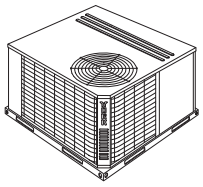
INSTALLATION MANUAL

R-410A
AFFINITY SERIES
BHX024-060
2-5 Ton



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General

YORK® Affinity Model BHX units are factory assembled heat pumps designed for outdoor installation on a roof top or a slab. Field-installed electric heater accessories are available to provide supplemental electric heat combined with electric cooling and heating.

The units are completely assembled on rigid, removable base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require only electric power and duct connections at the point of installation.

The electric heaters have nickel-chrome resistance wire elements and utilize single point power connection.

Safety Considerations

This is a safety alert symbol ⚠. When you see this symbol on labels or in manuals, be alert to the potential for personal injury.

Understand and pay particular attention the signal words **DANGER**, **WARNING** or **CAUTION**.

DANGER indicates an **imminently** hazardous situation, which, if not avoided, **will result in death or serious injury.**

WARNING indicates a **potentially** hazardous situation, which, if not avoided, **could result in death or serious injury.**

CAUTION indicates a potentially hazardous situation, which, if not avoided **may result in minor or moderate injury.** It is also used to alert against unsafe practices and hazards involving only property damage.

⚠WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual for assistance or for additional information, consult a qualified contractor, installer or service agency.

⚠ CAUTION

This product must be installed in strict compliance with the installation instructions and any applicable local, state and national codes including, but not limited to building, electrical, and mechanical codes.

⚠WARNING

Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer or service agency.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including.

Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

Inspection

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

Reference

Additional information is available in the following reference forms:

- Technical Guide - BHX024-060, 718421
- General Installation - BHX024-060, 155439
- Electric Heat Accessories - 66281, 708710

Renewal Parts

Contact your local York® parts distribution center for authorized replacement parts.

⚠ CAUTION

This product must be installed in strict compliance with the enclosed installation instructions and any applicable local, state, and national codes including, but not limited to, building, electrical, and mechanical codes.

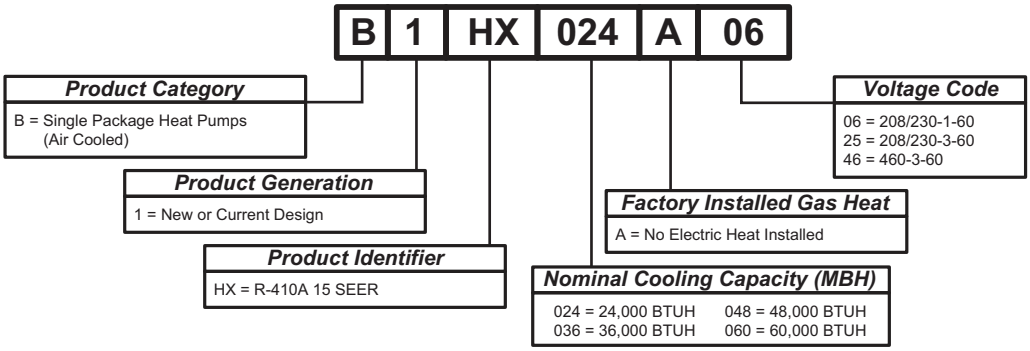
⚠WARNING

Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

Nomenclature



Installation

Limitations

These units must be installed in accordance with the following national and local safety codes.

1. National Electrical Code ANSI/NFPS No. 70 or Canadian Electrical Code Part 1, C22.1 (latest editions).
2. Local plumbing and waste water codes and other applicable local codes.

Refer to Table 6 for unit physical data and to Table 5 for electrical data.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or the customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculations made in accordance with industry recognized procedures identified by the Air Conditioning Contractors of America.

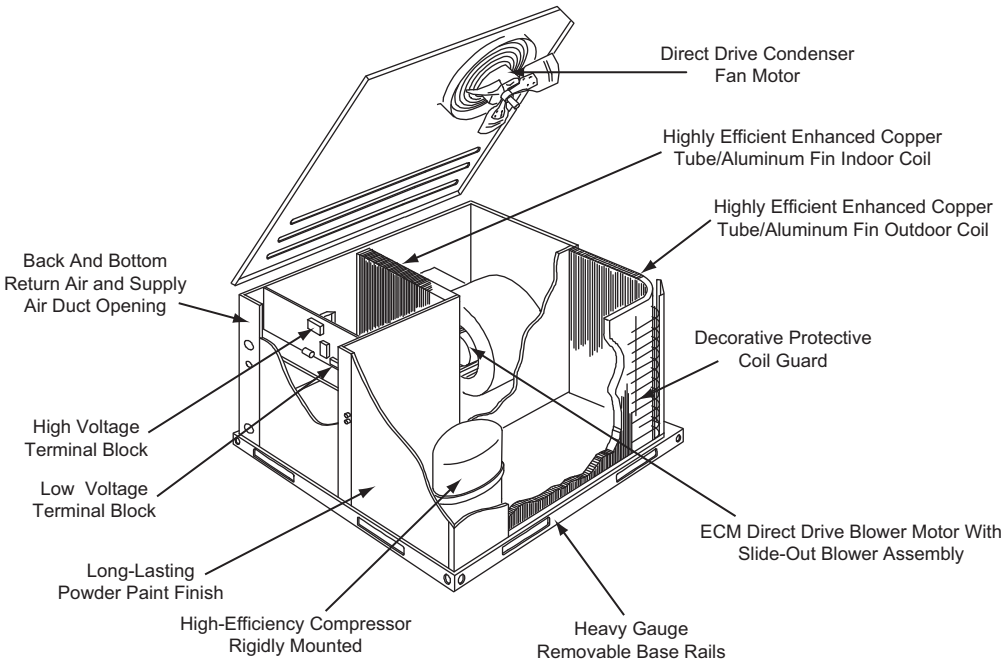


Figure 1: Component Location

Table 1: Unit Limitations

Size (Tons)	Unit Voltage	Unit Limitations		
		Applied Voltage		Outdoor DB Temp
		Min	Max	Max (°F)
024 (2.0)	208/230-1-60	187	252	115
036 (3.0)	208/230-1-60	187	252	115
	208/230-3-60	187	252	115
	460-3-60	432	504	115
048 (4.0)	208/230-1-60	187	252	115
	208/230-3-60	187	252	115
	460-3-60	432	504	115
060 (5.0)	208/230-1-60	187	252	115
	208/230-3-60	187	252	115
	460-3-60	432	504	115

Location

Use the following guidelines to select a suitable location for these units.

1. Unit is designed for outdoor installation only.
2. Condenser must have an unlimited supply of air. Where a choice of location is possible, position unit on either north or east side of building.
3. For ground level installation, a level pad or slab should be used. The thickness and size of the pad or slab used should meet local codes and unit weight. Do not tie the slab to the building foundation.
4. For roof top installation, be sure the structure can support the weight of the unit plus any field installed components. Unit must be installed on a level roof curb or appropriate angle iron frame providing adequate support under the compressor/condenser section.
5. Maintain level tolerance of unit to 1/8” maximum.

⚠WARNING

Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet, combustion air inlet or vent outlets.

Clearances

All units require certain clearances for proper operation and service. Refer to Table 4 for the clearances required for construction, servicing and proper unit operation.

Rigging And Handling

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit.

⚠ CAUTION

If a unit is to be installed on a roof curb other than a York® roof curb, gasketing must be applied to all surfaces that come in contact with the unit underside.

⚠ CAUTION

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

⚠ CAUTION

All panels must be secured in place when the unit is lifted.

The condenser coils should be protected from rigging cable damage with plywood or other suitable material.

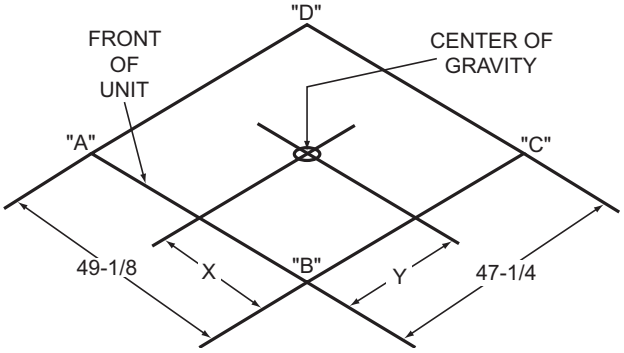


Figure 2: Unit 4 Point Load Weight

Size (Tons)	Weight (lbs.)		Center of Gravity		4 Point Load Location (lbs.)			
	Shipping	Operating	X	Y	A	B	C	D
024 (2.0)	385	380	22.25	25	103	90	87	100
036 (3.0)	405	400	21.75	24.25	108	90	92	110
048 (4.0)	445	440	22	26	126	107	95	112
060 (5.0)	465	460	22	26.25	133	113	99	116

Table 2: Unit Accessory Weights

Unit Accessory	Model	Weight (lbs.)	
		Shipping	Operating
Add Economizer	All	45	40
Add Electric Heat[1]	All	13	12

1. Weight given is for the maximum heater size available (25 kW).

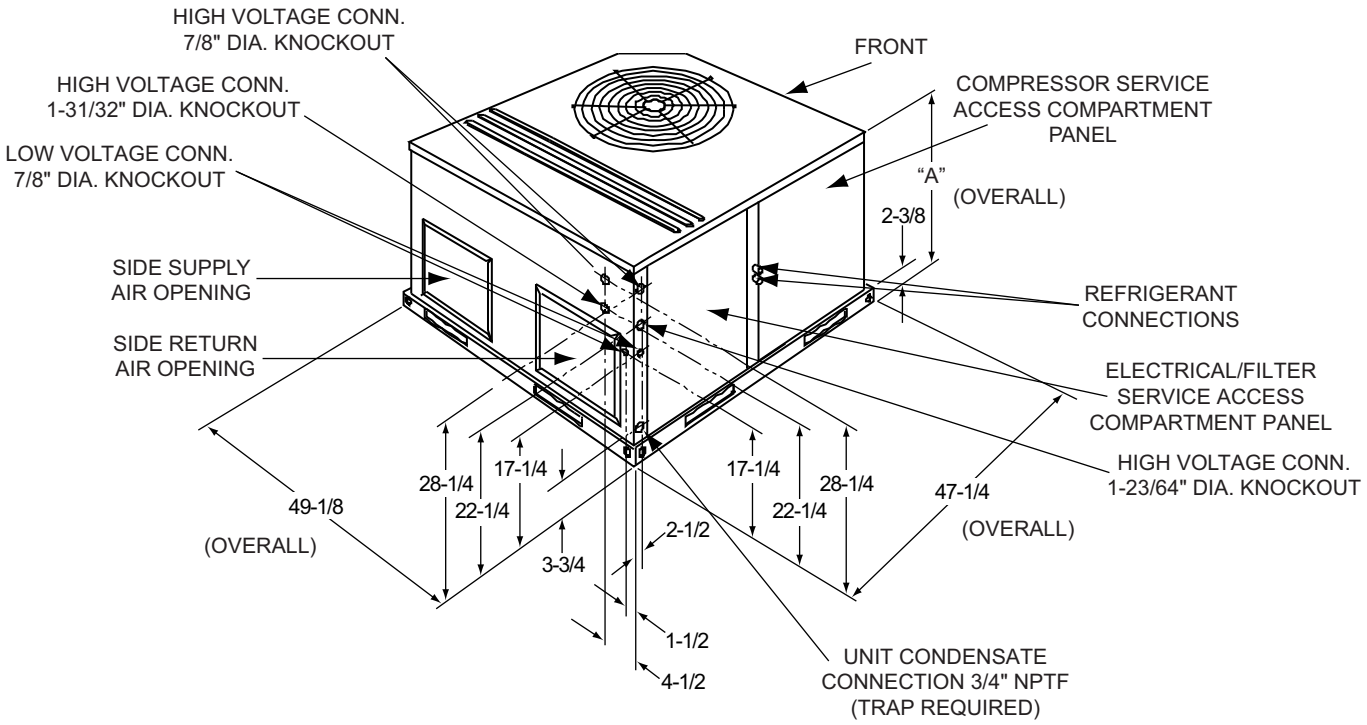


Figure 3: Unit Dimensions

Table 3: Unit Dimensions Front

Unit Size	Dimensions
	"A"
024, 036	33-1/2
048, 060	41-1/2

Table 4: Unit Clearances

Direction	Distance (in.)	Direction	Distance (in.)
Top[1]	36	Right	24
Front	12	Left	24
Rear	0	Bottom[2 3]	0

1. Units must be installed outdoors. Over hanging structure or shrubs should not obscure condenser air discharge outlet.
2. Units may be installed on combustable floors made from wood or class A, B or C roof covering materials.
3. Minimum Clearance of 1inch all sides of supply air duct for the first 3 foot of duct for 20 & 25 kW., zero inches there after. For all other heaters, zero inch clearance all sides for entire length of duct.

