3	2.35	24.2	94.9	4.02	3.1	1200	34.8	23.4	0.67	1.55	40.1	22.5	-
50	5.0	1.1	2.5	1000	32.8	2.29	25.0	100.3	4.20	3.5	1000	33.2	18.6	0.56	1.77	39.3	18.8	1.8
				1200	33.7	2.32	25.8	96.0	4.27	3.2	1200	35.0	20.7	0.59	1.86	41.3	18.8	1.9
	7.0	2.2	5.2	1000	34.0	2.34	26.0	101.4	4.26	3.6	1000	34.0	18.8	0.55	1.67	39.7	20.3	1.7
				1200	35.0	2.37	27.0	97.0	4.33	3.3	1200	35.7	20.9	0.59	1.75	41.7	20.4	1.8
	9.0	3.4	7.9	1000	34.7	2.36	26.7	102.1	4.31	3.7	1000	34.3	20.1	0.59	1.63	39.8	21.1	1.6
				1200	35.8	2.39	27.6	97.6	4.39	3.4	1200	36.1	22.3	0.62	1.71	41.9	21.1	1.7
60	5.0	1.0	2.4	1000	35.6	2.39	27.4	102.9	4.37	4.1	1000	33.8	21.2	0.63	2.01	40.7	16.8	2.1
				1200	36.7	2.40	28.5	98.3	4.48	3.7	1200	35.4	23.6	0.66	2.10	42.6	16.9	2.3
	7.0	2.2	5.0	1000	37.2	2.45	28.8	104.4	4.44	4.2	1000	34.6	21.4	0.62	1.91	41.1	18.1	2.0
				1200	38.4	2.47	30.0	99.6	4.56	3.9	1200	36.2	23.8	0.66	1.99	43.0	18.2	2.2
	9.0	3.3	7.6	1000	38.1	2.48	29.6	105.3	4.50	4.3	1000	34.9	22.6	0.65	1.87	41.3	18.7	1.9
				1200	39.4	2.49	30.9	100.4	4.63	4.0	1200	36.7	25.1	0.68	1.95	43.3	18.8	2.1
70	5.0	1.0	2.3	1000	38.5	2.49	30.0	105.6	4.53	4.6	1000	34.4	23.8	0.69	2.25	42.0	18.5	3.0
				1200	42.0	2.57	33.2	102.4	4.79	4.2	1200	37.1	27.1	2.12	2.08	44.2	17.8	3.1
	7.0	2.1	4.9	1000	40.4	2.57	31.7	107.5	4.61	4.7	1000	35.2	24.1	0.68	2.16	42.6	16.3	2.8
				1200	41.8	2.57	33.0	102.2	4.76	4.3	1200	36.8	26.7	0.73	2.23	44.4	16.5	3.0
	9.0	3.2	7.4	1000	41.5	2.60	32.6	108.4	4.68	4.9	1000	35.6	25.1	0.71	2.10	42.8	16.9	2.6
				1200	42.9	2.59	34.1	103.1	4.85	4.5	1200	37.2	27.8	0.75	2.19	44.7	17.0	2.9
80	5.0	1.0	2.2	1000	39.8	2.55	31.1	106.9	4.57	5.0	1000	33.8	24.5	0.72	2.41	42.1	14.0	3.7
				1200	41.2	2.53	32.6	101.8	4.76	4.6	1200	35.2	27.3	0.78	2.49	43.7	14.1	3.8
	7.0	2.0	4.7	1000	42.1	2.66	33.0	109.0	4.65	5.2	1000	34.8	24.8	0.71	2.33	42.7	14.9	3.4
				1200	43.5	2.63	34.6	103.6	4.85	4.8	1200	36.2	27.5	0.76	2.40	44.4	15.1	3.7
	9.0	3.1	7.1	1000	43.3	2.69	34.1	110.1	4.72	5.4	1000	35.2	25.5	0.72	2.28	42.9	15.4	3.2
				1200	44.8	2.65	35.8	104.6	4.95	4.9	1200	36.6	28.2	0.77	2.35	44.6	15.6	3.5
90	5.0	0.9	2.2	1000	41.2	2.62	32.2	108.1	4.60	5.3	1000	33.3	25.3	0.76	2.57	42.1	13.0	4.4
				1200	42.6	2.58	33.8	102.9	4.84	5.1	1200	34.5	28.1	0.81	2.64	43.5	13.1	4.7
	7.0	2.0	4.5	1000	43.8	2.74	34.4	110.5	4.68	5.7	1000	34.3	25.6	0.75	2.50	42.9	13.7	4.1
				1200	45.3	2.69	36.1	105.0	4.94	5.3	1200	35.6	28.4	0.80	2.56	44.3	13.9	4.5
	9.0	3.0	6.9	1000	45.1	2.78	35.7	111.8	4.76	5.9	1000	35.8	26.4	0.74	2.38	43.9	15.0	3.9
				1200	46.7	2.71	37.5	106.0	5.05	5.5	1200	36.0	28.6	0.79	2.51	44.6	14.3	4.3
100	5.0	0.9	2.1	**Operation not recommended**							**Operation not recommended**							
	7.0	1.9	4.4								1000	33.2	25.6	0.77	2.75	42.5	12.1	5.2
											1200	34.2	28.4	0.83	2.79	43.8	12.3	5.6
	9.0	2.9	6.6								1000	33.5	25.5	0.76	2.70	42.7	12.4	4.9
											1200	34.6	28.2	0.82	2.75	44.0	12.6	5.4
110	5.0	0.9	2.0								**Operation not recommended**							
	7.0	1.8	4.2								1000	32.0	25.5	0.80	3.00	42.2	10.7	6.3
											1200	32.9	28.4	0.86	3.02	43.2	10.9	6.9
	9.0	2.8	6.4								1000	32.3	25.2	0.78	2.95	42.4	11.0	5.9
											1200	33.2	27.8	0.84	2.98	43.4	11.1	6.5
120	5.0	0.8	1.9								**Operation not recommended**							
	7.0	1.7	4.0								1000	30.2	24.2	0.80	3.47	42.0	8.7	7.7
											1200	30.7	26.3	0.86	3.56	42.9	8.6	8.3
	9.0	2.7	6.1								1000	30.5	24.2	0.80	3.35	41.9	9.1	7.2
											1200	31.1	26.3	0.85	3.46	42.9	9.0	7.9

Performance capacities shown in thousands of Btuh.

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Performance Data cont.

