

# INSTALLATION MANUAL

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## NOTES, CAUTIONS AND WARNINGS

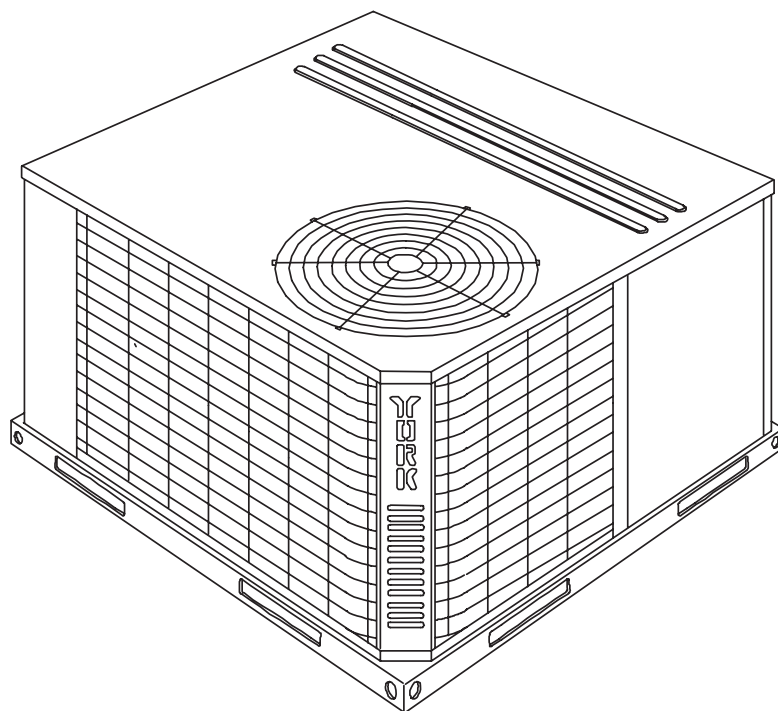
Installer should pay particular attention to the words: **NOTE**, **CAUTION**, and **WARNING**. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

**CAUTION:** READ ALL SAFETY GUIDES BEFORE YOU BEGIN TO INSTALL YOUR UNIT.

SAVE THIS MANUAL

## AFFINITY™ SERIES SINGLE PACKAGE HEAT PUMPS

**MODEL: B\*HP024 thru 060**  
**2 thru 5 Ton**  
**(13 SEER)**



ISO 9001  
Certified Quality  
Management System

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## GENERAL

YORK Model B\*HP 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.

## 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. Refer to Form 50.15-NM for additional information.

## REFERENCE

Additional information on the design, installation, operation and service of this equipment is available in the following reference forms:

- 268709 — General Installation
- 035-16605-003 — Electric Heater Accessory

## REPLACEMENT PARTS

Refer to User's Maintenance and Service Information Manual for complete listing of replacement parts on this equipment.

### 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

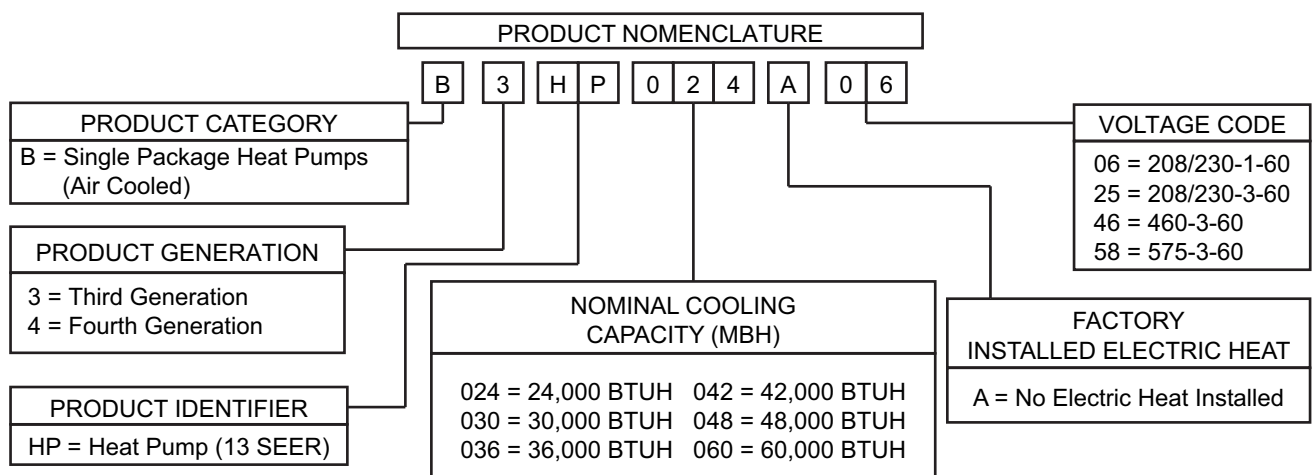
Improper installation may create a condition where the operation of the product could cause personal injury or property damage.

### WARNING

De-energize the electrical power to the unit before attempting to inspect, repair or perform maintenance to the unit.

Installer should pay particular attention to the words: NOTE, CAUTION and WARNING. Notes are intended to clarify or make the installation easier. Cautions are given to prevent equipment damage. Warnings are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

## PRODUCT NOMENCLATURE



## INSTALLATION

### LIMITATIONS

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

1. National Electrical Code ANSI/NFPA 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 1 for unit application data and to Table 4 for electric heat application 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.

**TABLE 1: Unit Application Data**

Voltage Variation, Min./Max. <sup>1</sup>	208/230 V <sup>2</sup>	187/253
	460 V	432/504
	575 V	540/630
Wet Bulb Temperature (°F) of Air on Evaporator Coil, Min./Max.		57/72
Dry Bulb Temperature (°F) of Air on Condenser Coil, Min. <sup>3</sup> /Max.		45/125

1. Rated in accordance with ARI Standard 110, utilization range "A".
2. "T1" transformer primary tap must be moved from the 230 volt connection to the 208 volt connection for low voltage applications of 208 volt and below.
3. A low ambient accessory is available for operation down to 0°F.

### 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 com-

ponents. 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.