Note: For units applied with a roof curb, the minimum clearance may be reduced from 1 inch to 1/2 inch between combustible roof curb material and this supply air duct.

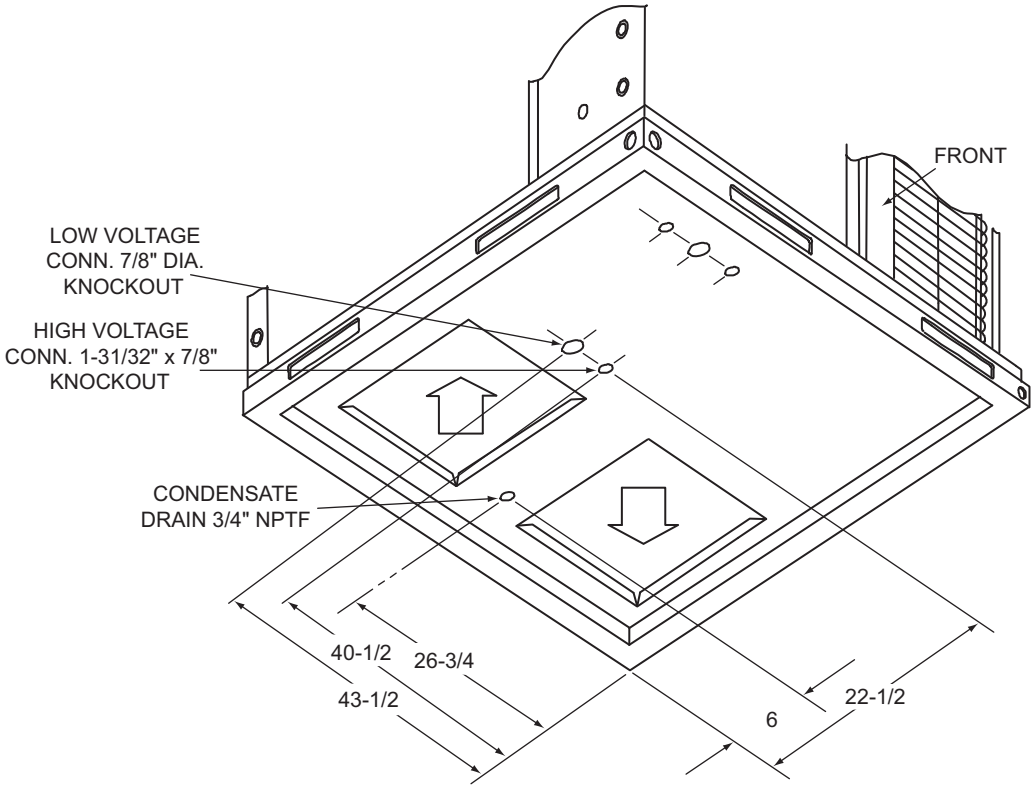


Figure 4: Dimensions Front and Bottom

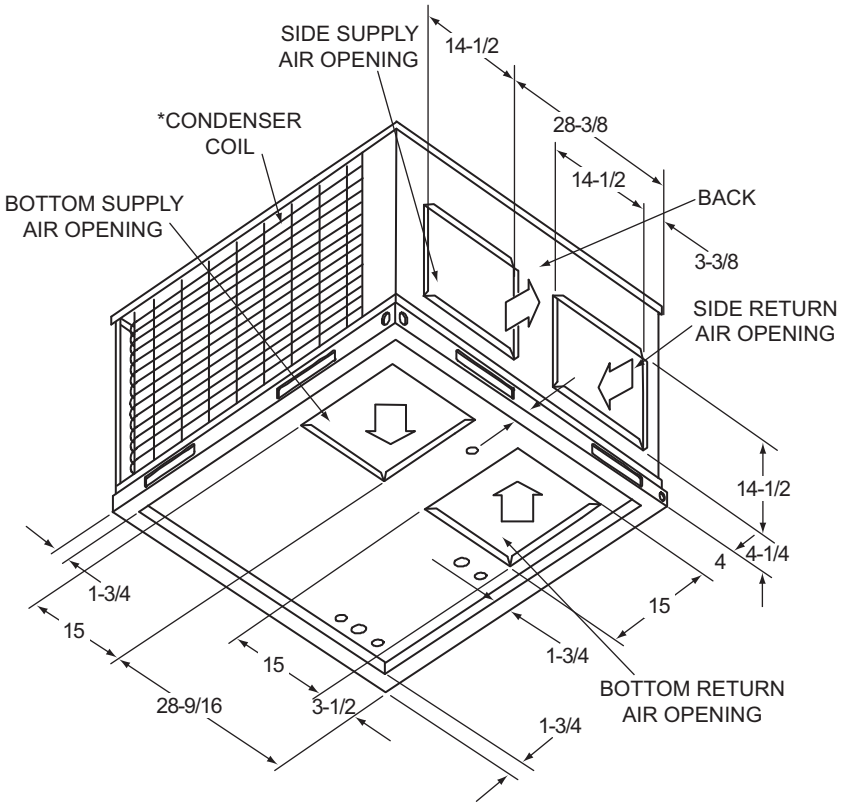


Figure 5: Dimensions Back and Bottom

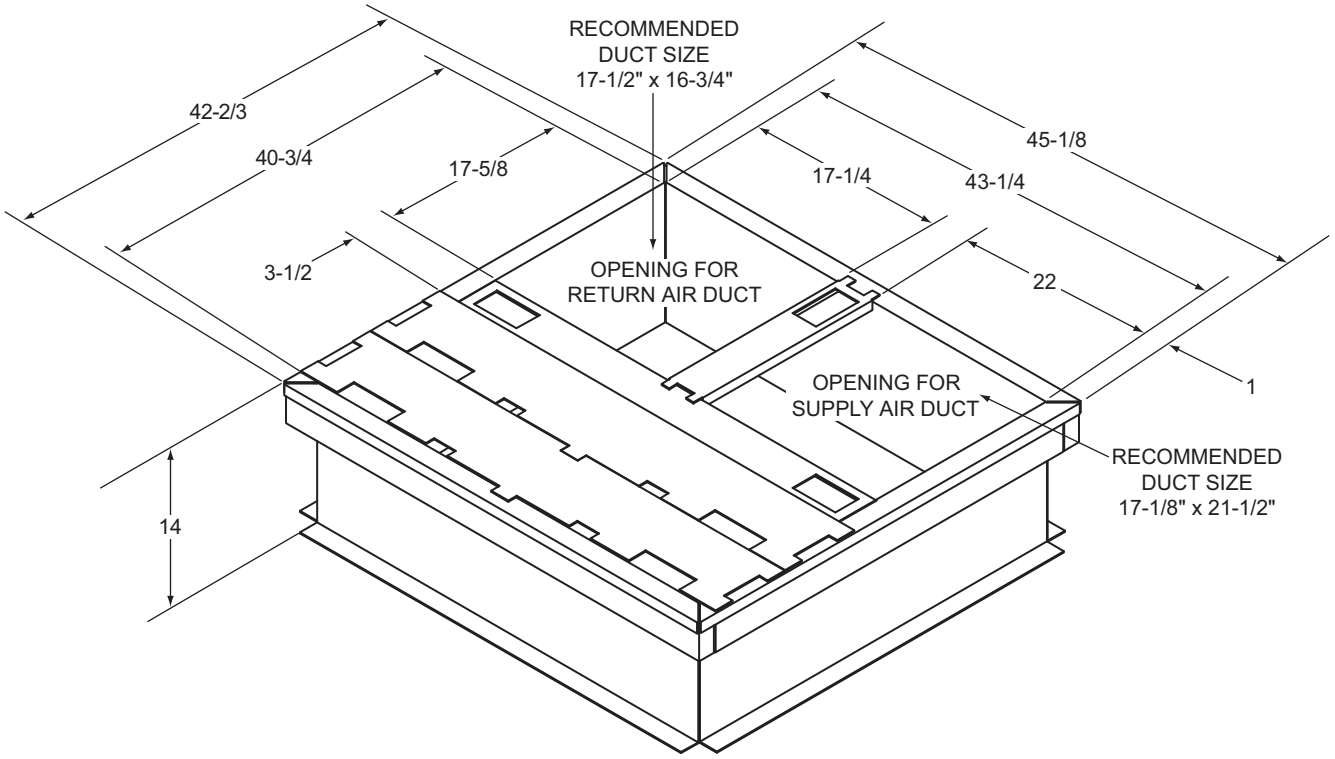


Figure 6: Roof Curb[1]

Ductwork

These units are adaptable to downflow use as well as rear supply and return air duct openings. To convert to downflow, use the following steps:

1. Remove the duct covers found in the bottom return and supply air duct openings. There are four (4) screws securing each duct cover (save these screws to use in Step 2).
2. Install the duct covers (removed in step one) to the rear supply and return air duct openings. Secure with the four (4) screws used in step one.
3. Seal duct covers with silicone caulk.

Duct work should be designed and sized according to the methods of the Air Conditioning Contractors of America (ACCA), as set forth in their Manual D.

A closed return duct system shall be used. This shall not preclude use of economizers or ventilation air intake. Flexible joints may be used in the supply and return duct work to minimize the transmission of noise.

⚠ CAUTION

When fastening duct work to the side duct flanges on the unit, insert the screws through the duct flanges only. DO NOT insert the screws through the casing. Outdoor duct work must be insulated and waterproofed.

1. 8" Roof Curb also available.

NOTE: Be sure to note supply and return openings.

Refer to Figures 4 and 5 for information concerning rear and bottom supply and return air duct openings.

Roof Curb

On applications when a roof curb is used, the unit must be positioned on the curb so the front of the unit is tight against the curb.

Filters

Single phase units are shipped without a filter or filter racks. It is the responsibility of the installer to secure a filter in the return air ductwork or install a Filter/Frame Kit (1FF0114).

A filter rack and high velocity filters are standard on three phase units.

Filters must always be used and must be kept clean. When filters become dirt laden, insufficient air will be delivered by the blower, decreasing your units efficiency and increasing operating costs and wear-and-tear on the unit and controls.

Filters should be checked monthly; this is especially important since this unit is used for both heating and cooling.

Condensate Drain

A condensate trap is recommended to be installed in the condensate drain. The plumbing must conform to local codes.

Use a sealing compound on male pipe threads. Install the condensate drain line (3/4” NPTF) to spill into an open drain.

⚠ CAUTION

Hand tighten only.

Service Access

Access to all serviceable components is provided at the following locations:

- Blower compartment access panel
- Electrical/Filter access panel
- Compressor access panel
- Refrigerant connections

Refer to Figures 1 and 3 for location of these access locations and minimum clearances in Table 4.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system. Gage sets, hoses, refrigerant containers and recovery systems must be designed to handle R-410A. If you are unsure, consult the equipment manufacturer. Failure to use R-410A compatible servicing equipment may result in property damage or injury.