048 Part Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	5.0	0.7	1.7	**Operation not recommended**							**Operation not recommended**							
	8.0	1.5	3.5															
	11.0	2.7	6.2	1200	23.0	2.36	15.0	87.8	2.87	4.1								
				1400	22.1	2.22	14.5	84.6	2.92	3.8								
30	5.0	0.6	1.6	**Operation not recommended**							**Operation not recommended**							
	8.0	1.5	3.4	1200	23.4	2.01	16.5	88.0	3.40	4.2	1200	32.9	25.0	0.76	1.10	36.7	29.9	-
				1400	24.3	2.07	17.3	86.1	3.45	3.8	1400	33.5	27.3	0.82	1.16	37.4	28.9	-
	11.0	2.6	6.0	1200	27.0	2.25	19.3	90.8	3.52	4.3	1200	33.1	25.0	0.75	1.07	36.7	31.0	-
				1400	25.9	2.12	18.7	87.1	3.58	3.9	1400	33.9	27.3	0.81	1.12	37.7	30.3	-
40	5.0	0.6	1.6	**Operation not recommended**							**Operation not recommended**							
	8.0	1.4	3.3	1200	28.1	2.04	21.1	91.7	4.03	4.3	1200	35.4	25.6	0.72	1.22	39.6	29.1	-
				1400	29.0	2.08	21.9	89.2	4.09	3.9	1400	36.1	28.0	0.77	1.28	40.4	28.3	-
	11.0	2.5	5.9	1200	29.6	2.09	22.5	92.8	4.15	4.4	1200	35.7	25.6	0.72	1.18	39.7	30.2	-
				1400	30.6	2.13	23.3	90.2	4.21	3.9	1400	36.5	28.0	0.77	1.24	40.7	29.6	-
50	5.0	0.5	1.2	1200	31.6	2.06	24.6	94.4	4.49	4.4	1200	37.1	25.0	0.68	1.37	41.8	27.0	1.5
				1400	32.6	2.09	25.5	91.6	4.57	4.1	1400	38.1	27.7	0.73	1.35	42.7	28.2	1.6
	8.0	1.4	3.2	1200	32.8	2.07	25.7	95.3	4.64	4.6	1200	37.4	25.2	0.67	1.34	42.0	28.0	1.4
				1400	33.7	2.09	26.6	92.3	4.73	4.2	1400	38.5	27.9	0.72	1.36	43.1	28.2	1.6
	11.0	2.5	5.7	1200	34.3	2.11	27.1	96.5	4.75	4.7	1200	38.0	25.8	0.68	1.32	42.6	28.7	1.3
				1400	35.3	2.14	28.0	93.3	4.83	4.3	1400	39.1	28.6	0.73	1.35	43.7	29.0	1.5
60	5.0	0.5	1.2	1200	34.9	2.12	27.7	96.9	4.83	4.9	1200	36.1	24.9	0.69	1.59	41.6	22.7	2.1
				1400	35.8	2.13	28.5	93.6	4.92	4.5	1400	37.1	27.6	0.74	1.62	42.7	22.9	2.3
	8.0	1.3	3.1	1200	36.3	2.11	29.1	98.0	5.04	5.0	1200	36.5	25.1	0.69	1.55	41.8	23.5	2.0
				1400	37.1	2.12	29.9	94.6	5.12	4.6	1400	37.5	27.7	0.74	1.58	42.9	23.7	2.2
	11.0	2.4	5.5	1200	37.6	2.16	30.2	99.0	5.10	5.2	1200	37.1	25.7	0.69	1.54	42.3	24.1	1.9
				1400	38.4	2.17	31.0	95.4	5.19	4.7	1400	38.1	28.5	0.75	1.57	43.4	24.3	2.1
70	5.0	0.4	0.7	1200	38.1	2.17	30.7	99.4	5.15	5.4	1200	35.2	24.8	0.70	1.81	41.4	19.5	3.1
				1400	38.2	2.17	30.8	95.3	5.16	5.0	1400	36.9	28.4	0.77	1.99	42.6	18.5	3.3
	8.0	1.3	3.0	1200	39.8	2.16	32.4	100.7	5.40	5.6	1200	35.5	24.9	0.70	1.76	41.5	20.2	2.9
				1400	40.5	2.16	33.1	96.8	5.50	5.2	1400	36.5	27.6	0.76	1.80	43.2	20.3	3.1
	11.0	2.3	5.3	1200	41.4	2.33	33.5	101.9	5.21	5.8	1200	36.1	25.6	0.71	1.75	42.1	20.7	2.7
				1400	41.5	2.20	34.0	97.4	5.53	5.3	1400	37.1	28.3	0.76	1.78	43.7	20.8	3.0
80	5.0	0.4	0.7	1200	42.0	2.20	34.5	102.4	5.61	6.1	1200	34.0	24.5	0.72	2.06	41.0	16.5	4.5
				1400	42.6	2.19	35.2	98.2	5.71	5.6	1400	34.9	27.1	0.78	2.10	42.1	16.6	4.7
	8.0	1.3	2.9	1200	44.1	2.18	36.6	104.0	5.91	6.3	1200	34.3	24.6	0.72	2.01	41.1	17.1	4.2
				1400	44.6	2.17	37.2	99.5	6.03	5.8	1400	35.2	27.3	0.77	2.05	42.2	17.2	4.5
	11.0	2.2	5.1	1200	44.7	2.23	37.1	104.5	5.87	6.5	1200	34.8	25.3	0.72	1.99	41.6	17.5	3.9
				1400	45.2	2.21	37.6	99.9	5.99	6.0	1400	35.8	28.0	0.78	2.03	42.7	17.6	4.3
90	5.0	0.3	0.6	1200	46.0	2.23	38.4	105.5	6.04	6.8	1200	32.7	24.2	0.74	2.32	40.6	14.1	6.3
				1400	46.4	2.20	38.9	100.7	6.17	6.3	1400	33.6	26.8	0.80	2.36	41.7	14.2	6.6
	8.0	1.2	2.8	1200	48.4	2.21	40.8	107.3	6.41	7.0	1200	33.0	24.3	0.74	2.26	40.7	14.6	5.9
				1400	48.7	2.18	41.2	102.2	6.54	6.5	1400	33.9	26.9	0.79	2.30	41.8	14.8	6.3
	11.0	2.1	5.0	1200	48.6	2.26	40.9	107.5	6.31	7.2	1200	34.8	27.3	0.78	2.38	42.9	14.6	5.5
				1400	48.8	2.22	41.2	102.3	6.44	6.7	1400	34.5	27.6	0.80	2.28	42.3	15.1	6.0
100	5.0	0.3	0.6	**Operation not recommended**							**Operation not recommended**							
	8.0	1.2	2.7								1200	30.7	24.7	0.80	2.72	40.0	11.3	7.3
											1400	31.6	27.3	0.86	2.77	41.0	11.4	8.1
	11.0	2.1	4.8								1200	31.2	25.3	0.81	2.69	40.4	11.6	6.9
											1400	32.1	28.0	0.87	2.75	41.5	11.7	7.6
110	5.0	0.3	0.6								**Operation not recommended**							
	8.0	1.1	2.6								1200	28.4	25.0	0.88	3.18	39.3	8.9	8.5
											1400	29.2	27.7	0.95	3.24	40.3	9.0	9.2
	11.0	2.0	4.6								1200	28.9	25.7	0.89	3.15	39.6	9.2	7.9
											1400	29.7	28.4	0.96	3.21	40.7	9.3	8.7
120	5.0	0.2	0.6								**Operation not recommended**							
	8.0	1.1	2.5								1200	23.8	21.4	0.90	3.36	35.2	7.1	11.0
											1400	24.2	23.2	0.96	3.44	36.0	7.0	11.7
	11.0	1.9	4.4								1200	24.0	21.4	0.89	3.25	35.1	7.4	10.4
											1400	24.5	23.2	0.95	3.35	35.9	7.3	11.4

Performance capacities shown in thousands of Btuh. 8/9/24

Performance Data cont.