### RIGGING AND HANDLING

Care must be exercised when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig unit with slings placed under the unit. Spreader bars of sufficient length should be used across the top of the unit.

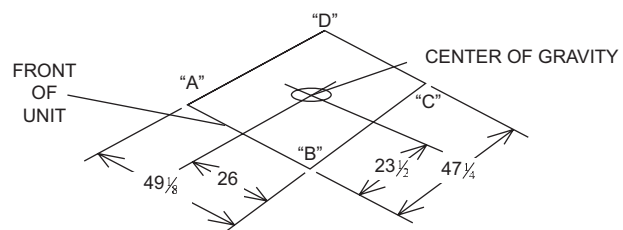
**BEFORE LIFTING A UNIT, MAKE SURE THAT ITS WEIGHT IS DISTRIBUTED EQUALLY ON THE CABLES SO THAT IT WILL LIFT EVENLY.**

Units may also be moved or lifted with a fork-lift. Slotted openings in the skid are provided for this purpose. Forks must pass completely through the base.

Refer to Table 2 for unit weights and to Figure 1 for approximate center of gravity.

**TABLE 2: Unit Dimensions**

Size	Shipping Weight (lbs.)	Operating Weight (lbs.)	Dimensions			
			"A"	"B"	"C"	"D"
024	356	351	97	93	81	84
030	353	348	96	93	81	84
036	388	383	106	102	89	92
042	440	435	120	115	101	104
048	485	480	132	127	111	115
060	495	490	135	130	113	117



**FIGURE 1 - Center of Gravity**

### CLEARANCES

All units require certain clearances for proper operation and service. Refer to Figures 3 & 4 for the clearances required for construction, servicing and proper unit operation.

### **WARNING**

Do not permit overhanging structures or shrubs to obstruct the condenser air discharge outlets.

## 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 later).
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.

Downflow units must have an "L"-shaped supply duct without any outlets or registers located below the outlet of the unit.

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

**NOTE:** Be sure to note supply and return openings.

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

## FILTERS

Single phase units are shipped without a filter and 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 a 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 is delivered by the blower, decreasing your unit's efficiency and increasing operating costs and wear-and-tear on the unit and controls.

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

## CONDENSATE DRAIN

A condensate trap is required 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 ( $\frac{3}{4}$ " NPTF) to spill into an open drain.

### CAUTION

Hand tighten only.

## SERVICE ACCESS

Access to all serviceable components is provided by the following removable panels:

- Blower service access
- Electrical/Filter access
- Compressor service access

Refer to Figures 3 & 4 for location of these access panels and minimum clearances.

## 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 Figure 2.

## 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 3.

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.

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

Refer to Figure 2 for typical field wiring and to the appropriate unit wiring diagram for control circuit and power wiring information.

COMPRESSORS

**CAUTION**

Do Not loosen compressor mounting bolts.