⚠WARNING

Wear safety glasses and gloves when handling refrigerants. Failure to follow this warning can cause serious personal injury.

Refer to Figure 12 for the R-410A quick reference guide.

Thermostat

The room thermostat should be located on an inside wall approximately 56" above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow manufacturer's instructions enclosed with the thermostat for general installation procedure. Six color coded insulated wires (minimum #18 AWG) should be used to connect thermostat to unit. See Figures 7 and 8.

Power And Control Wiring

Field wiring to the unit must conform to provisions of the current N.E.C. ANSI/NFPA No. 70 or C.E.C. and/or local ordinances. The unit must be electrically grounded in accordance with local codes or, in their absence, with the N.E.C./C.E.C. Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 5.

The wiring entering the cabinet must be provided with mechanical strain relief.

A fused disconnect switch should be field provided for the unit. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram.

Electrical line must be sized properly to carry the load. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

Refer to Figures 7, 8 and 9 for typical field wiring and to the appropriate unit wiring diagram for control circuit and power wiring information.

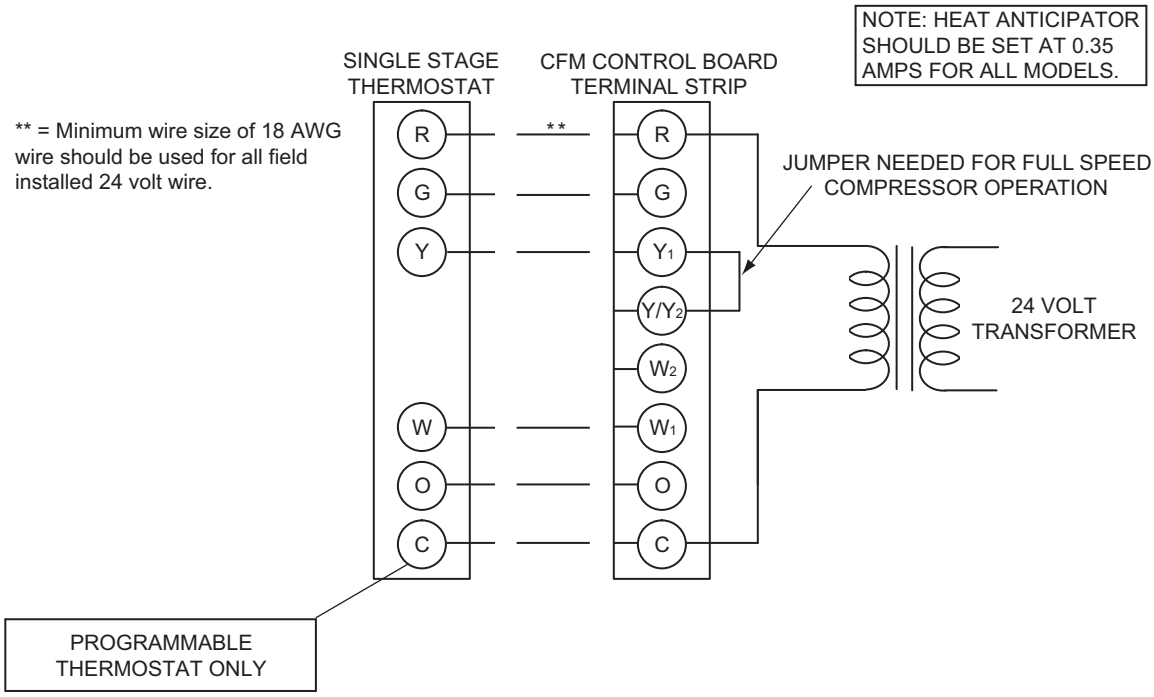


Figure 7: Field Control Wiring Diagram Single Stage Thermostat

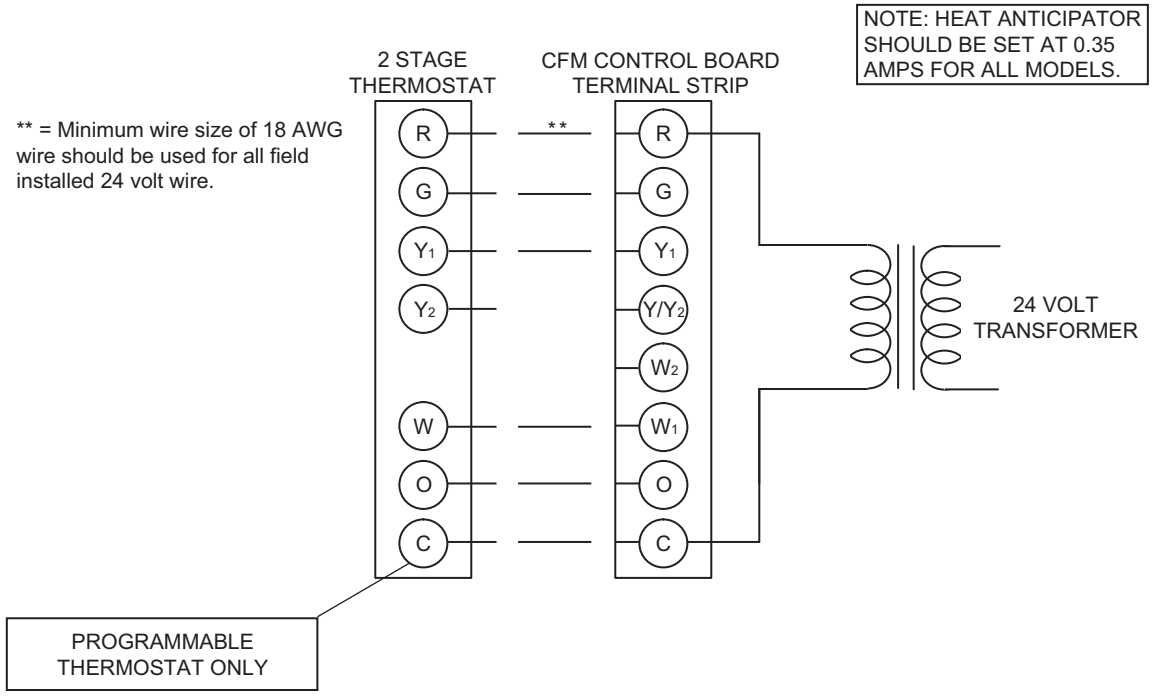


Figure 8: Field Control Wiring Diagram 2 Stage Thermostat

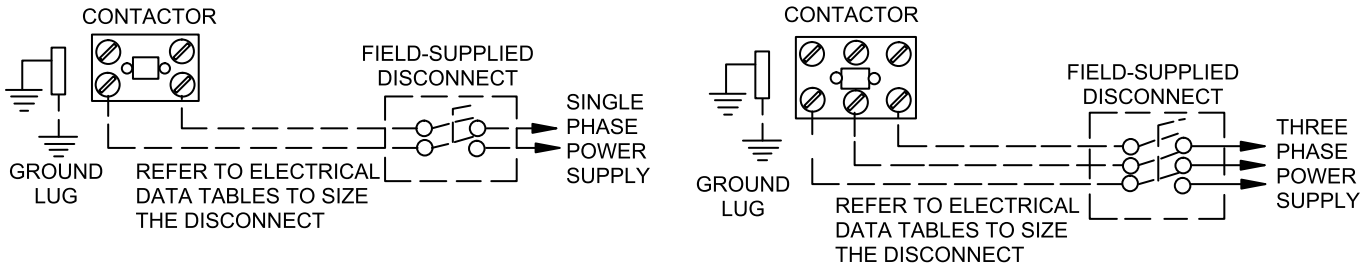


Figure 9: Field Power Wiring Diagram

Table 5: Electrical Data

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Electric Heat Option				MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
		RLA	LRA	MCC	FLA	FLA	Model	kW	Stages	Amps		
024 (2.0)	208/230-1-60	10.2	52	16	0.9	4.3	None	-	-	-	18	25
							2NH04500506	3.8/5	1	18.1/20.8	40.5/44	45/45
							2NH04500706	5.6/7.5	2	27.1/31.3	51.8/57	60/60
							2NH04501006	7.5/10	2	36.1/41.7	63.1/70	70/80
							2NE04500706	5.6 / 7.5	2	27.1 / 31.3	33.9 / 39.1	35 / 40
							2NE04501006	7.5 / 10	2	36.1 / 41.7	45.1 / 52.1	50 / 60
036 (3.0)	208/230-1-60	16.6	82	26	1.1	6.8	None	-	-	-	28.7	35
							2NH04500506	3.8/5	1	18.1/20.8	51.2/54.7	60/60
							2NH04500706	5.6/7.5	2	27.1/31.3	62.5/67.7	70/70
							2NH04501006	7.5/10	2	36.1/41.7	73.8/80.7	80/90
							2NH04501506	11.3/15	2	54.2/62.5	96.4/106.8	100/110
							2NE04500706	5.6 / 7.5	2	27.1 / 31.3	33.9 / 39.1	35 / 40
							2NE04501006	7.5 / 10	2	36.1 / 41.7	45.1 / 52.1	50 / 60
							2NE04501506	11.3 / 15	2	54.2 / 62.5	67.7 / 78.1	70 / 80
	208/230-3-60	11.1	58	17	1.1	6.8	None	-	-	-	21.8	30
							2NH04501025	7.5/10	1	20.8/24.1	47.8/51.8	50/60
							2NH04501525	11.3/15	1	31.3/36.1	60.9/66.9	70/70
	460-3-60	4.5	29	7	0.6	3.4	None	-	-	-	9.6	15
							2NH04501046	10	1	12	24.7	25
							2NH04501546	15	1	18	32.2	35
048 (4.0)	208/230-1-60	21.1	96	33	2.6	6.8	None	-	-	-	35.8	45
							2NP04501006	7.5/10	2	36.1/41.7	80.9/87.9	90/90
							2NP04501506	11.3/15	2	54.2/62.5	103.5/113.9	110/125
							2NP04502006	15/20	2	72.2/83.3	126.1/139.9	150/150
							2NP04502506	18.8/25	2	90.3/104.2	148.6/166	150/175
							2NE04501006	7.5 / 10	2	36.1 / 41.7	45.1 / 52.1	50 / 60
							2NE04501506	11.3 / 15	2	54.2 / 62.5	67.7 / 78.1	70 / 80
							2NE04502006	15 / 20	2	72.2 / 83.3	90.3 / 104.2	100 / 110
							2NE04502506	18.8 / 25	2	90.3 / 104.2	112.8 / 130.2	125 / 150
	208/230-3-60	13.4	88	21	2.6	6.8	None	-	-	-	26.2	35
							2NP04501025	7.5/10	1	20.8/24.1	52.2/56.2	60/60
							2NP04501525	11.3/15	1	31.3/36.1	65.2/71.3	70/80
							2NP04502025	15/20	2	41.7/48.1	78.3/86.3	80/90
							2NP04502525	18.8/25	2	52.1/60.1	91.3/101.3	100/110
	460-3-60	6.4	41	10	1.3	3.4	None	-	-	-	12.7	15
							2NP04501046	10	1	12	27.7	30
							2NP04501546	15	1	18	35.3	40
							2NP04502046	20	2	24.1	42.8	45
							2NP04502546	25	2	30.1	50.3	60

Table 5: Electrical Data (Continued)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Electric Heat Option				MCA[1] (Amps)	Max Fuse[2]/ Breaker[3] Size (Amps)
		RLA	LRA	MCC	FLA	FLA	Model	kW	Stages	Amps		
060 (5.0)	208/230-1-60	25.6	118	40	2.5	9.1	None	-	-	-	43.6	60
							2NP04501006	7.5/10	2	36.1/41.7	88.7/95.7	100/110
							2NP04501506	11.3/15	2	54.2/62.5	111.3/121.7	125/125
							2NH04502006	15/20	2	72.2/83.3	133.9/147.8	150/150
							2NP04502506	18.8/25	2	90.3/104.2	156.4/173.8	175/175
							2NE04501006	7.5 / 10	2	36.1 / 41.7	45.1 / 52.1	50 / 60
							2NE04501506	11.3 / 15	2	54.2 / 62.5	67.7 / 78.1	70 / 80
							2NE04502006	15 / 20	2	72.2 / 83.3	90.3 / 104.2	100 / 110
							2NE04502506	18.8 / 25	2	90.3 / 104.2	112.8 / 130.2	125 / 150
	208/230-3-60	17.6	135	28	2.5	9.1	None	-	-	-	33.6	45
							2NH04501025	7.5/10	1	20.8/24.1	59.7/63.7	70/70
							2NH04501525	11.3/15	1	31.3/36.1	72.7/78.7	80/80
							2NH04502025	15/20	2	41.7/48.1	85.7/93.7	90/100
							2NH04502525	18.8/25	2	52.1/60.1	98.8/108.8	100/110
	460-3-60	9.0	62	14	1.3	4.6	None	-	-	-	17.2	25
							2NP04501046	10	1	12	32.2	35
							2NH04501546	15	1	18	39.7	40
							2NH04502046	20	2	24.1	47.2	50
							2NP04502546	25	2	30.1	54.7	60

1. Minimum Circuit Ampacity.
2. Maximum Over Current Protection per standard UL 1995.
3. Fuse or HACR circuit breaker size installed at factory or field installed.