048 Full Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	6.0	1.1	2.4	**Operation not recommended**							**Operation not recommended**							
	9.0	2.1	4.9															
	12.0	3.2	7.3	1400	34.7	2.93	24.7	92.9	3.47	4.7								
				1600	33.4	2.99	23.2	89.3	3.27	4.2								
30	6.0	1.0	2.4	**Operation not recommended**							**Operation not recommended**							
	9.0	2.0	4.7	1400	35.2	2.95	25.1	93.3	3.49	4.9	1400	45.7	26.7	0.58	1.76	51.7	26.0	-
				1600	36.2	3.04	25.8	90.9	3.49	4.5	1600	46.5	29.2	0.63	1.85	52.8	25.1	-
	12.0	3.1	7.1	1400	38.3	3.01	28.0	95.3	3.73	5.0	1400	46.0	26.7	0.58	1.70	51.8	27.0	-
				1600	36.9	3.07	26.4	91.4	3.52	4.6	1600	47.1	29.2	0.62	1.79	53.2	26.3	-
40	6.0	1.0	2.3	**Operation not recommended**							**Operation not recommended**							
	9.0	2.0	4.6	1400	40.6	3.24	29.5	96.8	3.67	5.6	1400	48.7	30.2	0.62	2.09	55.8	23.2	-
				1600	41.8	3.31	30.5	94.2	3.70	5.2	1600	49.6	33.0	0.66	2.20	57.1	22.6	-
	12.0	3.0	6.9	1400	41.4	3.27	30.2	97.4	3.71	5.8	1400	49.1	30.2	0.62	2.03	56.0	24.1	-
				1600	42.7	3.34	31.3	94.7	3.75	5.3	1600	50.2	33.0	0.66	2.13	57.4	23.6	-
50	6.0	1.0	2.2	1400	44.4	3.45	32.6	99.3	3.77	6.1	1400	49.0	30.6	0.62	2.55	57.7	19.2	3.1
				1600	45.7	3.50	33.8	96.4	3.83	5.6	1600	51.6	34.0	0.66	2.68	60.7	19.2	3.3
	9.0	1.9	4.4	1400	46.0	3.53	33.9	100.4	3.82	6.3	1400	50.0	31.0	0.62	2.40	58.2	20.8	2.9
				1600	47.5	3.58	35.3	97.5	3.89	5.8	1600	52.6	34.4	0.65	2.52	61.2	20.9	3.1
	12.0	2.9	6.7	1400	47.0	3.56	34.9	101.1	3.87	6.5	1400	50.5	33.0	0.65	2.34	58.5	21.6	2.7
				1600	48.5	3.61	36.2	98.1	3.94	5.9	1600	53.2	36.7	0.69	2.46	61.6	21.6	3.0
60	6.0	0.9	2.2	1400	47.3	3.35	35.9	101.3	4.13	6.9	1400	48.2	31.2	0.65	2.74	57.6	17.6	3.8
				1600	48.8	3.38	37.3	98.3	4.24	6.4	1600	50.6	34.8	0.69	2.86	60.3	17.7	4.0
	9.0	1.9	4.3	1400	49.4	3.45	37.7	102.7	4.20	7.1	1400	49.4	31.6	0.64	2.60	58.2	19.0	3.5
				1600	51.0	3.47	39.2	99.5	4.31	6.6	1600	51.7	35.1	0.68	2.71	60.9	19.1	3.8
	12.0	2.8	6.5	1400	50.6	3.49	38.7	103.5	4.26	7.3	1400	49.8	33.3	0.67	2.54	58.5	19.7	3.3
				1600	52.3	3.50	40.4	100.3	4.38	6.7	1600	52.3	37.0	0.71	2.65	61.3	19.7	3.6
70	6.0	0.9	2.1	1400	50.3	3.26	39.2	103.3	4.53	7.9	1400	47.5	31.9	0.67	2.92	57.4	17.5	4.7
				1600	52.9	3.36	41.4	100.6	4.61	7.3	1600	50.6	36.5	0.72	3.12	60.7	16.2	5.0
	9.0	1.8	4.2	1400	52.9	3.36	41.4	105.0	4.61	8.1	1400	48.7	32.3	0.66	2.80	58.2	17.4	4.4
				1600	54.6	3.36	43.1	101.6	4.76	7.5	1600	50.8	35.8	0.70	2.90	61.1	17.5	4.7
	12.0	2.7	6.2	1400	54.3	3.40	42.6	105.9	4.67	8.4	1400	49.2	33.6	0.68	2.73	58.5	18.0	4.1
				1600	56.1	3.39	44.5	102.5	4.85	7.7	1600	51.4	37.2	0.72	2.84	61.2	18.1	4.5
80	6.0	0.9	2.0	1400	53.0	3.36	41.5	105.1	4.62	8.7	1400	46.0	31.8	0.69	3.28	57.2	14.0	5.9
				1600	54.9	3.33	43.5	101.7	4.82	8.1	1600	47.8	35.3	0.74	3.38	59.4	14.1	6.3
	9.0	1.7	4.0	1400	56.1	3.49	44.1	107.1	4.71	9.0	1400	47.3	32.2	0.68	3.17	58.1	14.9	5.5
				1600	58.0	3.46	46.2	103.5	4.91	8.3	1600	49.2	35.6	0.72	3.26	60.3	15.1	6.0
	12.0	2.6	6.0	1400	57.7	3.54	45.6	108.1	4.78	9.3	1400	47.8	32.9	0.69	3.10	58.4	15.4	5.1
				1600	59.7	3.49	47.8	104.5	5.02	8.6	1600	49.8	36.5	0.73	3.20	60.7	15.6	5.7
90	6.0	0.8	1.9	1400	55.7	3.46	43.9	106.9	4.72	9.7	1400	44.6	31.6	0.71	3.64	57.0	12.2	7.3
				1600	57.7	3.41	46.1	103.4	4.96	9.0	1600	46.1	35.1	0.76	3.73	58.8	12.4	7.8
	9.0	1.7	3.9	1400	59.2	3.62	46.9	109.2	4.80	10.0	1400	45.9	32.0	0.70	3.54	57.9	13.0	6.9
				1600	61.3	3.55	49.2	105.5	5.06	9.3	1600	47.6	35.5	0.75	3.62	59.9	13.1	7.5
	12.0	2.5	5.8	1400	61.1	3.67	48.6	110.4	4.88	10.3	1400	45.2	33.3	0.74	3.20	56.1	14.1	6.4
				1600	63.2	3.58	51.0	106.6	5.17	9.6	1600	48.1	35.8	0.74	3.55	60.2	13.5	7.1
100	6.0	0.8	1.9	**Operation not recommended**							**Operation not recommended**							
	9.0	1.6	3.7								1400	42.1	31.3	0.74	3.74	54.9	11.3	8.5
											1600	43.5	34.8	0.80	3.80	56.5	11.4	9.3
	12.0	2.4	5.6								1400	42.6	31.3	0.73	3.68	55.1	11.6	7.9
											1600	44.0	34.6	0.79	3.74	56.7	11.8	8.8
110	6.0	0.8	1.8	**Operation not recommended**							**Operation not recommended**							
	9.0	1.6	3.6								1400	38.4	30.7	0.80	3.95	51.8	9.7	10.4
											1600	39.4	34.1	0.86	3.98	53.0	9.9	11.3
	12.0	2.3	5.4								1400	38.7	30.3	0.78	3.88	52.0	10.0	9.7
											1600	39.8	33.4	0.84	3.92	55.2	10.2	10.8
120	6.0	0.7	1.7								**Operation not recommended**							
	9.0	1.5	3.5								1400	36.8	28.9	0.79	4.77	53.1	7.7	12.7
											1600	37.5	31.4	0.84	4.89	54.1	7.7	13.7
	12.0	2.2	5.2								1400	37.1	28.9	0.78	4.61	52.9	8.0	11.9
											1600	37.9	31.4	0.83	4.76	54.1	8.0	13.1

Performance capacities shown in thousands of Btuh.

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Performance Data cont.