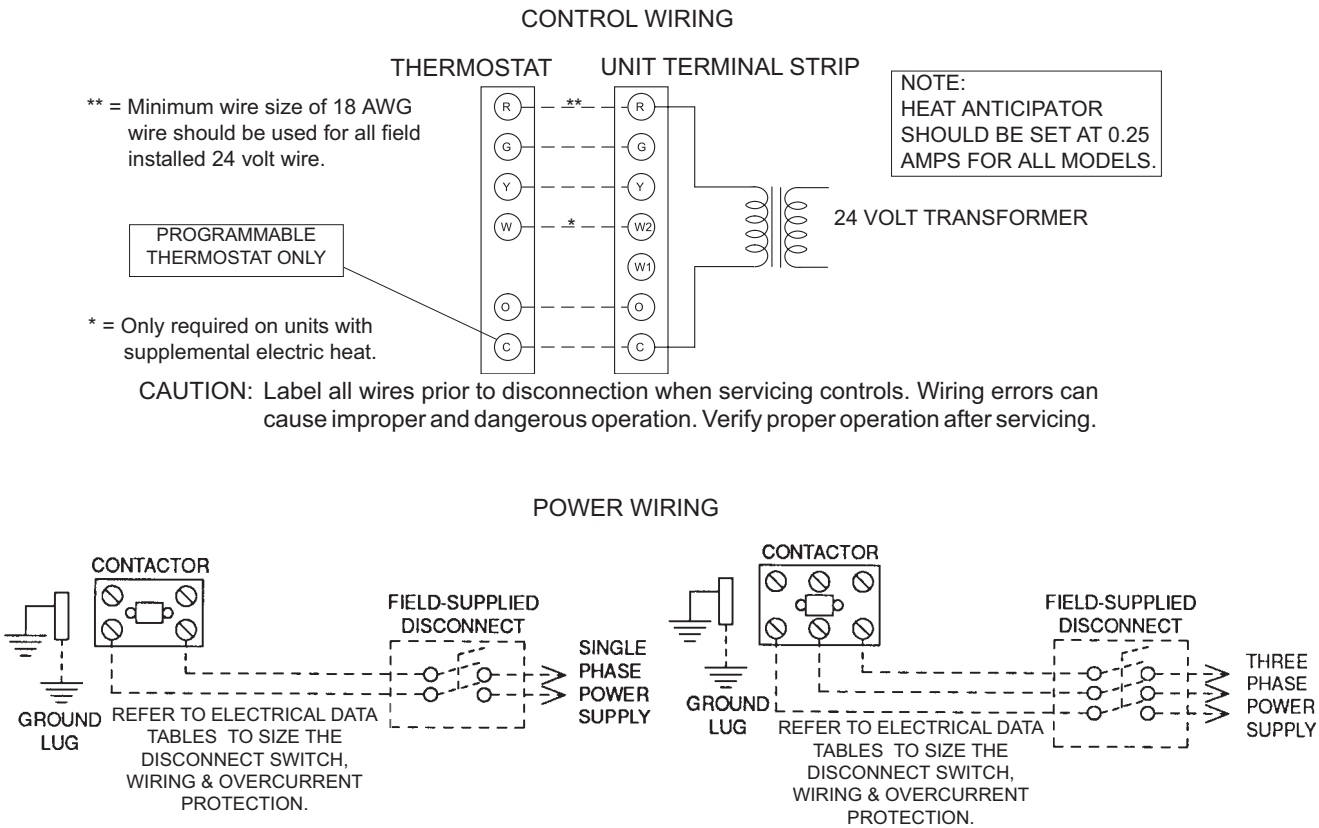


FIGURE 2 - Typical Field Wiring Diagram

TABLE 3: Physical Data

Models		BHP					
		024	030	036	042	048	060
INDOOR BLOWER	CENTRIFUGAL BLOWER (Dia. x Wd. in.) FAN MOTOR HP	10 X 8	10 X 8	11 x 10	11 x 10	11 x 10	11 x 10
		1/2	1/2	3/4	3/4	3/4	1
INDOOR COIL	ROWS DEEP FINS PER INCH FACE AREA (Sq. Ft.)	2	3	3	3	3	3
		15	13	15	16	16	16
		4.38	4.38	4.38	5.63	5.63	5.63
OUTDOOR FAN	PROPELLER DIA. (in.) FAN MOTOR HP NOM. CFM TOTAL	22	22	22	22	22	22
		1/4	1/4	1/4	1/4	1/4	1/2
		1,800	1,800	2,400	2,400	3,000	3,000
OUTDOOR COIL	ROWS DEEP FINS PER INCH FACE AREA (Sq. Ft.)	1	1	2	2	2	2
		20	20	20	20	20	20
		11.7	11.7	11.7	16.4	16.4	16.4
CHARGE	REFRIGERANT 22 (lbs./oz.)	5/5	5/15	8/8	9/14	12/0	10/4
FILTER	FACE AREA (Sq. Ft./Qty./Size)	4.28/2/14" x 22"					
COMPRESSOR	HERMETIC Type, (Qty. = 1)	Reciprocating	Scroll	Scroll	Reciprocating	Scroll	Scroll

TABLE 4: Electrical Data (13 SEER Heat Pump / Electric Heat)

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Electric Heat Option				MCA <sup>1</sup> (Amps)	Max Fuse <sup>2</sup> / Breaker <sup>3</sup> Size (Amps)
		RLA	LRA	MCC			Model	kW	Stages	Amps		
024	208/230-1-60	9.3	57	15	1.2	4.1	None	-	-	-	16.9	25
							2NH04500506	3.8/5	1	18.1/20.8	39.5/43	40/45
							2NH04500706	5.6/7.5	2	27.1/31.3	50.8/56	60/60
							2NH04501006	7.5/10	2	36.1/41.7	62.1/69	70/70
030	208/230-1-60	13.4	73	21	1.2	4.1	None	-	-	-	22.1	30
							2NH04500506	3.8/5	1	18.1/20.8	44.6/48.1	50/50
							2NH04500706	5.6/7.5	2	27.1/31.3	55.9/61.1	60/70
							2NH04501006	7.5/10	2	36.1/41.7	67.2/74.1	70/80
							2NH04501506	11.3/15	2	54.2/62.5	89.8/100.2	90/110
	208/230-3-60	9.0	63	14	1.2	4.1	None	-	-	-	16.6	20
							2NH04501025	7.5/10	1	20.8/24.1	42.6/46.6	45/50
							2NH04501525	11.3/15	1	31.3/36.1	55.6/61.7	60/70
	460-3-60	4.5	31	7	0.8	2.1	None	-	-	-	8.5	15
							2NH04501046	10	1	12	23.5	25
							2NH04501546	15	1	18	31	35
036	208/230-1-60	15.4	88	24	1.2	6.0	None	-	-	-	26.5	35
							2NH04500506	3.8/5	1	18.1/20.8	49/52.5	50/60
							2NH04500706	5.6/7.5	2	27.1/31.3	60.3/65.5	70/70
							2NH04501006	7.5/10	2	36.1/41.7	71.6/78.5	80/80
							2NH04501506	11.3/15	2	54.2/62.5	94.2/104.6	100/110
	208/230-3-60	10.2	77	16	1.2	6.0	None	-	-	-	20	25
							2NH04501025	7.5/10	1	20.8/24.1	46/50	50/60
							2NH04501525	11.3/15	1	31.3/36.1	59/65.1	60/70
	460-3-60	5.1	39	8	0.8	3.0	None	-	-	-	10.1	15
							2NH04501046	10	1	12	25.2	30
							2NH04501546	15	1	18	32.7	35
	575-3-60	4.2	31	7	0.6	2.4	None	-	-	-	8.3	15
							2NH04501058	10	1	9.6	20.3	25
							2NH04501558	15	1	14.4	26.3	30
							None	-	-	-	27.2	35
042	208/230-1-60	16.0	86	24	1.2	6.0	2NP04501006	7.5/10	2	36.1/41.7	72.3/78.5	80/80
							2NP04501506	11.3/15	2	54.2/62.5	94.9/104.6	100/110
							2ND04501506	3.8/5	1	18.1/20.8	49.8/52.5	60/60
							2ND04501506	7.5/10	1	36.1/41.7	72.3/78.5	80/80
							None	-	-	-	22.2	30
	208/230-3-60	12.0	84	18	1.2	6.0	2NP04501025	7.5/10	1	20.8/24.1	48.3/51.6	50/60
							2NP04501525	11.3/15	1	31.3/36.1	61.3/66.7	70/70
							None	-	-	-	11	15
	460-3-60	5.8	42	9	0.8	3.0	2NP04501046	10	1	12	26	30
							2NP04501546	15	1	18	33.6	35
							None	-	-	-	9.4	15
	575-3-60	5.1	34	8	0.6	2.4	2NP04501058	10	1	9.6	21.4	25
							2NP04501558	15	1	14.4	27.4	30
							None	-	-	-	36.5	45
048	208/230-1-60	23.4	126	37	1.2	6.0	2NP04501006	7.5/10	2	36.1/41.7	81.6/88.5	90/100
							2NP04501506	11.3/15	2	54.2/62.5	104.2/114.6	110/125
							2NP04502006	15/20	2	72.2/83.3	126.7/140.6	150/150
							2NP04502506	18.8/25	2	90.3/104.2	149.3/166.7	150/175
							None	-	-	-	23.3	30
	208/230-3-60	12.9	93	20	1.2	6.0	2NP04501025	7.5/10	1	20.8/24.1	49.4/53.4	50/60
							2NP04501525	11.3/15	1	31.3/36.1	62.4/68.4	70/70
							2NP04502025	15/20	2	41.7/48.1	75.4/83.5	80/90
							2NP04502525	18.8/25	2	52.1/60.1	88.5/98.5	90/100
	460-3-60	6.4	47	10	0.8	3.0	None	-	-	-	11.8	15
							2NP04501046	10	1	12	26.8	30
							2NP04501546	15	1	18	34.4	35
							2NP04502046	20	2	24.1	41.9	45
	575-3-60	5.1	37	8	0.6	2.4	2NP04502546	25	2	30.1	49.4	50
							None	-	-	-	9.4	15
							2NP04501058	10	1	9.6	21.4	25
							2NP04501558	15	1	14.4	27.4	30
							2NH04502058	20	2	19.2	33.4	35
							2NH04502558	25	2	24.1	39.4	40