Table 6: Physical Data

Component	Models			
	BHX024	BHX036	BHX048	BHX060
Nominal Tonnage	**2.0**	**3.0**	**4.0**	**5.0**
ARI COOLING PERFORMANCE				
Gross Capacity @ ARI A point (Btu)	24.9	35.3	49.2	58.8
ARI net capacity (Btu)	24.4	34.4	47.0	57.0
EER	12.0	11.5	11.3	11.0
SEER	16	15	15	14.5
Nominal CFM	800	1200	1600	1700
System power (KW)	2.0	3.0	4.2	5.2
Refrigerant type	R410a	R410a	R410a	R410a
Refrigerant charge (lb-oz)	7-10	10-4	12-4	12-0
ARI HEATING PERFORMANCE				
47°F Capacity Rating (Mbh)	19.8	33.0	45.0	55.0
System Power (Kw/COP)	3.5	3.1	3.0	3.1
17°F Capacity Rating (Mbh)	11.1	18.9	27.2	32.4
System Power (Kw/COP)	2.1	2.0	2.1	2.1
HSPF (BTU/Watts-hr.)	8.0	8.0	8.0	8.0
DIMENSIONS (inches)				
Length	49 1/8	49 1/8	49 1/8	49 1/8
Width	47 1/4	47 1/4	47 1/4	47 1/4
Height	33 1/2	33 1/2	41 1/2	41 1/2
OPERATING WT. (lbs.)	350	400	440	460
COMPRESSORS				
Type	Scroll 2-spd	Scroll 2-spd	Scroll 2-spd	Scroll 2-spd
Quantity	1	1	1	1
CONDENSER COIL DATA				
Face area (Sq. Ft.)	11.7	11.7	16.4	16.4
Rows	1	2	2	2
Fins per inch	20	20	20	20
Tube diameter (in.)	3/8	3/8	3/8	3/8
Circuitry Type	Interlaced	Interlaced	Interlaced	Interlaced
Refrigerant control	Orifice	TXV	TXV	TXV
EVAPORATOR COIL DATA				
Face area (Sq. Ft.)	4.38	4.38	5.63	5.63
Rows	3	3	3	3
Fins per inch	15	15	16	16
Tube diameter	3/8	3/8	3/8	3/8
Circuitry Type	Interlaced	Interlaced	Interlaced	Interlaced
Refrigerant control	TXV	TXV	TXV	TXV

Table 6: Physical Data (Continued)

Component	Models			
	BHX024	BHX036	BHX048	BHX060
Nominal Tonnage	**2.0**	**3.0**	**4.0**	**5.0**
CONDENSER FAN DATA				
Fan diameter (Inch)	22	22	22	22
Type	Axial	Axial	Axial	Axial
Drive type	Direct	Direct	Direct	Direct
No. speeds	2	1	2	2
Number of motors	1	1	1	1
Motor HP each	1/3	1/4	1/3	1/3
RPM	850/1100	1100	900/1100	950/1100
Nominal total CFM	2400	2400	3000	3000
DIRECT DRIVE EVAP FAN DATA				
Quantity	1	1	1	1
Fan Size (Inch)	10 x 8	11 x 10	11 x 10	11 x 10
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal
No. speeds	1	1	1	1
Motor HP each	1/2	3/4	3/4	1
RPM	Variable	Variable	Variable	Variable
Frame size	48	48	48	48
FILTERS				
Quantity - Size	2 - 22 x 14 x 1	2 - 22 x 14 x 1	2 - 22 x 14 x 1	2 - 22 x 14 x 1

Compressors

The scroll compressor used in this product is specifically designed to operate with R-410A Refrigerant and cannot be interchanged.

⚠ CAUTION

This system uses R-410A Refrigerant which operates at higher pressures than R-22. No other refrigerant may be used in this system.

The compressor also uses a polyolester (POE oil), Mobil 3MA POE. This oil is extremely hydroscopic, meaning it absorbs water readily. POE oil can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

⚠ CAUTION

Do not leave the system open to the atmosphere. Unit damage could occur due to moisture being absorbed by the **POE oil** in the system. This type of oil is highly susceptible to moisture absorption

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials.

⚠ CAUTION

Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take precautions to protect roofing.

Procedures which risk oil leakage include, but are not limited to, compressor replacement, repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device or coil.

Units are shipped with compressor mountings which are factory adjusted and ready for operation.

⚠ CAUTION

Do not loosen compressor mounting bolts.

Phasing

Three-phase, scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or is producing a high noise level, the scroll is misphased. Change the incoming line connection phasing to obtain the proper rotation.

⚠ CAUTION

Scroll compressors require proper rotation to operate properly. Failure to check and correct rotation may result in property damage.

Airflow Performance

Table 7: Side Duct Application

Size (Tons)	Mode		Thermostat Input	Speed Tap	CFM	External Static Pressure (Inch Water Gauge)								
						0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
						Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts
024 (2.0)	Cool	Low	Y1	COOL-A	600	58	74	91	108	126	143	161	179	197
			Y1	COOL-B	450	39	53	68	84	100	117	134	152	170
			Y1	COOL-C	525	47	63	79	95	112	129	146	164	182
			Y1	COOL-D	675	71	89	106	124	143	161	179	198	217
		High	Y1+Y2	COOL-A	800	99	118	137	157	177	197	217	238	259
			Y1+Y2	COOL-B	600	58	74	91	108	126	143	161	179	197
			Y1+Y2	COOL-C	700	76	94	112	130	149	167	186	205	224
			Y1+Y2	COOL-D	900	127	146	167	188	209	231	254	277	301
	Heat	Heat Pump	Y1	COOL-A	800	99	118	137	157	177	197	217	238	259
			Y1	COOL-B	600	58	74	91	108	126	143	161	179	197
			Y1	COOL-C	700	76	94	112	130	149	167	186	205	224
			Y1	COOL-D	900	127	146	167	188	209	231	254	277	301
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	720	80	98	117	135	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	720	80	98	117	135	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	900	127	146	167	188	-	-	-	-	-
	Cool	Low	Y1	COOL-A	900	140	165	191	217	245	273	303	333	364
			Y1	COOL-B	750	98	122	146	171	196	222	248	275	302
			Y1	COOL-C	825	118	142	167	192	219	246	273	302	331
			Y1	COOL-D	975	163	190	217	246	275	305	336	368	400
		High	Y1+Y2	COOL-A	1200	245	279	314	349	385	421	457	494	531
			Y1+Y2	COOL-B	1000	171	199	227	256	285	316	347	380	413
			Y1+Y2	COOL-C	1100	206	237	268	300	332	365	399	434	468
			Y1+Y2	COOL-D	1300	286	326	366	405	444	483	522	562	600
036 (3.0)	Heat	Heat Pump	Y1	COOL-A	1200	245	279	314	349	385	421	457	494	531
			Y1	COOL-B	1000	171	199	227	256	285	316	347	380	413
			Y1	COOL-C	1100	206	237	268	300	332	365	399	434	468
			Y1	COOL-D	1300	286	326	366	405	444	483	522	562	600
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1080	199	229	259	290	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1100	206	237	268	300	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1300	286	326	366	405	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1300	286	326	366	405	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	1300	286	326	366	405	-	-	-	-	-

Table 7: Side Duct Application (Continued)

Size (Tons)	Mode		Thermostat Input	Speed Tap	CFM	External Static Pressure (Inch Water Gauge)								
						0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
						Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts
048 (4.0)	Cool	Low	Y1	COOL-A	1050	184	216	248	280	313	346	380	414	448
			Y1	COOL-B	918	138	166	194	224	254	286	318	351	385
			Y1	COOL-C	984	160	190	220	251	282	315	348	381	416
			Y1	COOL-D	1115	210	243	277	311	345	379	414	449	484
		High	Y1+Y2	COOL-A	1600	448	500	551	600	647	693	736	779	819
			Y1+Y2	COOL-B	1400	338	383	426	468	509	549	589	627	664
			Y1+Y2	COOL-C	1500	391	439	486	532	576	618	660	700	739
			Y1+Y2	COOL-D	1700	508	565	620	672	723	772	818	863	905
	Heat	Heat Pump	Y1	COOL-A	1600	448	500	551	600	647	693	736	779	819
			Y1	COOL-B	1400	338	383	426	468	509	549	589	627	664
			Y1	COOL-C	1500	391	439	486	532	576	618	660	700	739
			Y1	COOL-D	1700	508	565	620	672	723	772	818	863	905
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1440	359	405	449	493	535	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1500	391	439	486	532	576	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1700	508	565	620	672	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1700	508	565	620	672	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	1700	508	565	620	672	723	-	-	-	-
	Cool	Low	Y1	COOL-A	1200	138	176	211	244	275	303	329	352	374
			Y1	COOL-B	1130	61	98	133	163	190	213	232	247	260
			Y1	COOL-C	1270	208	246	283	318	353	386	418	448	478
			Y1	COOL-D	1340	272	310	348	386	423	460	497	533	570
		High	Y1+Y2	COOL-A	1700	487	531	575	621	668	716	765	816	867
			Y1+Y2	COOL-B	1600	446	487	530	574	619	666	714	763	814
			Y1+Y2	COOL-C	1800	514	560	607	654	701	749	798	847	897
			Y1+Y2	COOL-D	1900	526	576	624	672	720	766	813	859	
060 (5.0)	Heat	Heat Pump	Y1	COOL-A	1700	487	531	575	621	668	716	765	816	867
			Y1	COOL-B	1600	446	487	530	574	619	666	714	763	814
			Y1	COOL-C	1800	514	560	607	654	701	749	798	847	897
			Y1	COOL-D	1900	526	576	624	672	720	766	813	859	-
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	2070	515	570	622	671	716	-	-	-	-