060 Part Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	6.0	0.9	1.4	**Operation not recommended**							**Operation not recommended**							
	10.0	2.7	6.2															
	14.0	4.9	11.4	1200	25.0	2.74	15.6	89.3	2.67	4.8								
				1500	26.9	2.76	17.5	86.6	2.86	4.5								
30	6.0	0.8	1.3	**Operation not recommended**							**Operation not recommended**							
	10.0	2.6	6.0	1200	30.6	2.77	21.1	93.6	3.24	5.0	1200	40.7	33.2	0.82	1.69	46.5	24.1	-
				1500	31.9	2.84	22.2	89.7	3.29	4.6	1500	41.3	36.3	0.88	1.78	47.4	23.2	-
	14.0	4.8	11.0	1200	31.5	2.89	21.6	94.3	3.19	5.1	1200	40.9	33.2	0.81	1.64	46.5	25.0	-
				1500	33.9	2.91	24.0	90.9	3.41	4.7	1500	41.9	36.3	0.87	1.72	47.8	24.4	-
40	6.0	0.7	1.3	**Operation not recommended**							**Operation not recommended**							
	10.0	2.5	5.9	1200	36.0	2.83	26.4	97.8	3.73	5.3	1200	44.5	32.9	0.74	1.76	50.5	25.2	-
				1500	37.3	2.88	27.4	93.0	3.79	4.9	1500	45.3	36.0	0.79	1.85	51.6	24.5	-
	14.0	4.6	10.7	1200	37.9	2.90	28.1	99.3	3.84	5.5	1200	44.8	32.9	0.73	1.71	50.7	26.2	-
				1500	39.3	2.95	29.2	94.2	3.90	5.0	1500	45.9	36.0	0.78	1.79	52.0	25.6	-
50	6.0	0.7	1.2	1200	40.0	2.89	30.1	100.8	4.06	5.7	1200	47.2	31.2	0.66	1.90	53.7	24.9	1.9
				1500	41.2	2.93	31.2	95.4	4.13	5.3	1500	48.6	34.5	0.71	1.74	54.5	32.5	2.0
	10.0	2.5	5.7	1200	41.4	2.89	31.5	101.9	4.20	5.8	1200	47.7	31.4	0.66	1.85	54.0	25.8	1.8
				1500	42.6	2.92	32.7	96.3	4.27	5.4	1500	49.0	34.7	0.71	1.89	55.4	26.0	1.9
	14.0	4.5	10.4	1200	43.3	2.95	33.2	103.4	4.30	6.0	1200	48.5	32.2	0.66	1.83	54.7	26.4	1.6
				1500	44.6	2.99	34.4	97.5	4.37	5.5	1500	49.8	35.6	0.71	1.87	56.2	26.6	1.8
60	6.0	0.5	1.2	1200	44.5	2.95	34.4	104.4	4.42	6.2	1200	45.9	31.0	0.68	2.10	53.1	21.9	2.6
				1500	45.6	2.98	35.5	98.2	4.49	5.8	1500	47.2	34.3	0.73	2.14	54.5	22.1	2.8
	10.0	2.4	5.5	1200	46.3	2.95	36.3	105.7	4.60	6.4	1200	46.3	31.2	0.67	2.04	53.3	22.7	2.5
				1500	47.4	2.97	37.3	99.3	4.68	5.9	1500	47.6	34.5	0.72	2.08	54.7	22.9	2.7
	14.0	4.3	10.0	1200	47.9	3.02	37.6	107.0	4.66	6.6	1200	47.1	32.0	0.68	2.03	54.0	23.2	2.3
				1500	49.0	3.03	38.7	100.2	4.74	6.1	1500	48.4	35.4	0.73	2.07	55.4	23.4	2.5
70	6.0	0.5	1.2	1200	49.0	3.02	38.7	107.8	4.75	6.9	1200	44.6	30.8	0.69	2.30	52.4	19.4	3.7
				1500	49.3	3.04	38.9	100.4	4.75	6.4	1500	45.8	34.4	0.75	2.60	54.0	17.6	3.9
	10.0	2.3	5.3	1200	51.2	3.01	40.9	109.5	4.98	7.1	1200	45.0	31.0	0.69	2.24	52.6	20.1	3.4
				1500	52.1	3.01	41.8	102.2	5.08	6.6	1500	46.2	34.3	0.74	2.28	54.7	20.3	3.7
	14.0	4.2	9.7	1200	52.5	3.08	42.0	110.5	5.00	7.2	1200	45.7	31.8	0.70	2.22	53.3	20.6	3.2
				1500	53.4	3.07	42.9	103.0	5.10	6.6	1500	47.0	35.2	0.75	2.26	54.8	20.8	3.5
80	6.0	0.5	1.1	1200	54.2	3.11	43.6	111.8	5.10	7.7	1200	43.1	30.1	0.70	2.65	52.1	16.3	5.5
				1500	54.9	3.10	44.4	103.9	5.20	7.1	1500	44.3	33.3	0.75	2.70	53.5	16.4	5.9
	10.0	2.2	5.1	1200	56.8	3.09	46.3	113.8	5.38	7.9	1200	43.5	30.3	0.70	2.58	52.3	16.9	5.2
				1500	57.5	3.07	47.0	105.5	5.49	7.3	1500	44.7	33.5	0.75	2.63	53.7	17.0	5.6
	14.0	4.1	9.4	1200	57.6	3.16	46.8	114.4	5.35	8.1	1200	44.2	31.1	0.70	2.56	52.9	17.3	4.9
				1500	58.2	3.13	47.5	105.9	5.45	7.5	1500	45.5	34.4	0.76	2.61	54.3	17.4	5.4
90	6.0	0.5	1.1	1200	59.4	3.21	48.4	115.8	5.43	8.6	1200	41.6	29.4	0.71	3.00	51.9	13.9	7.5
				1500	59.9	3.17	49.1	107.0	5.54	7.9	1500	42.8	32.6	0.76	3.06	53.2	14.0	7.9
	10.0	2.1	5.0	1200	62.4	3.18	51.6	118.2	5.76	8.8	1200	42.0	29.6	0.70	2.92	52.0	14.4	6.9
				1500	62.8	3.13	52.1	108.8	5.88	8.2	1500	43.2	32.8	0.76	2.98	53.3	14.5	7.6
	14.0	3.9	9.0	1200	62.7	3.24	51.7	118.4	5.67	9.1	1200	40.6	30.6	0.75	2.88	50.4	14.1	6.5
				1500	63.0	3.19	52.1	108.9	5.79	8.4	1500	43.9	33.6	0.77	2.95	54.0	14.9	7.2
100	6.0	0.4	1.0	**Operation not recommended**							**Operation not recommended**							
	10.0	2.1	4.8								1200	38.8	29.3	0.75	3.34	50.2	11.6	9.1
											1500	39.9	32.4	0.81	3.40	51.5	11.7	9.8
	14.0	3.8	8.7								1200	39.5	30.0	0.76	3.31	50.7	11.9	8.4
											1500	40.6	33.3	0.82	3.37	52.0	12.0	9.3
110	6.0	0.4	1.0								**Operation not recommended**							
	10.0	2.0	4.6								1200	35.6	29.0	0.81	3.75	48.4	9.5	11.3
											1500	36.6	32.1	0.88	3.82	49.6	9.6	12.4
	14.0	3.6	8.4								1200	36.2	29.7	0.82	3.72	48.9	9.7	10.6
											1500	37.2	32.9	0.88	3.79	50.1	9.8	11.8
120	6.0	0.4	1.0								**Operation not recommended**							
	10.0	1.9	4.4								1200	34.6	28.1	0.81	4.30	49.3	8.1	14.1
											1500	35.3	30.5	0.86	4.41	50.3	8.0	15.3
	14.0	3.5	8.1								1200	35.0	28.1	0.80	4.16	49.1	8.4	13.2
											1500	35.7	30.5	0.85	4.29	50.3	8.3	14.7

Performance capacities shown in thousands of Btuh. 8/9/24

Performance Data cont.