**TABLE 4: Electrical Data (13 SEER Heat Pump / Electric Heat) (Continued)**

Size (Tons)	Volt	Compressors (each)			OD Fan Motors (each)	Supply Blower Motor	Electric Heat Option				MCA <sup>1</sup> (Amps)	Max Fuse <sup>2</sup> / Breaker <sup>3</sup> Size (Amps)
		RLA	LRA	MCC			Model	kW	Stages	Amps		
060	208/230-1-60	25.0	150	39	2.3	7.6	None	-	-	-	41.2	50
							2NP04501006	7.5/10	2	36.1/41.7	86.3/93.2	100/100
							2NP04501506	11.3/15	2	54.2/62.5	108.9/119.3	110/125
							2NH04502006	15/20	2	72.2/83.3	131.4/145.3	150/150
							2NP04502506	18.8/25	2	90.3/104.2	154/171.4	175/175
	208/230-3-60	17.3	123	27	2.3	7.6	None	-	-	-	31.5	40
							2NH04501025	7.5/10	1	20.8/24.1	57.6/61.6	60/70
							2NH04501525	11.3/15	1	31.3/36.1	70.6/76.6	80/80
							2NH04502025	15/20	2	41.7/48.1	83.6/91.7	90/100
							2NH04502525	18.8/25	2	52.1/60.1	96.7/106.7	100/110
	460-3-60	8.4	70	13	1.3	3.8	None	-	-	-	15.6	20
							2NP04501046	10	1	12	30.6	35
							2NH04501546	15	1	18	38.2	40
							2NH04502046	20	2	24.1	45.7	50
							2NP04502546	25	2	30.1	53.2	60
	575-3-60	7.0	53	11	1.1	3.0	None	-	-	-	12.9	15
							2NH04501058	10	1	9.6	24.9	25
							2NH04501558	15	1	14.4	30.9	35
							2NH04502058	20	2	19.2	36.9	40
							2NH04502558	25	2	24.1	42.9	45

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 5: Side & Bottom Supply Air Blower Performance**

Size (Tons)	Blower Speed	External Static Pressure (Inch Water Gauge)														
		0.2			0.4			0.6			0.8			1.0		
		CFM	W	RPM	CFM	W	RPM	CFM	W	RPM	CFM	W	RPM	CFM	W	RPM
024	Low (1)	721	82	600	611	97	705	-	-	-	-	-	-	-	-	-
	Low/Medium (2)	769	93	628	694	112	730	610	126	832	-	-	-	-	-	-
	Medium (3)	882	131	704	812	147	797	736	162	889	651	177	979	-	-	-
	Medium/High (4)	971	171	773	916	188	857	851	205	939	775	219	1019	681	230	1097
	High (5)	-	-	-	-	-	-	957	249	982	887	261	1052	788	266	1120
030	Low (1)	828	110	673	759	125	771	-	-	-	-	-	-	-	-	-
	Low/Medium (2)	991	168	754	934	187	839	868	205	922	783	221	1003	-	-	-
	Medium (3)	1091	214	807	1041	234	883	983	253	958	910	269	1033	785	273	1106
	Medium/High (4)	1189	269	861	1144	288	927	1091	305	994	1027	318	1061	912	316	1132
	High (5)	-	-	-	1235	347	970	1186	360	1028	1125	368	1086	1007	352	1147
036	Low (1)	1025	158	769	906	175	856	-	-	-	-	-	-	-	-	-
	Low/Medium (2)	1214	237	764	1125	260	839	1034	283	913	942	307	987	-	-	-
	Medium (3)	1370	305	779	1276	330	846	1179	354	913	1078	377	981	971	397	1048
	Medium/High (4)	-	-	-	1416	413	872	1314	436	932	1206	454	993	1083	460	1051
	High (5)	-	-	-	-	-	-	1441	530	970	1326	538	1022	1182	521	1070
042	Low (1)	1241	221	702	1151	245	778	1058	268	853	-	-	-	-	-	-
	Low/Medium (2)	1406	299	759	1325	324	826	1242	349	893	1158	373	959	1072	396	1025
	Medium (3)	1536	376	808	1461	403	869	1384	427	928	1305	449	988	1223	468	1046
	Medium/High (4)	1656	466	858	1584	492	912	1509	515	966	1430	533	1019	1344	542	1070
	High (5)	-	-	-	1687	590	955	1611	610	1004	1527	620	1051	1428	615	1097
048	Low (1)	1342	249	717	1250	273	789	-	-	-	-	-	-	-	-	-
	Low/Medium (2)	1596	397	817	1513	422	875	1432	447	934	1354	474	995	1276	501	1058
	Medium (3)	1705	476	858	1624	501	911	1545	526	966	1466	549	1021	1386	571	1077
	Medium/High (4)	1806	561	895	1726	587	945	1646	610	995	1564	628	1046	1476	639	1096
	High (5)	1898	652	929	1819	679	977	1736	698	1023	1646	709	1069	1547	706	1112
060	Low (1)	1580	394	859	1504	420	917	-	-	-	-	-	-	-	-	-
	Low/Medium (2)	1614	419	874	1540	446	931	-	-	-	-	-	-	-	-	-
	Medium (3)	1733	508	924	1663	536	976	1588	559	1026	1501	572	1072	-	-	-
	Medium/High (4)	2003	737	1030	1922	746	1069	1829	746	1104	1712	728	1134	1528	659	1146
	High (5)	2214	968	1104	2089	918	1121	1949	859	1136	1785	787	1148	1576	689	1154