Table 8: Bottom Duct Application

Size (Tons)	Mode		Thermostat Input	Speed Tap	CFM	External Static Pressure (Inch Water Gauge)								
						0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
						Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts
024 (2.0)	Cool	Low	Y1	COOL-A	600	58	74	91	108	126	143	161	179	197
			Y1	COOL-B	450	39	53	68	84	100	117	134	152	170
			Y1	COOL-C	525	47	63	79	95	112	129	146	164	182
			Y1	COOL-D	675	71	89	106	124	143	161	179	198	217
		High	Y1+Y2	COOL-A	800	99	118	137	157	177	197	217	238	259
			Y1+Y2	COOL-B	600	58	74	91	108	126	143	161	179	197
			Y1+Y2	COOL-C	700	76	94	112	130	149	167	186	205	224
			Y1+Y2	COOL-D	900	127	146	167	188	209	231	254	277	301
	Heat	Heat Pump	Y1	COOL-A	800	99	118	137	157	177	197	217	238	259
			Y1	COOL-B	600	58	74	91	108	126	143	161	179	197
			Y1	COOL-C	700	76	94	112	130	149	167	186	205	224
			Y1	COOL-D	900	127	146	167	188	209	231	254	277	301
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	720	80	98	117	135	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	720	80	98	117	135	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	880	121	140	160	181	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	800	99	118	137	157	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	900	127	146	167	188	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	900	127	146	167	188	-	-	-	-	-
036 (3.0)	Cool	Low	Y1	COOL-A	900	140	165	191	217	245	273	303	333	364
			Y1	COOL-B	750	98	122	146	171	196	222	248	275	302
			Y1	COOL-C	825	118	142	167	192	219	246	273	302	331
			Y1	COOL-D	975	163	190	217	246	275	305	336	368	400
		High	Y1+Y2	COOL-A	1200	245	279	314	349	385	421	457	494	531
			Y1+Y2	COOL-B	1000	171	199	227	256	285	316	347	380	413
			Y1+Y2	COOL-C	1100	206	237	268	300	332	365	399	434	468
			Y1+Y2	COOL-D	1300	286	326	366	405	444	483	522	562	600
	Heat	Heat Pump	Y1	COOL-A	1200	245	279	314	349	385	421	457	494	531
			Y1	COOL-B	1000	171	199	227	256	285	316	347	380	413
			Y1	COOL-C	1100	206	237	268	300	332	365	399	434	468
			Y1	COOL-D	1300	286	326	366	405	444	483	522	562	600
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1080	199	229	259	290	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1100	206	237	268	300	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	1200	245	279	314	349	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1300	286	326	366	405	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1300	286	326	366	405	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	1320	295	336	376	417	-	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	1300	286	326	366	405	-	-	-	-	-

Table 8: Bottom Duct Application (Continued)

Size (Tons)	Mode		Thermostat Input	Speed Tap	CFM	External Static Pressure (Inch Water Gauge)								
						0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
						Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts	Watts
048 (4.0)	Cool	Low	Y1	COOL-A	1050	184	216	248	280	313	346	380	414	448
			Y1	COOL-B	918	138	166	194	224	254	286	318	351	385
			Y1	COOL-C	984	160	190	220	251	282	315	348	381	416
			Y1	COOL-D	1115	210	243	277	311	345	379	414	449	484
		High	Y1+Y2	COOL-A	1600	448	500	551	600	647	693	736	779	819
			Y1+Y2	COOL-B	1400	338	383	426	468	509	549	589	627	664
			Y1+Y2	COOL-C	1500	391	439	486	532	576	618	660	700	739
			Y1+Y2	COOL-D	1700	508	565	620	672	723	772	818	863	905
	Heat	Heat Pump	Y1	COOL-A	1600	448	500	551	600	647	693	736	779	819
			Y1	COOL-B	1400	338	383	426	468	509	549	589	627	664
			Y1	COOL-C	1500	391	439	486	532	576	618	660	700	739
			Y1	COOL-D	1700	508	565	620	672	723	772	818	863	905
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1440	359	405	449	493	535	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1500	391	439	486	532	576	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	1600	448	500	551	600	647	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1700	508	565	620	672	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1700	508	565	620	672	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	1760	546	606	663	718	771	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	1700	508	565	620	672	723	-	-	-	-
060 (5.0)	Cool	Low	Y1	COOL-A	1200	138	176	211	244	275	303	329	352	374
			Y1	COOL-B	1130	61	98	133	163	190	213	232	247	260
			Y1	COOL-C	1270	208	246	283	318	353	386	418	448	478
			Y1	COOL-D	1340	272	310	348	386	423	460	497	533	570
		High	Y1+Y2	COOL-A	1700	487	531	575	621	668	716	765	816	867
			Y1+Y2	COOL-B	1600	446	487	530	574	619	666	714	763	814
			Y1+Y2	COOL-C	1800	514	560	607	654	701	749	798	847	897
			Y1+Y2	COOL-D	1900	526	576	624	672	720	766	813	859	
	Heat	Heat Pump	Y1	COOL-A	1700	487	531	575	621	668	716	765	816	867
			Y1	COOL-B	1600	446	487	530	574	619	666	714	763	814
			Y1	COOL-C	1800	514	560	607	654	701	749	798	847	897
			Y1	COOL-D	1900	526	576	624	672	720	766	813	859	-
		Heat Pump + Aux. Heat	Y1+W1	COOL-A; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-A; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-A; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-A; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-B; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-B; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-B; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-B; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-C; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-C; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-C; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-C; HEAT-D	2070	515	570	622	671	716	-	-	-	-
			Y1+W1	COOL-D; HEAT-A	1900	526	576	624	672	720	-	-	-	-
			Y1+W1	COOL-D; HEAT-B	1975	526	578	628	677	723	-	-	-	-
			Y1+W1	COOL-D; HEAT-C	2150	495	554	607	656	699	-	-	-	-
			Y1+W1	COOL-D; HEAT-D	2070	515	570	622	671	716	-	-	-	-

Table 9: Additional Static Resistance

Size (Tons)	CFM	Wet Indoor Coil	Economizer[1]	Filter/Frame Kit	Electric Heat
024 (2.0)	500	0.01	0.00	0.01	0.02
	600	0.01	0.00	0.02	0.03
	700	0.01	0.00	0.02	0.03
	800	0.01	0.01	0.02	0.03
	900	0.01	0.01	0.02	0.04
	1000	0.02	0.01	0.02	0.04
	1100	0.03	0.01	0.03	0.05
	1200	0.04	0.02	0.03	0.06
036 (3.0)	700	0.01	0.00	0.02	0.03
	800	0.01	0.01	0.02	0.03
	900	0.01	0.01	0.02	0.04
	1000	0.02	0.01	0.02	0.04
	1100	0.03	0.01	0.03	0.05
	1200	0.04	0.02	0.03	0.06
	1300	0.04	0.03	0.03	0.07
	1400	0.04	0.04	0.03	0.08
048 (4.0)	1100	0.03	0.01	0.03	0.05
	1200	0.04	0.02	0.03	0.06
	1300	0.04	0.03	0.03	0.07
	1400	0.04	0.04	0.03	0.08
	1500	0.04	0.05	0.04	0.09
	1600	0.04	0.06	0.05	0.10
	1700	0.05	0.07	0.05	0.11
	1800	0.05	0.07	0.06	0.11
	1900	0.06	0.08	0.06	0.11
	2000	0.07	0.08	0.07	0.12
060 (5.0)	1100	0.03	0.01	0.03	0.05
	1200	0.04	0.02	0.03	0.06
	1300	0.04	0.03	0.03	0.07
	1400	0.04	0.04	0.03	0.08
	1500	0.04	0.05	0.04	0.09
	1600	0.04	0.06	0.05	0.10
	1700	0.05	0.07	0.05	0.11
	1800	0.05	0.07	0.06	0.11
	1900	0.06	0.08	0.06	0.11
	2000	0.07	0.08	0.07	0.12

1. The pressure drop through the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

Table 10: Electric Heat Minimum Supply Air

Size (Tons)	Voltage	Minimum Supply Air (CFM) Heater kW					
		5.0	7.5	10.0	15.0	20.0	25.0
024 (2.0)	208/230-1-60	630	630	800	-	-	-
036 (3.0)	208/230-1-60	1070	1070	1070	1070	-	-
	208/230-3-60	1070	1070	1070	1070	-	-
	460-3-60	1070	1070	1070	1070	-	-
048 (4.0)	208/230-1-60	-	-	1200	1430	1430	1430
	208/230-3-60	-	-	1200	1430	1430	1430
	460-3-60	-	-	1200	1430	1430	1430
060 (5.0)	208/230-1-60	-	-	1615	1615	1955	1955
	208/230-3-60	-	-	1615	1615	1955	1955
	460-3-60	-	-	1615	1615	1955	1955

Table 11: Indoor Blower Specifications

Size (Tons)	Motor				
	HP	RPM	Eff.	SF	Frame
024 (2.0)	1/2	Variable	0.8	1.0	48
036 (3.0)	3/4	Variable	0.8	1.0	48
048 (4.0)	3/4	Variable	0.8	1.0	48
060 (5.0)	1	Variable	0.8	1.0	48

Table 12: Electric Heat Multipliers

Voltage		kW Capacity Multipliers[1]
Nominal	Applied	
240	208	0.75
	230	0.92
480	460	0.92

1. Electric heaters are rated at nominal voltage. Use this table to determine the electric heat capacity for heaters applied at lower voltages.

Blower Speed Selection

The variable speed blowers are designed to deliver constant CFM regardless of the external static pressure (ESP) in the ductwork. Therefore, if too many supply registers are closed, a filter becomes clogged, or there is a restriction in the ductwork, the motor will automatically operate at a higher speed to compensate for the higher ESP. This may result in a higher operating sound level.

These units have variable speed motors that automatically adjust to provide constant CFM from 0.2" to 0.6" w.c. static pressure. From 0.6" to 1.0" static pressure, CFM is reduced by 2% per 0.1" increase in static. Operation on duct systems with greater than 1.0" w.c. external static pressure is not recommended.

To Set Cooling CFM:

Refer to Tables 7 and 8 for the possible high speed cooling and heat pump CFM selections.

Find the recommended system airflow for the unit model.

Set “COOL” and “ADJ” Jumpers on the CFM selection board as indicated in Tables 7, 8 and Figure 10.

NOTE: CFM indicator light flashes once for every 100 CFM (i.e., 12 flashes = 1200 CFM).

⚠ CAUTION

Do not change the “ADJ” tab position on the CFM selection board as this will change your cooling CFM previously selected.

To Set Heat Pump CFM:

The heat pump CFM setting is the same as the cooling CFM. No additional CFM setting is required, however, you must remove the jumper at the bottom of the connector board labeled “HP” for heat pump operation (See Figure 10).

To Set Delay Profile:

Every unit has multiple cooling “blower off delay” profiles to optimize system performance and efficiency. Refer to Table 13 for the regional climate in your area. Place the “DELAY” jumper tap on the CFM selection board to the appropriate pin setting.

To Set Electric Heat CFM:

The blower speed required for the Electric Heat is different than cooling.

Refer to Table 10 for the minimum required CFM for the electric heater installed. Find the desired airflow in Tables 7 and 8. Set the “Heat” Jumper on the CFM selection board to tap shown.

Fan Only CFM:

When the connection is made from “R” to “G”, the fan only mode is activated. In this mode, the blower will deliver 75% of the cooling system CFM. This connection is factory set from the manufacturer and cannot be field adjusted.

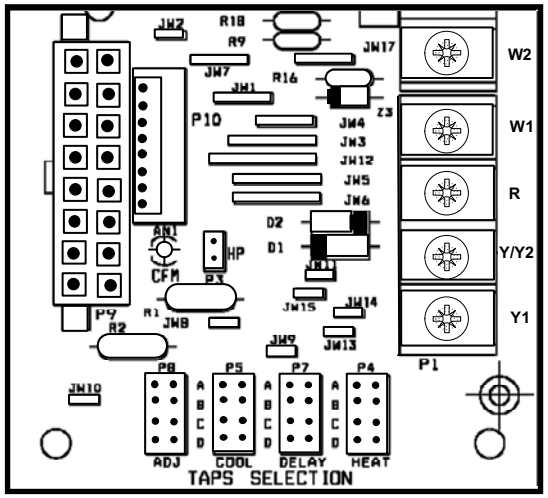


Figure 10: Control Board Speed Tap Location

Table 13: Delay Profile

Delay Tap	Regional Climate Type
Jumper at “A”	Standard Setting
Jumper at “B”	Humid Climate
Jumper at “C”	Dry Climate
Jumper at “D”	Temperate Climate

Operation

The following sequences of operation are based on using a standard single-stage heat pump thermostat.