060 Full Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	8.0	1.4	3.2	**Operation not recommended**							**Operation not recommended**							
	12.0	3.9	8.9															
	16.0	6.3	14.6	1500	37.8	3.67	25.3	93.3	3.02	6.1								
				1800	38.5	3.55	26.4	89.8	3.18	5.6								
30	8.0	1.4	3.2	**Operation not recommended**							**Operation not recommended**							
	12.0	3.7	8.7	1500	44.9	3.85	31.8	97.7	3.42	6.4	1500	53.0	37.7	0.71	2.56	61.8	20.7	-
				1800	46.8	3.95	33.3	94.1	3.47	6.0	1800	53.9	41.2	0.76	2.70	63.1	20.0	-
	16.0	6.1	14.2	1500	48.9	4.19	34.6	100.2	3.42	6.6	1500	53.3	37.7	0.71	2.49	61.8	21.4	-
				1800	49.8	4.05	36.0	95.6	3.60	6.2	1800	54.6	41.2	0.75	2.61	63.5	20.9	-
40	8.0	1.3	3.1	**Operation not recommended**							**Operation not recommended**							
	12.0	3.6	8.4	1500	51.0	3.99	37.4	101.5	3.75	7.3	1500	58.2	38.8	0.67	2.79	67.7	20.8	-
				1800	52.7	4.06	38.9	97.1	3.80	6.7	1800	59.3	42.4	0.71	2.93	69.3	20.2	-
	16.0	6.0	13.8	1500	53.7	4.08	39.8	103.2	3.85	7.4	1500	58.6	38.8	0.66	2.71	67.9	21.6	-
				1800	55.6	4.16	41.4	98.6	3.91	6.8	1800	60.0	42.4	0.71	2.84	69.6	21.1	-
50	8.0	1.3	3.0	1500	54.9	4.12	40.9	103.9	3.91	7.8	1500	61.9	38.1	0.62	3.11	72.6	19.9	4.1
				1800	56.7	4.18	42.4	99.1	3.97	7.3	1800	63.7	42.2	0.66	3.05	74.1	23.3	4.2
	12.0	3.5	8.1	1500	56.9	4.12	42.8	105.1	4.04	8.1	1500	62.5	38.3	0.61	3.03	72.8	20.6	3.7
				1800	58.6	4.18	44.3	100.1	4.11	7.4	1800	64.2	42.4	0.66	3.09	74.8	20.8	4.0
	16.0	5.8	13.3	1500	59.5	4.22	45.1	106.8	4.14	8.2	1500	63.5	39.3	0.62	3.00	73.8	21.2	3.6
				1800	61.3	4.27	46.7	101.5	4.21	7.5	1800	65.3	43.5	0.67	3.06	75.7	21.3	3.9
60	8.0	1.2	2.9	1500	61.6	4.43	46.4	108.0	4.07	8.7	1500	61.2	38.1	0.62	3.38	72.7	18.1	4.9
				1800	63.1	4.46	47.9	102.5	4.14	8.1	1800	62.9	42.2	0.67	3.45	74.7	18.2	5.1
	12.0	3.4	7.9	1500	64.0	4.42	48.9	109.5	4.24	8.9	1500	61.7	38.3	0.62	3.30	73.0	18.7	4.6
				1800	65.5	4.45	50.4	103.7	4.32	8.4	1800	63.5	42.4	0.67	3.36	74.9	18.9	4.9
	16.0	5.6	12.9	1500	66.3	4.52	50.8	110.9	4.29	9.1	1500	62.8	39.3	0.63	3.27	73.9	19.2	4.2
				1800	67.8	4.55	52.2	104.9	4.37	8.5	1800	64.5	43.5	0.67	3.33	75.9	19.4	4.7
70	8.0	1.2	2.8	1500	68.1	4.75	51.9	112.0	4.21	9.8	1500	60.4	38.1	0.63	3.66	72.9	16.5	5.9
				1800	69.7	4.52	54.3	105.9	4.52	9.1	1800	62.3	42.3	0.68	3.83	75.1	16.3	6.2
	12.0	3.3	7.6	1500	71.1	4.73	55.0	113.9	4.41	10.0	1500	61.0	38.3	0.63	3.56	73.1	17.1	5.5
				1800	72.4	4.72	56.3	107.2	4.49	9.3	1800	62.7	42.4	0.68	3.63	75.4	17.3	5.9
	16.0	5.4	12.5	1500	72.9	4.83	56.5	115.0	4.43	10.3	1500	62.0	39.3	0.63	3.53	74.0	17.6	5.2
				1800	74.2	4.82	57.8	108.2	4.51	9.7	1800	63.7	43.5	0.68	3.60	76.0	17.7	5.7
80	8.0	1.2	2.7	1500	73.9	5.01	56.8	115.6	4.32	11.0	1500	58.9	37.7	0.64	4.04	72.6	14.6	7.5
				1800	74.9	4.98	57.9	108.5	4.41	10.3	1800	60.5	41.7	0.69	4.12	74.5	14.7	7.9
	12.0	3.2	7.4	1500	77.5	4.98	60.5	117.8	4.56	11.4	1500	59.4	37.9	0.64	3.93	72.8	15.1	7.0
				1800	78.4	4.94	61.5	110.3	4.65	10.5	1800	61.0	42.0	0.69	4.01	74.7	15.2	7.5
	16.0	5.2	12.1	1500	78.5	5.08	61.2	118.5	4.53	11.7	1500	60.4	38.9	0.64	3.90	73.7	15.5	6.5
				1800	79.4	5.04	62.2	110.8	4.62	10.9	1800	62.1	43.1	0.69	3.98	75.6	15.6	7.2
90	8.0	1.1	2.6	1500	79.6	5.28	61.6	119.2	4.43	12.4	1500	57.3	37.3	0.65	4.42	72.4	13.0	9.6
				1800	80.3	5.21	62.5	111.3	4.52	11.5	1800	58.9	41.3	0.70	4.50	74.3	13.1	10.3
	12.0	3.1	7.1	1500	83.8	5.23	65.9	121.7	4.69	12.8	1500	57.8	37.5	0.65	4.31	72.5	13.4	9.0
				1800	84.3	5.16	66.6	113.4	4.79	11.9	1800	59.4	41.5	0.70	4.39	74.4	13.5	9.7
	16.0	5.0	11.6	1500	84.1	5.33	65.9	121.9	4.62	13.1	1500	58.1	39.4	0.68	4.17	72.3	13.9	8.4
				1800	84.5	5.25	66.7	113.5	4.72	12.5	1800	60.4	42.6	0.71	4.35	75.2	13.9	9.3
100	8.0	1.1	2.5	**Operation not recommended**							**Operation not recommended**							
	12.0	3.0	6.8								1500	54.6	37.1	0.68	4.83	71.1	11.3	10.9
											1800	56.1	41.1	0.73	4.92	72.9	11.4	11.7
	16.0	4.8	11.2								1500	55.5	38.1	0.69	4.79	71.8	11.6	10.2
											1800	57.1	42.2	0.74	4.88	73.7	11.7	11.2
110	8.0	1.0	2.4								**Operation not recommended**							
	12.0	2.9	6.6								1500	51.4	36.7	0.71	5.35	69.7	9.6	13.9
											1800	52.8	40.7	0.77	5.46	71.5	9.7	14.9
	16.0	4.7	10.8								1500	52.3	37.7	0.72	5.31	70.4	9.8	12.9
											1800	53.7	41.7	0.78	5.41	72.2	9.9	14.2
120	8.0	1.0	2.3								**Operation not recommended**							
	12.0	2.7	6.3								1500	50.8	36.7	0.72	5.89	70.9	8.6	16.4
											1800	51.7	39.8	0.77	6.04	72.3	8.6	17.1
	16.0	4.5	10.4								1500	51.2	36.7	0.72	5.70	70.7	9.0	15.6
											1800	52.3	39.8	0.76	5.88	72.4	8.9	17.3

Performance capacities shown in thousands of Btuh.