**TABLE 6: Additional Static Pressure Resistance<sup>1,2</sup>**

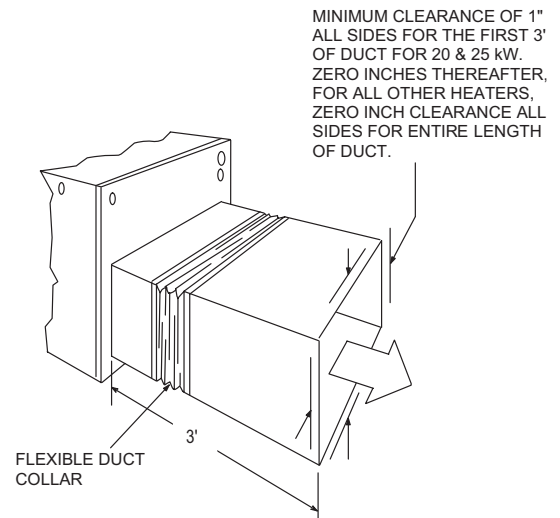
DESCRIPTION	RESISTANCE, IWG															
	CFM															
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
Wet Indoor Coil	0.01	0.01	0.01	0.02	0.01	0.02	0.03	0.04	0.04	0.03	0.04	0.04	0.05	0.05	0.06	0.07
Economizer	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.07	0.08	0.08
Filter/Frame Kit	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.05	0.06	0.06	0.07
Electric Heat	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.01	0.11	0.11	0.12

1. Deduct these resistance values from the available external static pressures shown in the respective Blower Performance Table.
2. The pressure thru the economizer is greater for 100% outdoor air than for 100% return air. If the resistance of the return air duct system is less than 0.25 IWG, the unit will deliver less CFM during full economizer operation.

CLEARANCES (Minimum)	
Front	12"
Back	0"
Left Side (Filter Access)	24"
Right Side	24"
Below Unit <sup>1</sup>	0"
Above Unit <sup>2</sup>	36" For Condenser Air Discharge

1. Units may be installed on combustible floors made from wood or class A, B or C roof covering material.
2. Units must be installed outdoors. Overhanging structures or shrubs should not obstruct outdoor air discharge outlet.

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 THE SUPPLY DUCT.

**FIGURE 3 - Clearances**

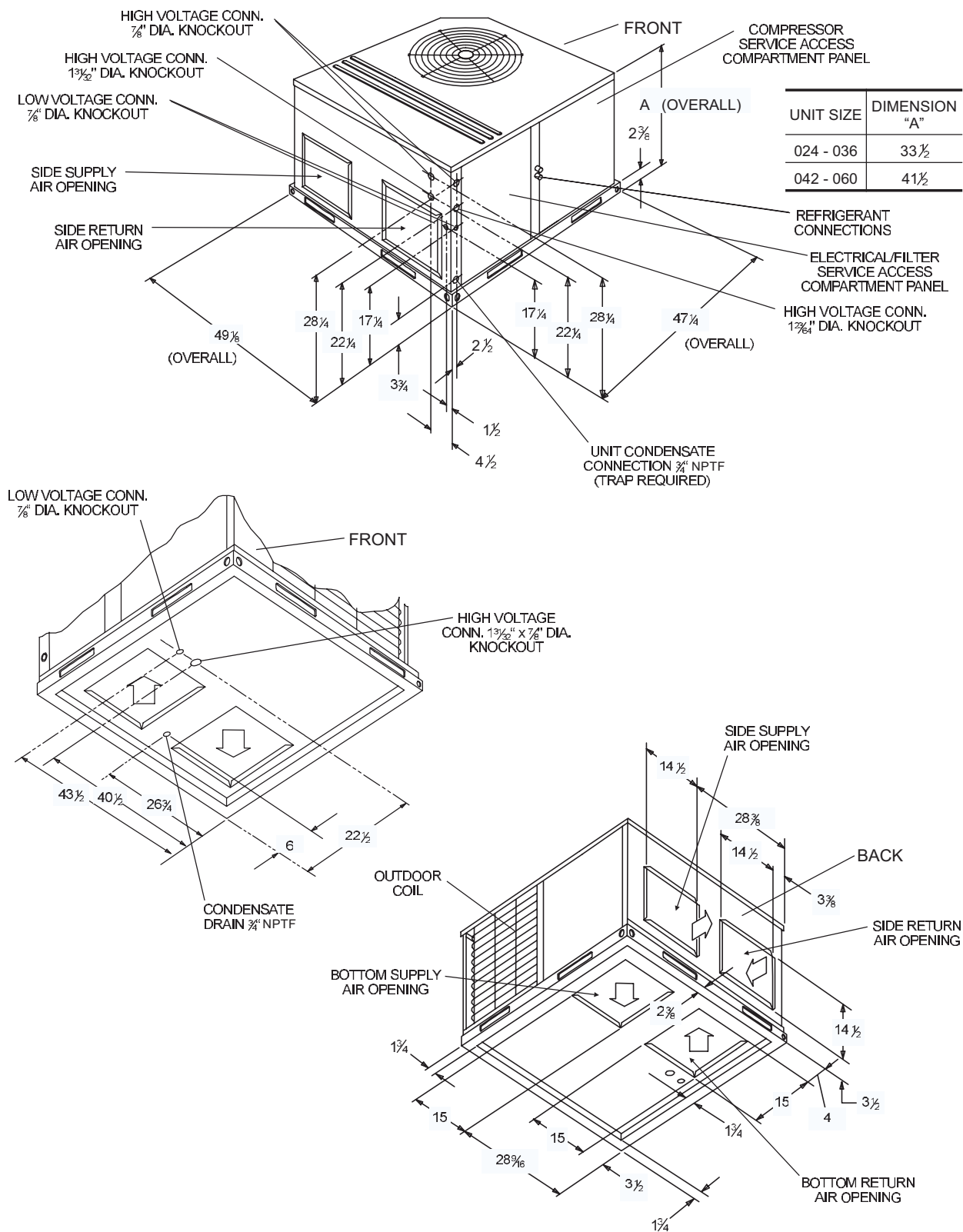


FIGURE 4 - Dimensions

## SEQUENCE OF OPERATION

### ANTI-SHORT CYCLE TIMER

This unit has an anti-short cycle timer built in to the defrost control. This timer will not permit the compressor to start within five minutes after the completion of the last cycle or power interruption. To bypass the anti-short cycle feature, short the "TEST" pins together for 2 seconds.