Cooling Sequence Of Operations

1. If the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" signals the ECM motor controller to operate the blower at 75% of the rated airflow. If the fan switch on the thermostat is in the "AUTO" position, the blower operates only when there is a call for cooling by the thermostat.
2. If the 2-stage thermostat calls for the first stage of cooling, the 24 volts at "O" energizes the reversing valve solenoid. The 24 volts at "Y1" signals the ECM controller to operate the blower at low speed and closes the contactor coil M1 after the anti-short cycle period is complete. Power is supplied to the compressor and outdoor fan motor, and the reversing

valve switches to the cooling position. When the fan switch on the thermostat is in the "AUTO" position, the indoor blower motor is energized at the low-speed cooling airflow.

3. If the 2-stage thermostat calls for the second stage of cooling, the 24 volts at "Y2" signals the ECM controller to operate the blower at high speed and energizes the compressor solenoid to close the bypass ports so that the compressor operates at full capacity. If the outdoor fan motor has an ECM controller, the 24 volts at "Y2" signals the motor to operate at high speed.
4. When the cooling demand is satisfied, the 24 volt "Y1" and "Y2" signals are removed and the M1 contactor is de-energized. If the fan switch on the thermostat is in the "ON" position, the blower will continue to run at 75% of the rated airflow. If the fan switch is in the "AUTO" position, the blower will continue to run for a short period as determined by the "DELAY" jumper setting on the CFM Selector board.

Heating Sequence Of Operations

1. If the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" signals the ECM motor controller to operate the blower at 75% of the rated airflow. If the fan switch on the thermostat is in the "AUTO" position, the blower operates only when there is a call for heating by the thermostat.
2. The heat pump is rated to operate at single speed only in heating mode. If the thermostat calls for heating, the 24 volts at "Y" signals the ECM controller to operate the blower at high speed and closes the contactor coil M1 after the anti-short cycle period is complete. Power is supplied to the compressor and outdoor fan motor. When the fan switch on the thermostat is in the "AUTO" position, the indoor blower motor is energized at the heating airflow. The reversing valve remains in the heating position.
3. For units equipped with supplementary electric heat, 24 volts at "W" sends 24 volts to "W2" on the fan control board. This signal also is sent through the defrost control terminals "W" and "W6" and back to the fan control "W1". The 24 volt signal energizes all stages of electric heat.
4. When the heating demand is satisfied, the 24 volt "W" signal is removed and the electric heat is de-energized. The M1 contactor is de-energized when the 24 volt "Y" signal is removed. If the fan switch on the thermostat is in the "ON" position, the blower will continue to run at 75% of the rated airflow. If the fan switch is in the "AUTO" position, the blower will continue to run for a short period as determined by the "DELAY" jumper setting on the CFM Selector board.

Please refer to Tables 14 and 15 for more information.

Defrost Operation

The demand defrost control implements a temperature differential ("delta-T") demand defrost algorithm. The heat pump is allowed to operate in the heating mode until the combination of outdoor ambient and outdoor coil temperatures indicate that defrosting is necessary. When coil temperature is below the initiate point for the ambient temperature continuously for 4-1/2 minutes, the heat pump is put into a defrost cycle. This 4-1/2 minute timer eliminates unnecessary defrost cycles caused by refrigeration surges such as those that occur at the start of a heating cycle.

A timed inhibit feature prevents the system from responding to a call for defrost less than 20 minutes after the initiation of the previous defrost. After the 20 minute inhibit time has expired, temperature conditions must call for defrost continuously for 4-1/2 minutes before a defrost cycle is initiated. A temperature inhibit feature prohibits defrost if the coil temperature is above 40 °F.

A forced-defrost feature puts the system into a defrost period every 6 hours and 4 minutes to recirculate lubricants, unless the coil temperature is above 40 °F. All defrost timing occurs only while the compressor is on. During the defrost mode, the defrost control will provide a 24 volt signal from terminal "W1/66" to the fan control terminal "W1". This signal will energize electric heat stage 1, if the unit is so equipped. For trouble shooting purposes, the defrost cycle can be manually initiated by shorting the "TEST" pins together for 5 seconds. Defrost will terminate normally during the "TEST" mode.

Demand Defrost Selection

Demand defrost jumper is factory set at position #2.

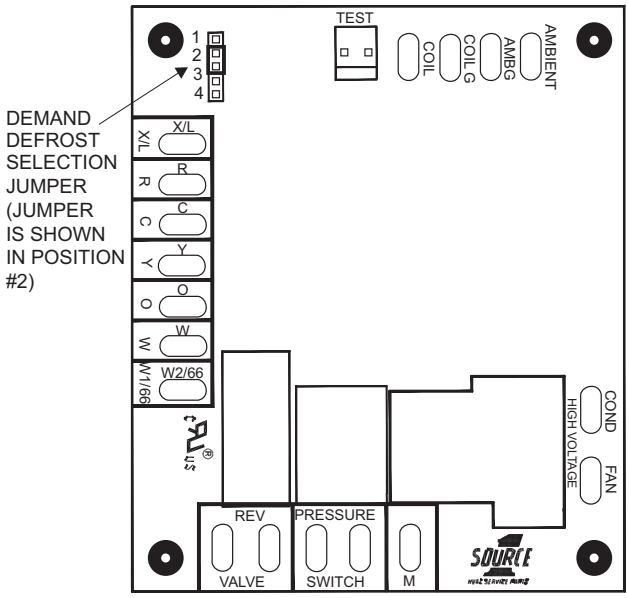


Figure 11: Demand Defrost "Curve" Selection Jumper

Heat Pump Safety Switch Operation

The unit is equipped with a safety package. The refrigeration system will be protected against high or low refrigerant pressure. If either of these safety switches opens, the unit will be shut off for the 5 minute anti-short cycle time. Once this has expired, a six hour elapsed run timer begins. If a second opening of a safety switch occurs during this six hour period, the compressor will be locked out. Resetting the lockout function is accomplished by:

1. Removing power from the control's thermostat 1st stage (Y) input for a time not to exceed 5 seconds (ON-OFF-ON).
2. Removing power from "R" for more than 2 seconds.
3. Shorting the "TEST" pins together for more than 2 seconds.

Electric Heat Limit Switch Operation

The limit switch responds to over-temperature conditions in the air duct. Opening the device results in dropping power to the relays. The control logic will also respond by turning off the relays. After four limit cycle trips the unit goes into a 1 hour soft lockout period. If the control "sees" another limit cycle during this period, the unit will go into a hard lockout condition. Once in a hard lockout state, the fan is locked on and the heaters are disabled. Only a power cycle will clear this state.

During the soft lockout period, the fan responds to thermostat input but the heaters are enabled. This is to sense a failed heater relay. The limit cycle count is reset at the start of a heat request. If the limit remains open for period of 80 seconds or more, the control is immediately put into a hard lockout condition. Only a power cycle will clear this state.

Table 14: Thermostat Signals (Single Phase Units)

Signal	State	Board Function
G	ON	BLOWER INSTANT ON AT 75% RATED AIRFLOW
	OFF	BLOWER INSTANT OFF
G, Y1 & O	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN FIRST STAGE COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF BLOWER OFF DELAY DETERMINED BY “DELAY” JUMPER SETTING
G, Y1, Y2 & O	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN SECOND STAGE COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF BLOWER OFF DELAY DETERMINED BY “DELAY” JUMPER SETTING
G & W	ON	BLOWER INSTANT ON HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT 1/2 SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF
G, Y2 & W	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON SYSTEM OPERATES IN HEATING HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT 1/2 SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF
W	ON	BLOWER INSTANT ON HEATER BANK 1 ELEC. HEAT INSTANT ON HEATER BANK 2 ELEC. HEAT 10 SEC. DELAY ON HEATER BANK 3 ELEC. HEAT 20 SEC. DELAY ON
	OFF	HEATER BANK 3 ELEC. HEAT INSTANT OFF HEATER BANK 2 ELEC. HEAT 1/2 SEC. DELAY OFF HEATER BANK 1 ELEC. HEAT 1 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF

Table 15: Thermostat Signals (Three Phase Units)

Signal	State	Board Function
G	ON	BLOWER INSTANT ON AT 75% RATED AIRFLOW
	OFF	BLOWER INSTANT OFF
G, Y1 & O	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN FIRST STAGE COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF BLOWER OFF DELAY DETERMINED BY “DELAY” JUMPER SETTING
G, Y1, Y2 & O	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN SECOND STAGE COOLING
G & Y2	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) SYSTEM OPERATES IN HEATING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF BLOWER OFF DELAY DETERMINED BY “DELAY” JUMPER SETTING
G & W	ON	BLOWER INSTANT ON HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT 1/2 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF
G, Y2 & W	ON	BLOWER INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON SYSTEM OPERATES IN HEATING HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT 1/2 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF
W	ON	BLOWER INSTANT ON HEATER BANK 1, 2 & 3 ELEC. HEAT INSTANT ON HEATER BANK 4, 5 & 6 ELEC. HEAT 10 SEC. DELAY ON
	OFF	HEATER BANK 4, 5 & 6 ELEC. HEAT INSTANT OFF HEATER BANK 1, 2 & 3 ELEC. HEAT 1/2 SEC. DELAY OFF BLOWER 60 SEC. DELAY OFF

Maintenance

Normal Maintenance

⚠WARNING

Prior to any of the following maintenance procedures, shut off all power to the unit, to avoid personal injury.

Periodic maintenance consists of changing or cleaning filters and general cleaning of the outdoor coil.

FILTERS - Inspect once a month. Replace Disposable or clean Permanent Type as necessary. DO NOT replace Permanent Type with Disposable.

MOTORS - Indoor and outdoor fan motors are permanently lubricated and require no maintenance.

OUTDOOR COIL - Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep the coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean the coil, be sure that the power to the unit is shut off prior to cleaning.

⚠ CAUTION

Exercise care when cleaning the coil so that the coil fins are not damaged.

Do not permit the hot condenser air discharge to be obstructed by overhanging structures or shrubs.

Troubleshooting

⚠WARNING

Troubleshooting of components necessarily requires opening the electrical control box with the power connected to the unit. Use extreme care when working with live circuit! Check the unit nameplate for the correct range before making any connections with line terminals.