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Performance Data cont.

066 Part Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	10.0	1.6	3.8	**Operation not recommended**							**Operation not recommended**							
	13.0	3.2	7.3															
	16.0	4.7	10.8	1400	34.9	3.55	22.8	93.1	2.88	4.2								
				1600	34.1	3.51	22.1	89.7	2.85	4.9								
30	10.0	1.6	3.7	**Operation not recommended**							**Operation not recommended**							
	13.0	3.1	7.1	1400	35.6	3.40	24.0	93.6	3.07	5.3	1400	49.5	34.4	0.69	2.00	56.4	24.7	-
				1600	37.1	3.49	25.2	91.5	3.11	4.5	1600	50.3	37.6	0.75	2.11	57.5	23.9	-
	16.0	4.5	10.5	1400	40.4	3.62	28.0	96.7	3.27	4.8	1400	49.8	34.4	0.69	1.94	56.4	25.6	-
				1600	39.5	3.58	27.3	92.9	3.23	5.5	1600	51.0	37.6	0.74	2.04	58.0	25.0	-
40	10.0	1.5	3.6	**Operation not recommended**							**Operation not recommended**							
	13.0	3.0	6.9	1400	42.6	3.51	30.6	98.2	3.56	6.3	1400	52.0	34.9	0.67	2.08	59.1	24.9	-
				1600	44.1	3.57	31.9	95.5	3.61	5.7	1600	52.9	38.1	0.72	2.19	60.4	24.2	-
	16.0	4.4	10.2	1400	44.9	3.59	32.6	99.7	3.66	6.5	1400	52.4	34.9	0.67	2.02	59.3	25.9	-
				1600	46.5	3.66	34.0	96.9	3.72	5.9	1600	53.6	38.1	0.71	2.12	60.8	25.3	-
50	10.0	1.5	3.5	1400	47.9	3.61	35.5	101.6	3.89	6.6	1400	53.2	33.8	0.64	2.22	60.8	23.9	2.0
				1600	49.4	3.66	36.9	98.6	3.95	6.1	1600	54.7	37.4	0.68	1.00	58.1	28.1	2.1
	13.0	2.9	6.7	1400	49.5	3.61	37.2	102.8	4.02	6.8	1400	53.7	34.0	0.63	2.17	61.1	24.8	1.8
				1600	51.0	3.66	38.6	99.5	4.09	6.2	1600	55.2	37.6	0.68	2.21	62.7	25.0	2.0
	16.0	4.3	9.9	1400	51.9	3.70	39.3	104.3	4.11	7.0	1400	54.6	34.9	0.64	2.15	61.9	25.4	1.7
				1600	53.4	3.74	40.6	100.9	4.18	6.4	1600	56.1	38.6	0.69	2.19	63.6	25.6	1.9
60	10.0	1.4	3.3	1400	53.7	3.73	40.9	105.5	4.22	7.3	1400	51.7	33.7	0.65	2.55	60.4	20.3	2.9
				1600	55.0	3.76	42.2	101.8	4.29	6.7	1600	53.1	37.3	0.70	2.60	62.0	20.4	3.1
	13.0	2.8	6.5	1400	55.8	3.72	43.1	106.9	4.39	7.5	1400	52.1	33.9	0.65	2.48	60.6	21.0	2.7
				1600	57.1	3.74	44.3	103.1	4.47	6.9	1600	53.6	37.5	0.70	2.53	62.2	21.2	2.9
	16.0	4.1	9.6	1400	57.8	3.81	44.8	108.2	4.45	7.7	1400	53.0	34.7	0.66	2.46	61.4	21.5	2.5
				1600	59.1	3.83	46.0	104.2	4.52	7.1	1600	54.5	38.5	0.71	2.51	63.0	21.7	2.8
70	10.0	1.4	3.2	1400	59.4	3.85	46.3	109.3	4.52	8.1	1400	50.1	33.5	0.67	2.88	59.9	17.4	4.1
				1600	61.8	3.83	48.7	105.8	4.73	7.5	1600	52.2	37.9	0.73	2.94	61.7	17.8	4.3
	13.0	2.7	6.2	1400	62.0	3.83	48.9	111.0	4.74	8.3	1400	50.5	33.7	0.67	2.80	60.1	18.0	3.8
				1600	63.1	3.83	50.1	106.5	4.83	7.7	1600	51.9	37.3	0.72	2.86	62.2	18.2	4.1
	16.0	4.0	9.2	1400	63.6	3.92	50.2	112.1	4.76	8.5	1400	51.4	34.6	0.67	2.78	60.8	18.5	3.5
				1600	64.7	3.91	51.4	107.4	4.85	7.9	1600	52.8	38.3	0.73	2.83	62.5	18.7	3.9
80	10.0	1.4	3.1	1400	63.8	3.94	50.4	112.2	4.75	8.0	1400	47.9	33.0	0.69	3.24	58.9	14.8	6.1
				1600	64.7	3.92	51.3	107.4	4.84	8.3	1600	49.2	36.5	0.74	3.30	60.5	14.9	5.9
	13.0	2.6	6.0	1400	66.9	3.91	53.6	114.3	5.01	9.3	1400	48.3	33.2	0.69	3.16	59.1	15.3	5.2
				1600	67.7	3.89	54.4	109.2	5.11	8.6	1600	49.6	36.8	0.74	3.22	60.6	15.4	5.6
	16.0	3.9	8.9	1400	67.8	4.00	54.2	114.9	4.98	9.6	1400	49.1	34.1	0.69	3.13	59.8	15.7	4.8
				1600	68.6	3.96	55.0	109.7	5.07	8.9	1600	50.5	37.7	0.75	3.19	61.3	15.8	5.8
90	10.0	1.3	3.0	1400	68.2	4.03	54.5	115.1	4.96	10.1	1400	45.6	32.5	0.71	3.61	57.9	12.7	8.5
				1600	68.8	3.98	55.2	109.8	5.06	9.3	1600	46.9	36.0	0.77	3.68	59.4	12.8	9.0
	13.0	2.5	5.8	1400	71.8	3.99	58.1	117.5	5.26	10.4	1400	46.0	32.7	0.71	3.51	58.0	13.1	8.0
				1600	72.2	3.94	58.7	111.8	5.37	9.8	1600	47.3	36.2	0.76	3.58	59.5	13.2	8.6
	16.0	3.7	8.6	1400	72.1	4.07	58.2	117.7	5.18	10.8	1400	50.2	35.9	0.72	3.55	62.3	14.1	7.4
				1600	72.4	4.01	58.8	111.9	5.29	10.0	1600	48.1	37.1	0.77	3.55	60.2	13.5	8.2
100	10.0	1.3	2.9	**Operation not recommended**							**Operation not recommended**							
	13.0	2.4	5.6								1400	45.3	33.4	0.74	4.21	59.6	10.8	10.2
											1600	46.5	37.0	0.79	4.29	61.2	10.9	11.3
	16.0	3.6	8.3								1400	46.0	34.2	0.74	4.17	60.2	11.0	9.5
											1600	47.3	37.9	0.80	4.25	61.8	11.1	10.4
110	10.0	1.2	2.8								**Operation not recommended**							
	13.0	2.3	5.4								1400	44.5	34.1	0.77	4.90	61.2	9.1	13.0
											1600	45.7	37.7	0.82	4.99	62.8	9.2	14.1
	16.0	3.5	8.0								1400	45.2	35.0	0.77	4.86	61.8	9.3	12.1
											1600	46.5	38.7	0.83	4.95	63.4	9.4	13.4
120	10.0	1.2	2.7								**Operation not recommended**							
	13.0	2.2	5.2								1400	38.1	30.0	0.79	5.26	56.1	7.3	15.9
											1600	38.8	32.6	0.84	5.40	57.2	7.2	16.9
	16.0	3.3	7.7								1400	38.5	30.0	0.78	5.09	55.8	7.6	14.6
											1600	39.3	32.6	0.83	5.25	57.2	7.5	16.4

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Performance Data cont.