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

### COOLING OPERATION

1. When the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" will bring on the indoor blower motor at the cooling airflow. When 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. On a call for cooling, the thermostat sends 24 volts to "Y" and "O" on the fan control and defrost control boards. The reversing valve solenoid is energized, and after the anti-short cycle period is complete, contactor coil M1 is energized. Power is supplied to the compressor and outdoor fan motor, and the reversing valve is switched to the cooling position. When the fan switch on the thermostat is in the "AUTO" position, the indoor blower motor is energized at the cooling airflow.
3. When the demand for cooling has been satisfied, the 24 volt "Y" signal is removed, and the M1 contactor is de-energized. When the fan switch on the thermostat is in the "ON" position, the indoor blower motor continues to run. If the fan switch is in the "AUTO" position, the indoor motor ramps down over a 30-second period.

### HEATING OPERATION

1. When the fan switch on the thermostat is in the "ON" position, the 24 volts at "G" brings on the indoor blower motor at the heating flow. When the fan switch on the thermostat is in the "AUTO" position, the blower operates when there is a call for heating by the thermostat.
2. On a call for heating, the thermostat sends 24 volts to "Y" on the fan control board. After the anti-short cycle period is complete, the 24 volt signal ener-

gizes contactor coil M1 and power is supplied to the compressor and outdoor fan motor. The reversing valve remains in the heating position. When the fan switch on the thermostat is in the "AUTO" position, the indoor blower is energized at the heating airflow.

3. For units equipped with supplementary electric heat, when the heat pump cannot meet the demand, the thermostat "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 electric heat is de-energized when the 24 volt "W" signal is removed, and the M1 contactor is de-energized when the 24 volt "Y" signal is removed. When the fan switch on the thermostat is in the "ON" position, the indoor blower continues to run. When the fan switch is in the "AUTO" position, the indoor blower motor ramps down over a 15-second period.

Please refer to Tables 8 and 9 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.

TABLE 7: Demand Defrost Selection

Unit	Pin Position
B*HP 036, 048, 060	1
B*HP 024, 030	2
B*HP 042	3

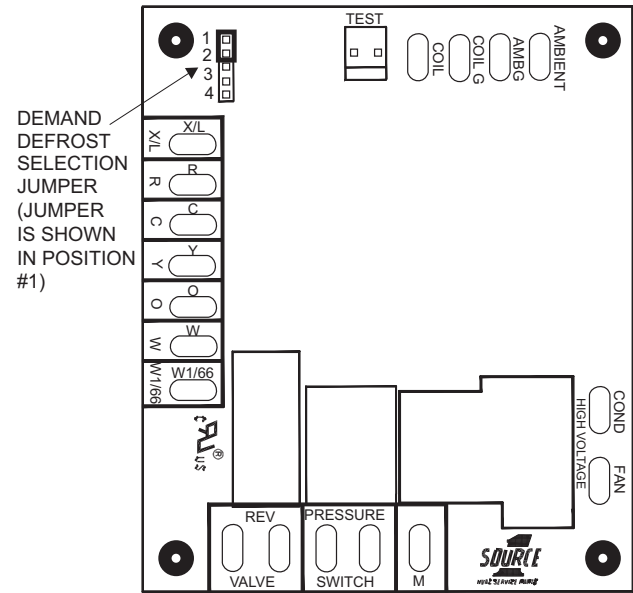


FIGURE 5 - Demand Defrost “Curve” Selection Jumper

Heat Pump Safety Switch Operation

If the unit is equipped with the field installed upgrade safety package, the refrigeration system will be protected against high or low refrigerant pressure and low indoor coil temperature. If any of these three 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 of 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 during this period the control “sees” another limit cycle, 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.**

SECURE OWNER'S APPROVAL

When the system is functioning 1/6 properly, secure the owner's approval. Show him the location of all disconnect switches and the thermostat. Teach him how to start and stop the unit and how to adjust temperature settings within the limitations of the system.

**TABLE 8: Thermostat Signals (Single Phase Units)**

SIGNAL	STATE	BOARD FUNCTION
"G"	ON	FAN INSTANT ON
	OFF	FAN INSTANT OFF
"G" & "Y" & "O"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "Y"	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 FAN 60 SEC. DELAY OFF
"G" & "W"	ON	FAN 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 FAN 10 SEC. DELAY OFF
"G" & "Y" & "W"	ON	FAN 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 FAN 60 SEC. DELAY OFF
"W"	ON	FAN 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 FAN 10 SEC. DELAY OFF

**TABLE 9: Thermostat Signals (Three Phase Units)**

SIGNAL	STATE	BOARD FUNCTION
"G"	ON	FAN INSTANT ON
	OFF	FAN INSTANT OFF
"G" & "Y" & "O"	ON	FAN INSTANT ON COMPRESSOR AND OUTDOOR FAN INSTANT ON (AFTER ANTI-SHORT CYCLE DELAY) REVERSING VALVE ENERGIZED SYSTEM OPERATES IN COOLING
	OFF	COMPRESSOR AND OUTDOOR FAN INSTANT OFF FAN 60 SEC. DELAY OFF
"G" & "Y"	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 FAN 60 SEC. DELAY OFF
"G" & "W"	ON	FAN 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 FAN 10 SEC. DELAY OFF
"G" & "Y" & "W"	ON	FAN 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 FAN 60 SEC. DELAY OFF
"W"	ON	FAN 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 FAN 10 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.