⚠ CAUTION

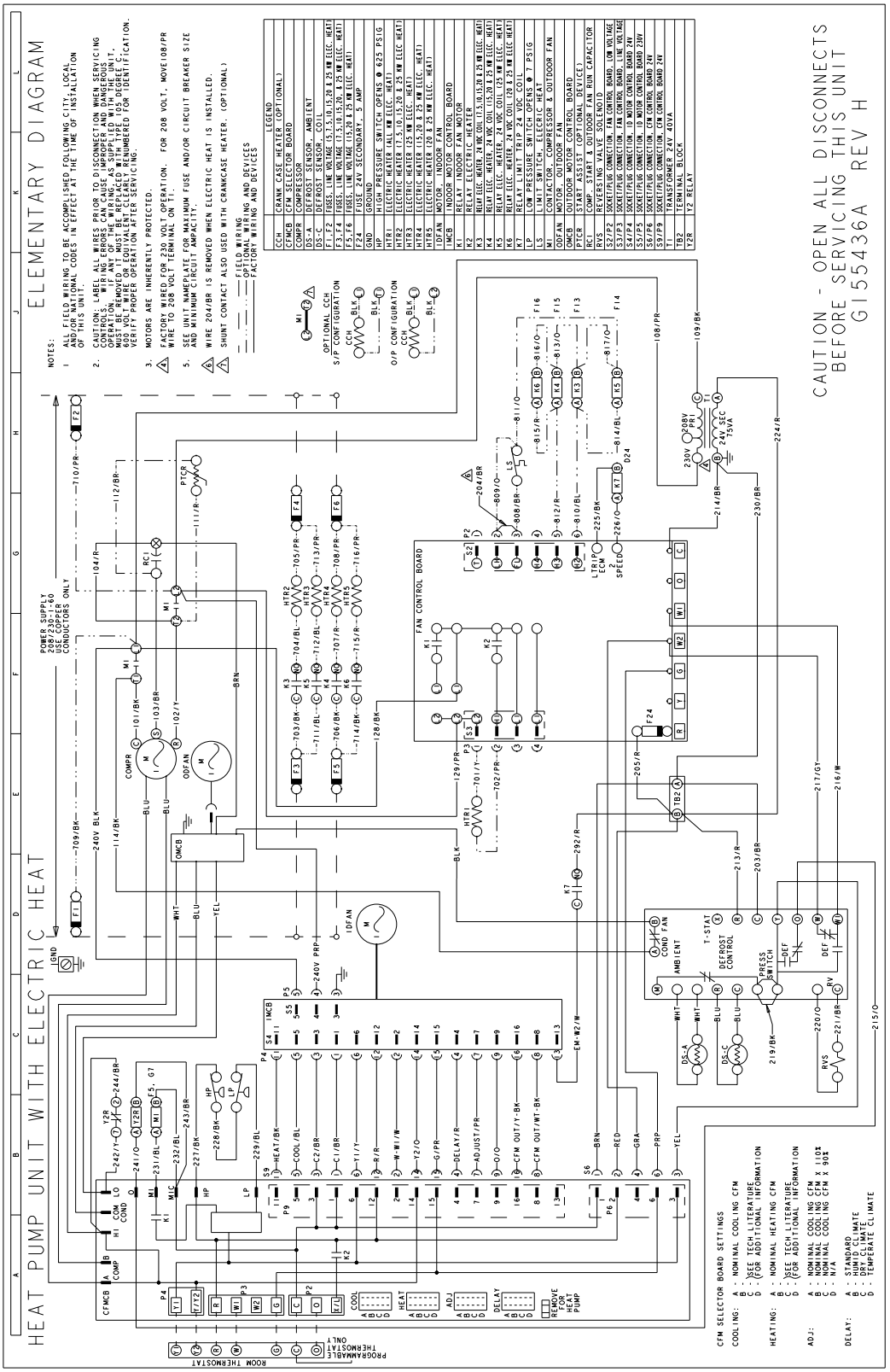
The wire number or color and terminal designations referred to may vary. Check the wiring label inside the control box access panel for the correct wiring.

⚠ CAUTION

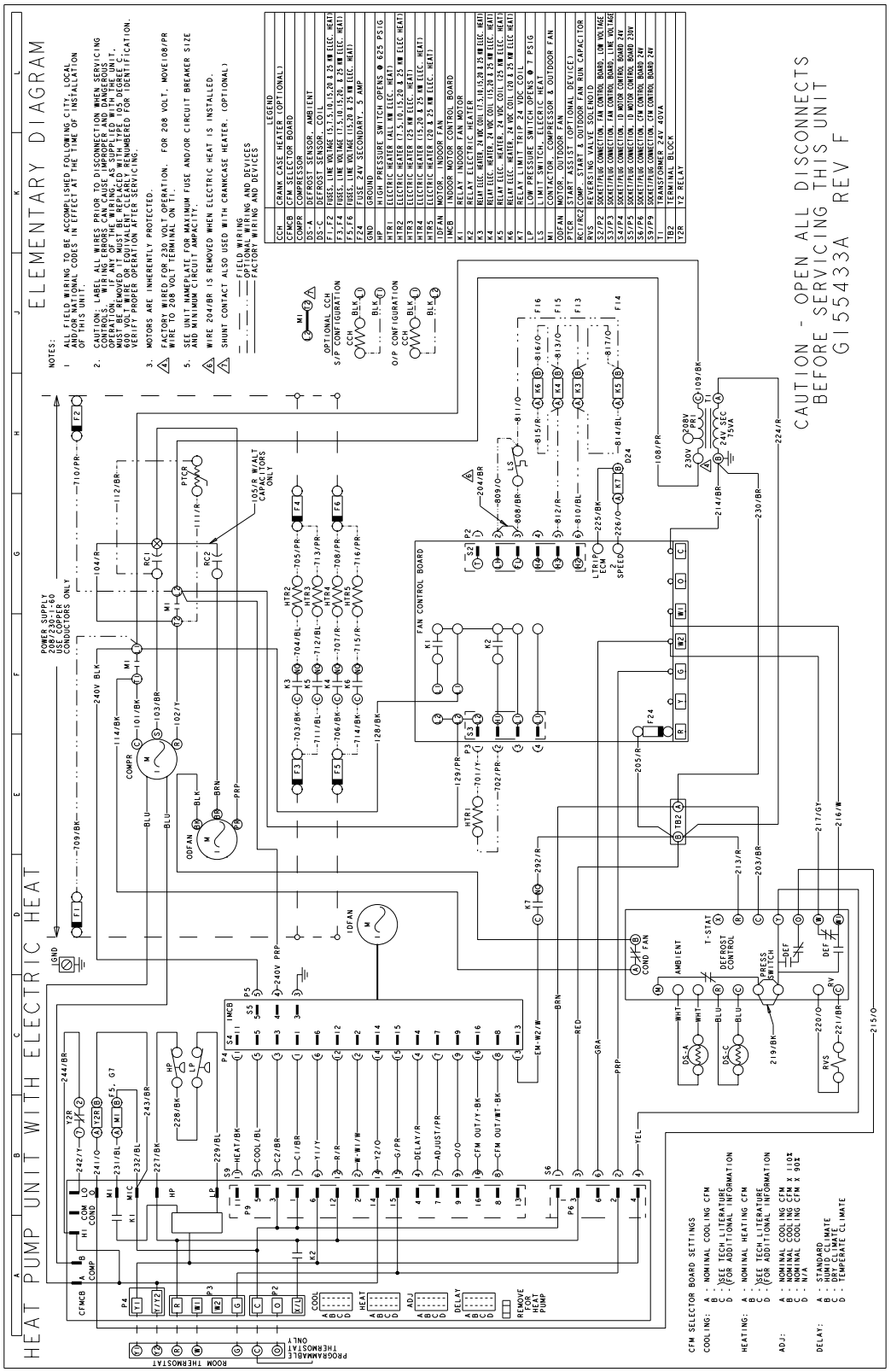
If the variable speed motor found in the B1HZ models operates erratically, check the fan control board for the presence of a break-off tab. Remove tab if present.

Wiring Diagrams

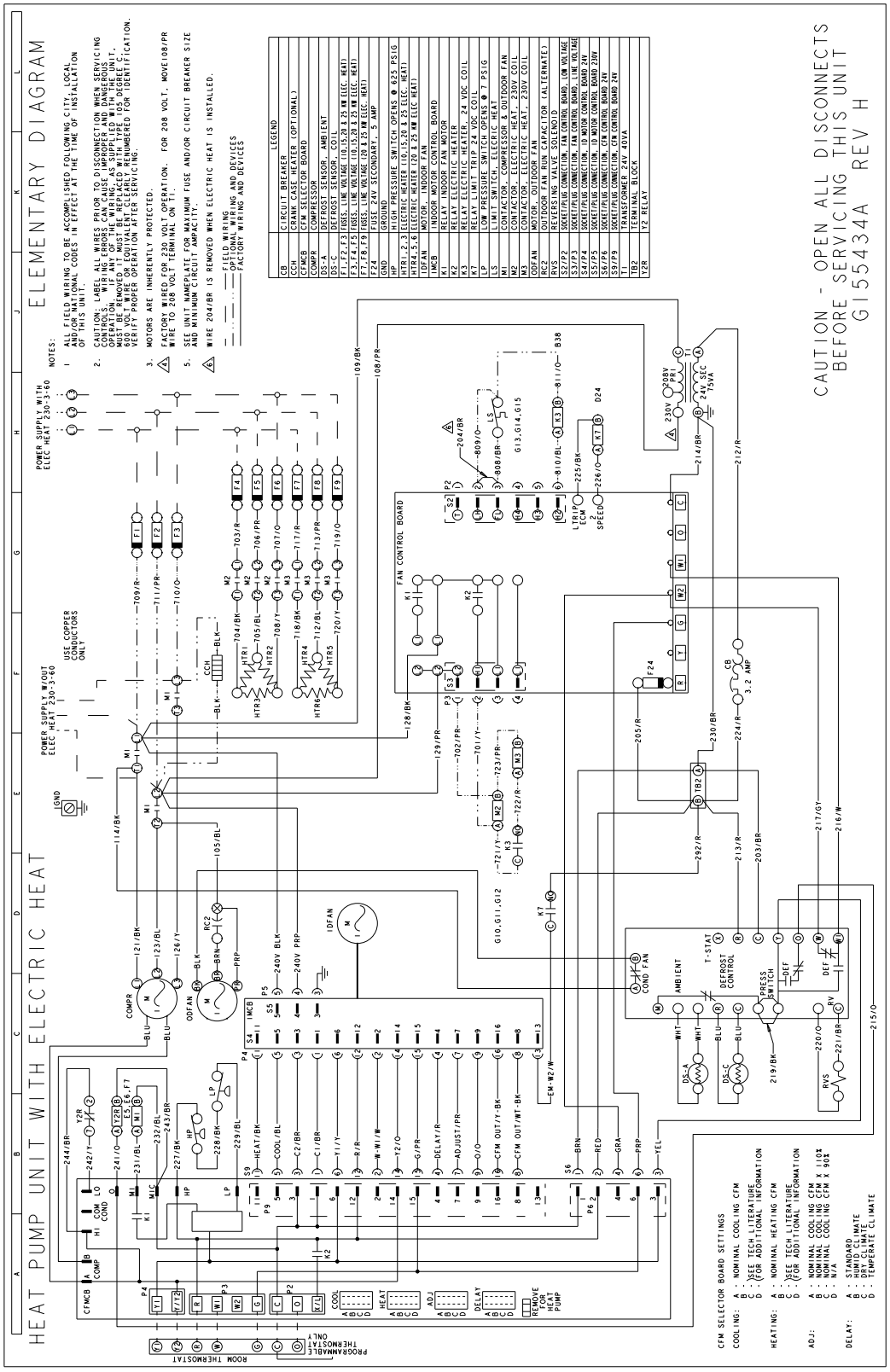
BHX024, 048 and 060 Heat Pump 208/230-1-60 volt Wiring Diagram