066 Full Load

EWT °F	Flow gpm	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT	Airflow cfm	HC kBtuh	Power kW	HE kBtuh	LAT °F	COP	HWC kBtuh	Airflow cfm	TC kBtuh	SC kBtuh	S/T Ratio	Power kW	HR kBtuh	EER	HWC kBtuh
20	12.0	2.7	6.2	**Operation not recommended**							**Operation not recommended**							
	15.0	4.4	10.3															
	18.0	6.2	14.3	1800 2000	43.9 43.7	4.43 4.49	28.8 28.4	92.6 90.2	2.90 2.85	7.9 7.1								
30	12.0	2.6	6.0	**Operation not recommended**							**Operation not recommended**							
	15.0	4.3	10.0	1800 2000	52.7 54.2	4.64 4.78	36.9 37.9	97.1 95.1	3.33 3.32	8.3 7.6	1800 2000	60.5 61.5	36.8 40.2	0.61 0.65	3.13 3.30	71.2 72.7	19.3 18.6	- -
	18.0	6.0	13.9	1800 2000	55.6 55.3	4.77 4.83	39.3 38.8	98.6 95.6	3.42 3.36	8.5 7.7	1800 2000	60.8 62.3	36.8 40.2	0.60 0.65	3.04 3.19	71.2 73.2	20.0 19.5	- -
40	12.0	2.5	5.9	**Operation not recommended**							**Operation not recommended**							
	15.0	4.2	9.7	1800 2000	59.6 61.5	4.76 4.86	43.4 44.9	100.7 98.5	3.67 3.71	9.2 8.4	1800 2000	65.0 66.2	40.2 43.9	0.62 0.66	3.37 3.53	76.5 78.2	19.3 18.8	- -
	18.0	5.8	13.5	1800 2000	60.8 62.8	4.80 4.91	44.4 46.0	101.3 99.1	3.71 3.75	9.5 8.6	1800 2000	65.5 67.0	40.2 43.9	0.61 0.66	3.27 3.42	76.6 78.6	20.1 19.6	- -
50	12.0	2.5	5.7	1800 2000	64.2 66.1	4.76 4.83	48.0 49.7	103.0 100.6	3.95 4.02	9.9 9.2	1800 2000	65.9 69.4	39.7 44.1	0.60 0.64	3.77 3.97	78.8 82.9	17.5 17.5	4.3 4.5
	15.0	4.1	9.4	1800 2000	66.6 68.7	4.87 4.94	50.0 51.9	104.2 101.8	4.01 4.08	10.2 9.4	1800 2000	67.4 70.8	40.1 44.6	0.60 0.63	3.55 3.73	79.5 83.5	19.0 19.0	4.0 4.3
	18.0	5.7	13.1	1800 2000	68.1 70.2	4.91 4.98	51.3 53.2	105.0 102.5	4.06 4.13	10.5 9.6	1800 2000	68.0 71.6	42.8 47.6	0.63 0.66	3.47 3.64	79.8 84.0	19.6 19.7	3.7 4.1
60	12.0	2.4	5.5	1800 2000	69.6 71.8	5.05 5.08	52.4 54.5	105.8 103.3	4.04 4.15	11.1 10.3	1800 2000	64.5 67.6	40.6 45.1	0.63 0.67	4.07 4.25	78.4 82.1	15.9 15.9	5.5 5.5
	15.0	3.9	9.1	1800 2000	72.7 75.1	5.19 5.22	55.0 57.3	107.4 104.8	4.11 4.21	11.5 10.6	1800 2000	66.0 69.1	41.1 45.6	0.62 0.66	3.87 4.02	79.2 82.9	17.1 17.2	4.9 5.3
	18.0	5.5	12.7	1800 2000	74.5 77.0	5.24 5.27	56.6 59.0	108.3 105.6	4.16 4.28	11.8 10.9	1800 2000	66.7 70.0	43.3 48.0	0.65 0.69	3.77 3.94	79.5 83.4	17.7 17.8	4.5 5.0
70	12.0	2.3	5.3	1800 2000	75.1 81.8	5.33 5.41	56.9 62.7	108.6 107.9	4.13 4.43	12.5 11.6	1800 2000	63.1 67.9	41.5 48.1	0.66 0.71	4.36 4.34	78.0 82.2	17.5 15.6	6.6 6.9
	15.0	3.8	8.8	1800 2000	78.9 81.5	5.51 5.51	60.1 63.3	110.6 107.7	4.20 4.34	12.9 11.9	1800 2000	64.7 67.5	42.0 46.6	0.65 0.69	4.18 4.32	79.0 82.7	15.5 15.6	6.1 6.6
	18.0	5.3	12.2	1800 2000	80.9 83.7	5.57 5.55	61.9 64.8	111.6 108.8	4.26 4.42	13.3 12.3	1800 2000	65.4 68.3	43.7 48.4	0.67 0.71	4.07 4.24	79.3 82.8	16.0 16.1	5.7 6.3
80	12.0	2.2	5.1	1800 2000	78.1 80.8	5.48 5.43	59.4 62.3	110.2 107.4	4.18 4.36	13.9 12.8	1800 2000	59.9 62.3	41.4 46.0	0.69 0.74	4.74 4.89	76.1 78.9	12.6 12.7	8.4 8.9
	15.0	3.7	8.5	1800 2000	82.6 85.4	5.69 5.64	63.1 66.1	112.5 109.5	4.25 4.44	14.3 13.2	1800 2000	61.5 64.0	41.9 46.4	0.68 0.73	4.57 4.71	77.1 80.1	13.5 13.6	7.8 8.4
	18.0	5.1	11.8	1800 2000	84.9 87.9	5.77 5.68	65.3 68.5	113.7 110.7	4.32 4.53	14.7 13.6	1800 2000	62.2 64.8	42.9 47.6	0.69 0.73	4.48 4.62	77.5 80.5	13.9 14.0	7.2 8.0
90	12.0	2.1	5.0	1800 2000	81.1 84.0	5.62 5.54	61.9 65.1	111.7 108.9	4.23 4.45	15.4 14.3	1800 2000	56.7 58.7	41.3 45.8	0.73 0.78	5.12 5.24	74.1 76.6	11.1 11.2	10.5 11.1
	15.0	3.5	8.2	1800 2000	86.2 89.3	5.87 5.77	66.2 69.6	114.4 111.3	4.30 4.54	15.9 14.7	1800 2000	58.4 60.5	41.8 46.3	0.72 0.77	4.97 5.09	75.3 77.9	11.7 11.9	9.8 10.6
	18.0	4.9	11.4	1800 2000	88.9 92.0	5.96 5.81	68.6 72.2	115.8 112.6	4.38 4.64	16.4 15.2	1800 2000	68.5 61.2	47.7 46.7	0.70 0.76	4.96 4.99	85.4 78.2	13.8 12.3	9.1 10.1
100	12.0	2.1	4.8	**Operation not recommended**							**Operation not recommended**							
	15.0	3.4	7.9								1800 2000	55.0 56.8	42.7 47.4	0.78 0.83	5.39 5.47	73.4 75.5	10.2 10.4	12.2 13.2
	18.0	4.8	11.0								1800 2000	55.6 57.5	42.6 47.2	0.77 0.82	5.29 5.38	73.7 75.8	10.5 10.7	11.3 12.5
110	12.0	2.0	4.6	**Operation not recommended**							**Operation not recommended**							
	15.0	3.3	7.6								1800 2000	51.8 53.2	43.7 48.6	0.84 0.91	5.80 5.84	71.5 73.1	8.9 9.1	14.9 16.1
	18.0	4.6	10.6								1800 2000	52.3 53.7	43.1 47.6	0.82 0.89	5.70 5.76	71.7 75.7	9.2 9.3	13.8 15.3
120	12.0	1.9	4.4	**Operation not recommended**							**Operation not recommended**							
	15.0	3.2	7.3								1800 2000	50.3 51.2	39.2 42.6	0.78 0.83	6.75 6.93	73.3 74.8	7.4 7.4	18.0 19.5
	18.0	4.4	10.2								1800 2000	50.7 51.8	39.2 42.6	0.77 0.82	6.53 6.74	73.0 74.8	7.8 7.7	16.7 18.5