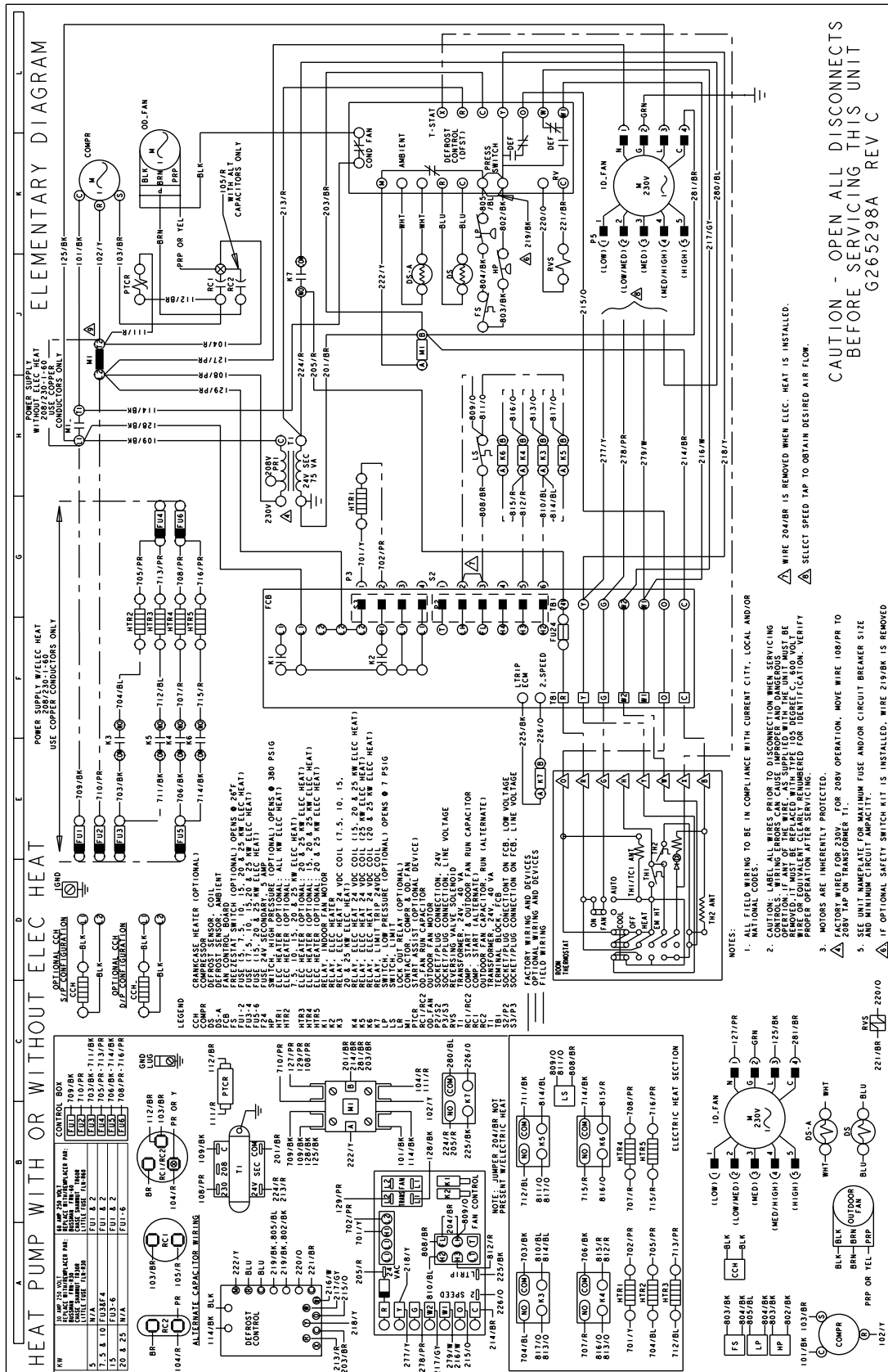
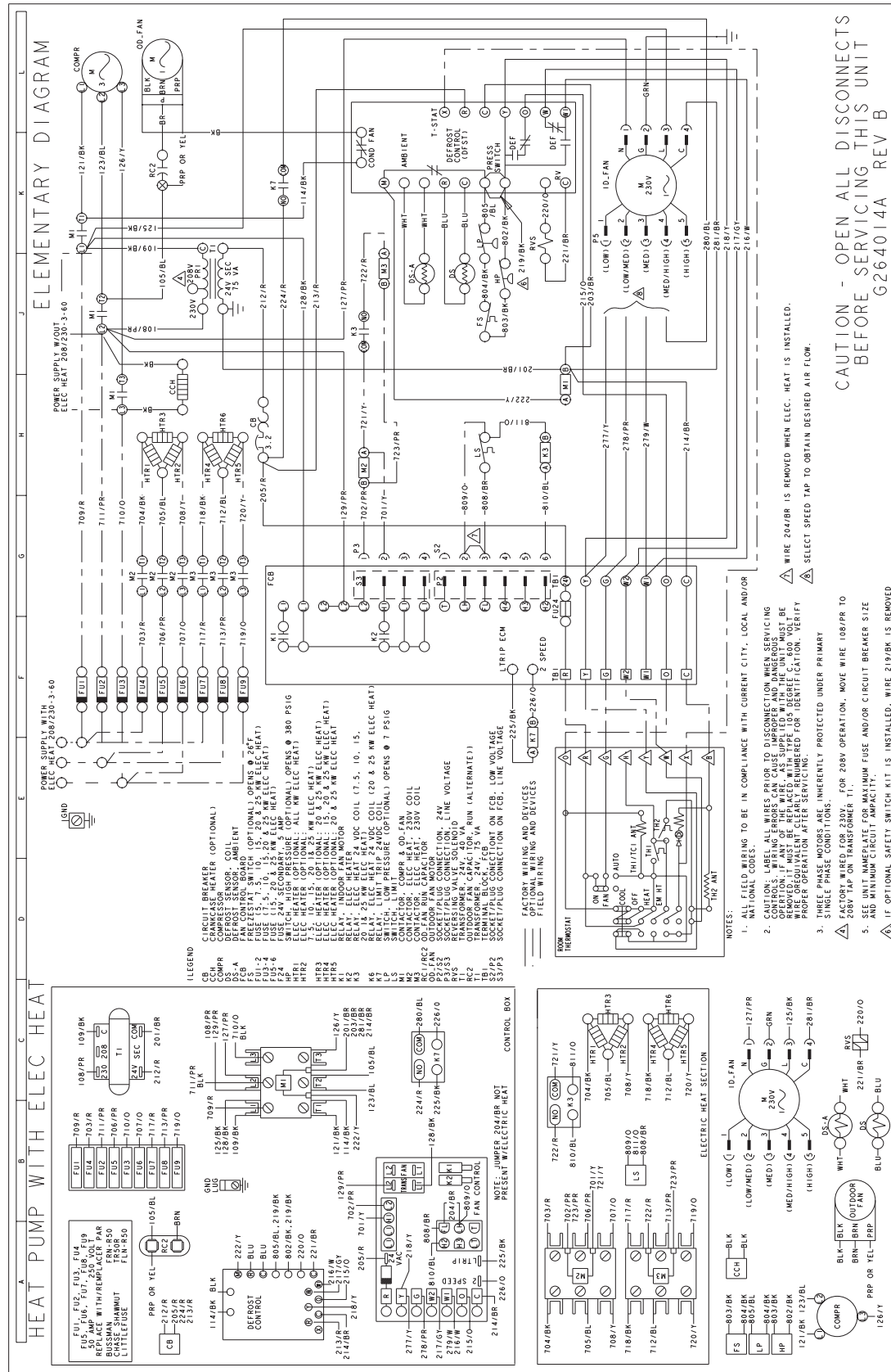
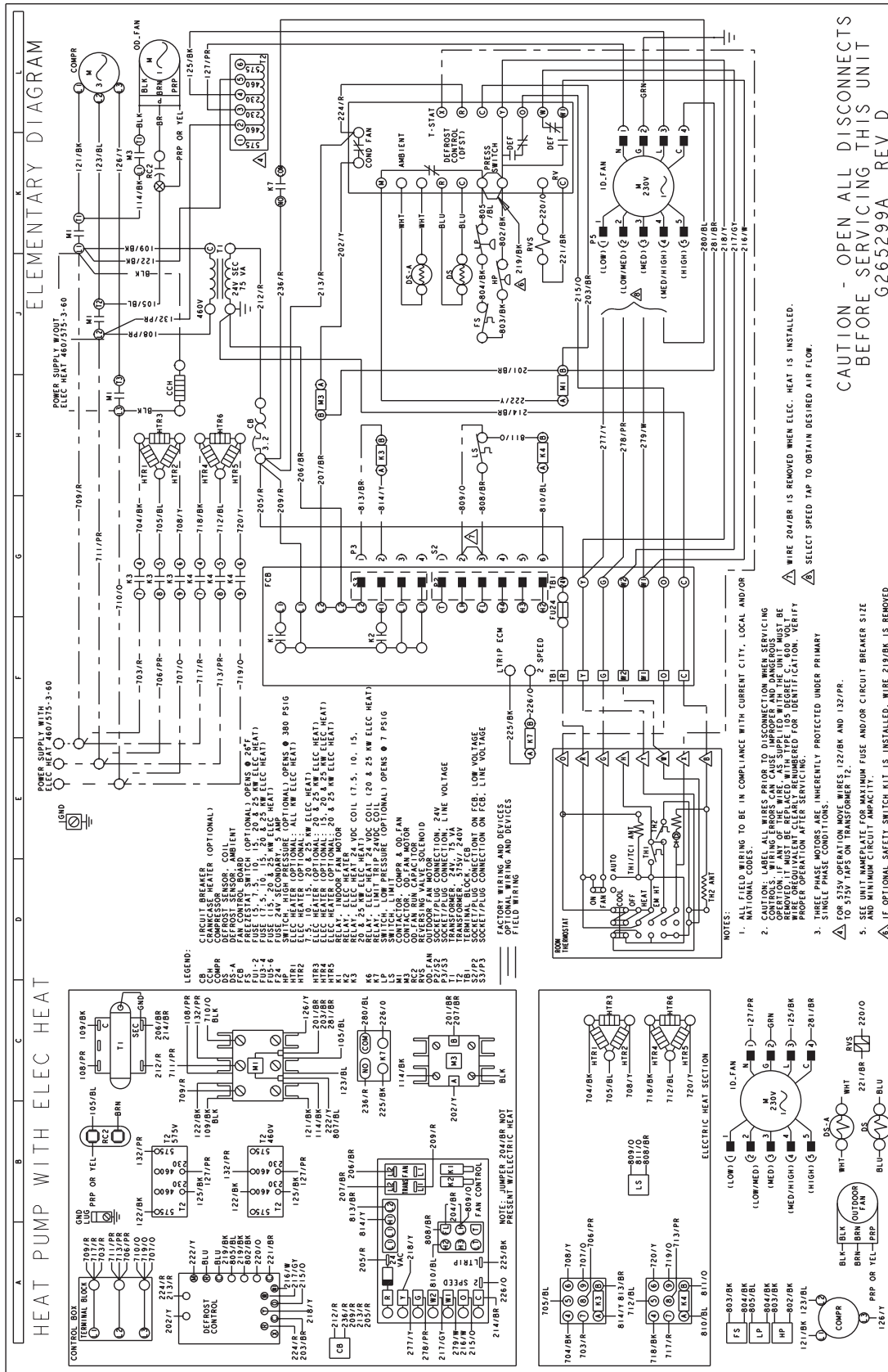


FIGURE 6 - Typical Wiring Diagram BHP Models - 208/230-1-60 Power Supply

**FIGURE 7 - Typical Wiring Diagram BHP Models - 208/230-3-60 Power Supply**





**FIGURE 8 - Typical Wiring Diagram BHP Models - 460/575-3-60 Power Supply**