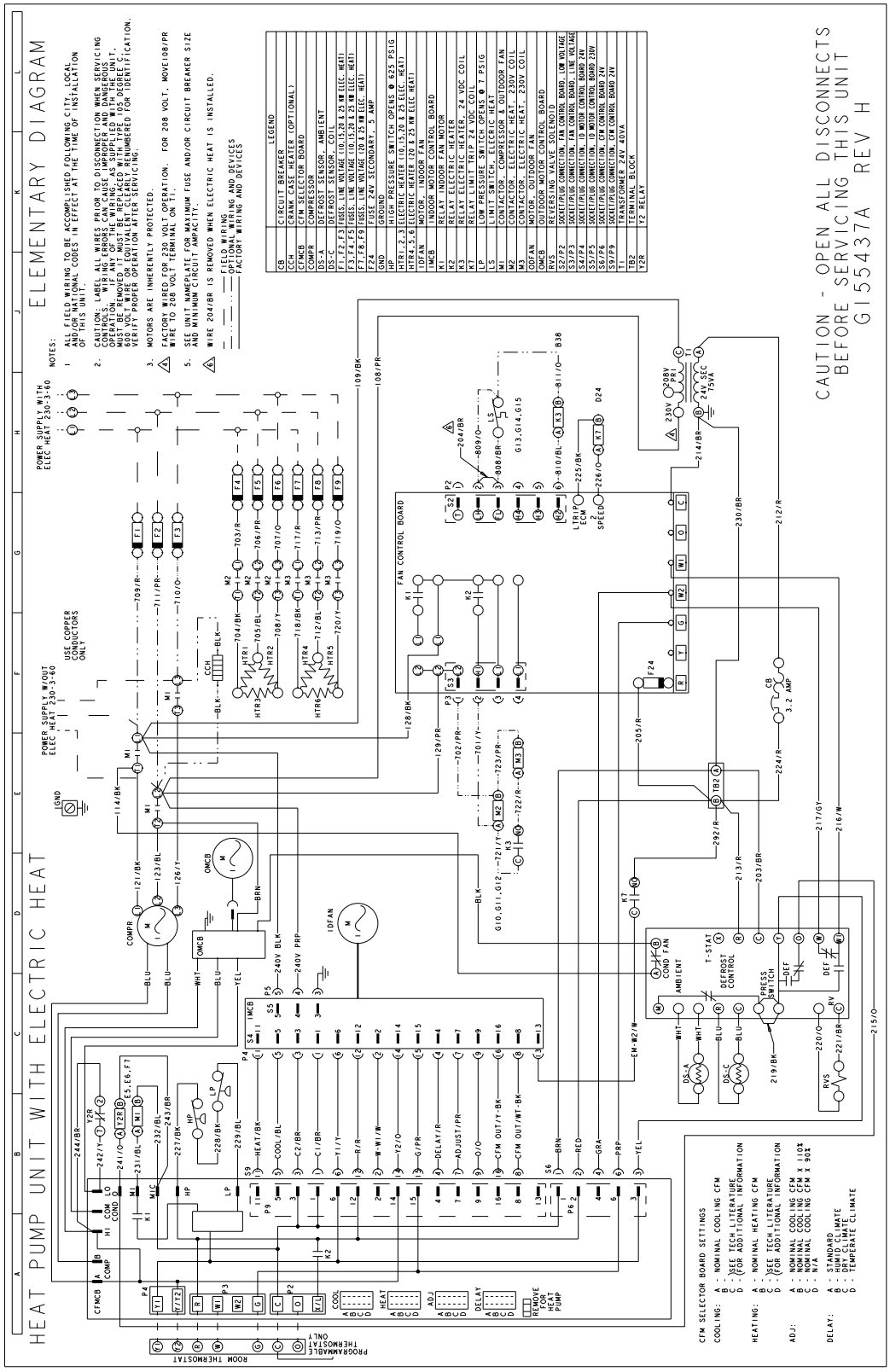
BHX036 Heat Pump 208/230-1-60 volt Wiring Diagram



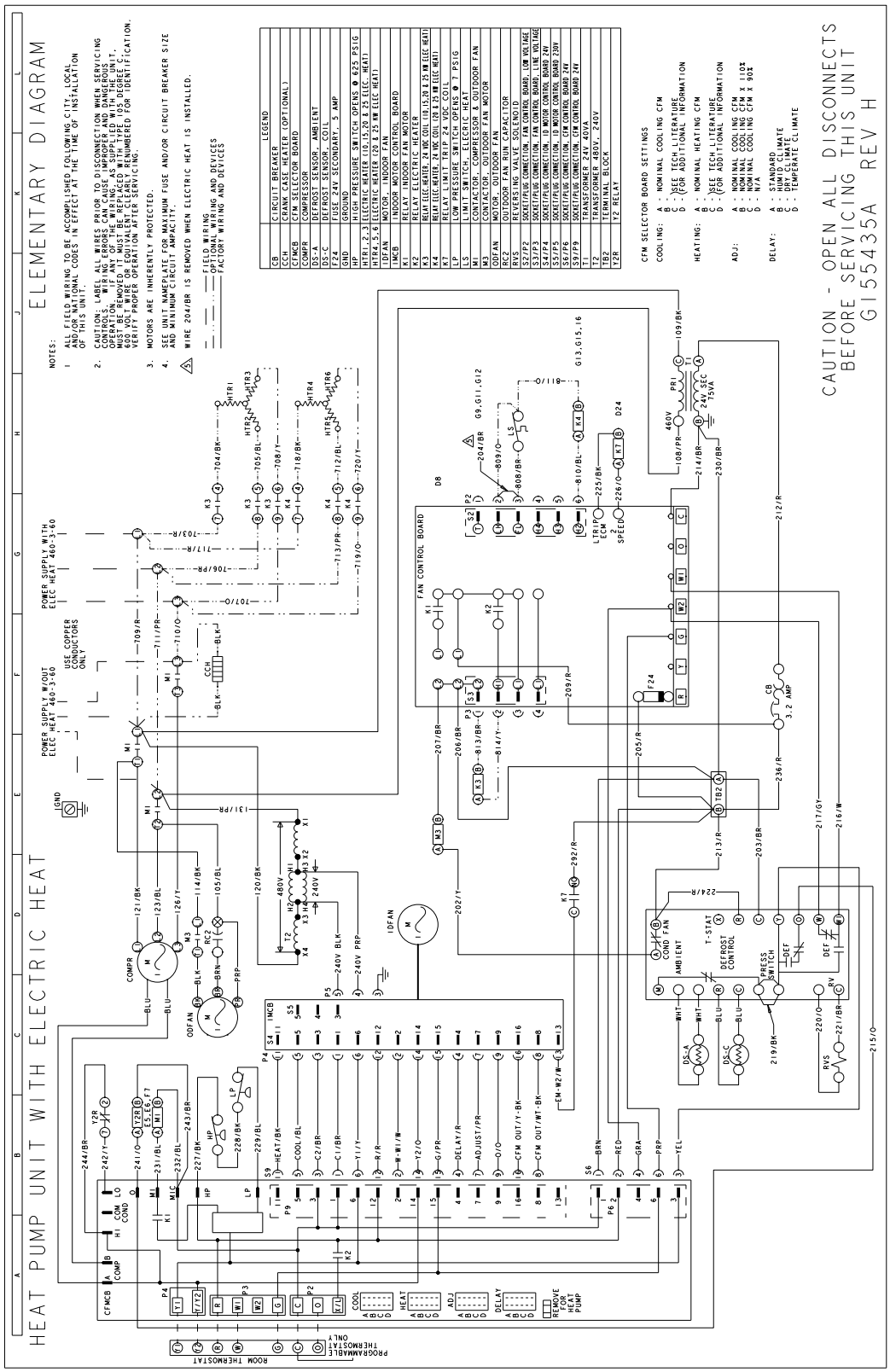
BHX036 Heat Pump 230-3-60 volt Wiring Diagram



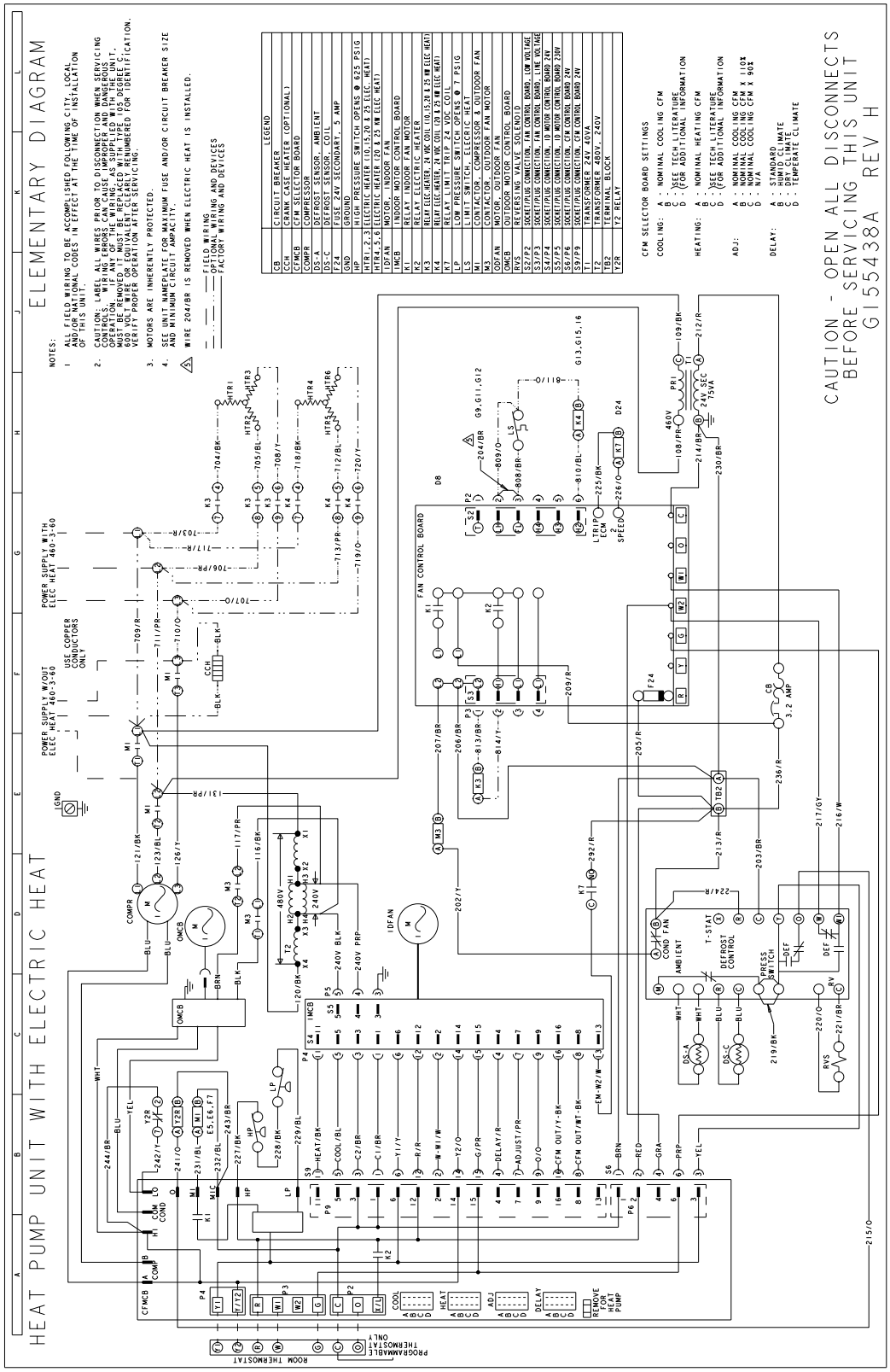
BHX048 and 060 Heat Pump 230-3-60 volt Wiring Diagram



BHX036 Heat Pump 460-3-60 volt Wiring Diagram



BHX048 and 060 Heat Pump 460-3-60 volt Wiring Diagram



R-410A QUICK REFERENCE GUIDE

Refer to Installation Instructions for specific installation requirements.

- **R-410A Refrigerant operates at 50 - 70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with R-410A.**
- **R-410A Refrigerant cylinders are rose colored.**
- **Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400, or DOT BW400.**
- **Recovery equipment must be rated for R-410A.**
- **Do Not use R-410A service equipment on R-22 systems. All hoses, gages, recovery cylinders, charging cylinders and recovery equipment must be dedicated for use on R-410A systems only.**
- **Manifold sets must be at least 700 psig high side, and 180 psig low side, with 550 psig retard.**
- **All hoses must have a service pressure rating of 800 psig.**
- **Leak detectors must be designed to detect HFC refrigerants.**
- **Systems must be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose.**
- **R-410A can only be used with POE type oils.**
- **POE type oils rapidly absorb moisture from the atmosphere.**
- **Vacuum pumps will not remove moisture from POE type oils.**
- **Do not use liquid line driers with a rated working pressure rating less than 600 psig.**
- **Do not install suction line driers in the liquid line.**
- **A liquid line drier is required on every unit.**
- **Do not use a R-22 TXV. If a TXV is to be used, it must be a R-410A TXV.**
- **Never open system to atmosphere when under a vacuum.**
- **If system must be opened for service, evacuate system then break the vacuum with dry nitrogen and replace all filter driers.**

Figure 12: R-410A Quick Reference Guide

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