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Service Parts List

		Dual Capacity Split Units				
		24	**36**	**48**	**60**	**66**
Compressor	Compressor	34P749-01	34P751-01	34P753-01	34P755-01	34P756-01
	Run Capacitor	16P008D18K	16P008D21K	16P008D31K	16P008D32K	16P008D34K
	Power Harness	11P781-01				
	Solenoid Harness	11P782-02				
Refrigeration Components	Accumulator	36P509-02	36P509-01			
	Coax	62P594-01	62I638-01	62I628-01		62P555-01
	TXV	33P628-06	33P628-07	33P628-08	33P628-09	33P628-10
	Reversing Valve	33P506-05	33P503-05	33P526-05		
	Filter Dryer	36P500B01			36P500B02	
	Service Valve Suction	33P554B02	33P554B03		33P554B04	
	Service Valve Liquid	33P554B01			33P554B05	
Desuperheater	Desuperheater	62P516-05		62P516-03		
	Desuperheater Pump Assembly	24S502-06				
Electrical	Contactor	13P521-01				
	2 Pole Screw Term. Block	12P500A01				
	ABC Board	17X553-59				
	AXB Board	17X597-40				
	ASB Board	17P599-01				
	ABC/AXB/ASB Comm. Cable	11P837-05				
	Circuit Breaker 5amp, 250V	19P583-01				
Sensors & Safeties	High Pressure Transduce Kit	SKP110PT				
	Low Pressure Transducer Kit	SKP110PT				
	Current Sensor	12P557-01				
	Thermistor Suction Line	12P555-05				
	Thermistor Liquid Line Heating	12P555-03				
	Thermistor EWT	12P560-01				
	Thermistor LWT	12P560-02				
	Thermistor Hot water Limit (HWG)	12P555-04				
	Freeze Protection Thermistor	FP1RK01				
	Refrigertion Leak Sensor	19P688-01				
	High Pressure Switch	SKHPE600				
	Low Pressure Switch	SKLPE40				

Part numbers subject to change 9/24/24

Air Handler Service Parts

	Part Description	**024**	**036**	**048**	**060**	**066**
Refrigeration	Air Coil	61P740-41	61P738-41	61P747-41	61P737-41	61P737-41
	TXV	33P626-09	33P626-10	33P626-11	33P626-12	33P626-13
ECM Motor & Blower/ Control Option D	Blower Assembly	54S561-05N	54S562-04N	54S563-09N	54S563-10N	54S563-10N
	ECM Blower Housing	53P529-01	53P528-01	53P526-01	53P526-01	53P526-01
	ECM Motor 208-230/60/1	14S568-01	14S568-02	14S569-01	14S569-02	14S569-02
	ECM Power Harness	11P922-01	11P922-01	11P922-01	11P922-01	11P922-01
	ECM Control Harness	11P940-01	11P940-01	11P940-01	11P940-01	11P940-01
Electrical Control Option D	AHB Board	17X558-24	17X558-24	17X558-24	17X558-24	17X558-24
	Transformer 100VAC	15P519-01	15P519-01	15P519-01	15P519-01	15P519-01
	Power Block	12P501A02	12P501A02	12P501A02	12P501A02	12P501A02
	Ground Lug	12P004A	12P004A	12P004A	12P004A	12P004A
	Condensate Sensor	12P504A01	12P504A01	12P504A01	12P504A01	12P504A01
	FP2 Sensor	12P550-01	12P550-01	12P550-01	12P550-01	12P550-01
	Leaving Air Thermistor	12P555-06	12P555-06	12P555-06	12P555-06	12P555-06
	Current Transducer(s)	12P557-01	12P557-01	12P557-01	12P557-01	12P557-01
	4 Pole Low Voltage Block	12P570-01	12P570-01	12P570-01	12P570-01	12P570-01
5kW Auxiliary Heat	Limit	13P725-05	13P725-05			
	Fused Back Up	13P735-02	13P735-02			
10kW Auxiliary Heat	Limit		13P725-05	13P725-05	13P725-05	13P725-05
	Fused Back Up		13P735-01	13P735-01	13P735-01	13P735-01
15kW Auxiliary Heat	Limit			13P725-05	13P725-05	13P725-05
	Limit DPST			13P734-01	13P734-01	13P734-01
	Fused Back Up			13P735-02	13P735-02	13P735-02
20kW Auxiliary Heat	Limit DPST				13P734-01	13P734-01
	Fused Back Up				13P735-02	13P735-02

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Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

1. Become familiar with the equipment and its operation.
2. Isolate system electrically.
3. Before attempting the procedure, ensure that:
   - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
   - all personal protective equipment is available and being used correctly;
   - the recovery process is supervised at all times by a competent person;
   - recovery equipment and cylinders conform to the appropriate standards.
4. Pump down refrigerant system, if possible.
5. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
6. Make sure that cylinder is situated on the scales before recovery takes place.
7. Start the recovery machine and operate in accordance with instructions.
8. Do not overfill cylinders (no more than 80 % volume liquid charge).
9. Do not exceed the maximum working pressure of the cylinder, even temporarily.
10. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
11. Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked

Decommissioning - Unit Labeling Requirements

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing FLAMMABLE REFRIGERANTS, ensure that there are labels on the equipment stating the equipment contains FLAMMABLE REFRIGERANT.

Refrigerant Recovery

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

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

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

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

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

Refrigerant Removal and Evacuation

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

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

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants.

This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems. For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Charging Procedures

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

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Notes

Revision Guide

Pages:	Description:	Date:	By:
All	Document Creation	4 March 2024	SW
4	Add Pump Selection Sensor Kit Table	3 March 2025	SW
23	Update Thermostat Table	6 March 2025	SW
4	Add Freeze Protection Warning	8 April 2025	SW
5	Update Refrigerant Charge	8 April 2025	SW
76	Added Air Handler Service Parts Table	8 April 2025	SW

Product:	**Affinity Indoor Split Series**
Type:	Geothermal Heat Pumps
Size:	2-6 Ton Dual Capacity
Document Type:	Operation & Maintenance
Part Number:	OMW5-0021Y
Release Date:	04/25