MANUAL 2100-010D

INSTALLATION INSTRUCTIONS

Bard
SINCE 1914

SINGLE PACKAGE HEAT PUMPS

MODELS

PH24
PH30
PH31-1
PH36-2
PH48-1
PH60-1

BARD MANUFACTURING CO. • BRYAN, OHIO 43506
Dependable quality home equipment... since 1914

SPECIFICATIONS

MODEL	PH24	PH30	PH31-1	PH36-2	PH36-2(3)	†PH36-2(3)	PH48-1	PH48-1(3)	†PH48-1(3)	PH60-1	PH60-1(3)	†PH60-1(3)
Cooling Capacity BTUH	23 000	28 000	28 500	34 500	35 000	35 000	47 000	47 000	47 000	56 000	56 000	56 000
*Hi Temp Heating BTUH	23 000	29 000	32 000	36 500	37 000	37 000	47 000	47 000	47 000	58 000	58 000	58 000
†Lo Temp Heating BTUH	12 500	14 000	14 000	18 000	18 000	18 000	24 000	24 000	24 000	33 000	33 000	33 000
Electrical Rating — 60 Hz	230-1	230-1	*230 208-1	*230 208-1	*230 208-3	460-3	**230 208-1	**230 208-3	460-3	**230 208-1	**[illegible]	460-3
Operating Voltage Range	197-253	207-253	197-253	197-253	197-253	414-506	197-253	187-253	414-506	197-253	187-253	414-506
Min. Circuit Ampacity	21	25	26	29	24	15	39	30	15	44	34	15
††Field Wire Size	(2) #10AWG	(2) #10AWG	(2) #10AWG	(2) #10AWG	(3) #10AWG	(3) #14AWG	(2) #8AWG	(3) #10AWG	(3) #14AWG	(2) #8AWG	(3) #8AWG	(3) #14AWG
Delay Fuse — Max. Amps	30	40	35	45	35	15	60	45	15	60	50	20
Total Unit Amps	17.6	20.9	21.4	23.4	19.4	8.7	32.7	25.7	9.9	37.2	29.2	11.5
Compressor — Circuit A												
Volts	230 208	230	230 208	230 208	230 200	460	230 208	230 200	460	230 208	230 200	460
Rated Load Amps	13	15.5	17	20	16	7.0	26	19	6.5	29	21	7.5
Lock Rotor Amps	60	76	68	91	74	41	115	93	32	132	103	38
Fan Motor & Condenser												
Fan Motor — HP RPM	1/2 1075	1/2 1075	1/5 1075	1/5 1075	1/5 1075	1/3 1075	1/3 825	1/3 825	1/3 825	[illegible] 1075	1/2 1075	1/2 1075
Fan Motor — Amps	4.4	4.4	1.6	1.6	1.6	1.4	2.8	2.8	2.8	4.3	4.3	4.3
Fan Dia. — Out CFM	18"-1760	18"-1760	20" 2250	20" 2300	20" 2300	20" 2300	24" 3300	24" 3300	24" 3300	24" 3500	24" 3500	24" 3500
Face Area Sq. Ft. Rows Fins per in.	3.75 3.14	3.75 3.14	3.75 3.14	5.04 3.14	5.04 3.14	5.04 3.14	7.7 2.14	7.7 2.14	7.7 2.14	7.7 3.12	7.7 3.12	7.7 3.12
Motor & Evaporator	0010-6	0010-6	0010-8	0010-8	0010-8	0010-8	0010-10	0010-10	0010-10	0010-10	0010-10	0010-10
Blower Motor — HP RPM	Common	Common	1/3 1075	1/3 1075	1/3 1075	1/3 1075	1/2 1075	1/2 1075	1/2 1075	1/2 1075	1/2 1075	1/2 1075
Blower Motor — Amps	w fan	w fan	2.8	2.1	2.1	1.3	3.9	3.9	3.9	3.9	3.9	2.9
CFM Cooling w Filter (Rated)	880 @ .17	900 @ .10	1075 @ .5	1285 @ .2	1285 @ .2	1285 @ .2	1750 @ .3	1760 @ .3	1760 @ .3	1560 @ .20	1860 @ .20	1860 @ .20
Face Area Sq. Ft. Row Fins per in.	2.08 3/12	2.08 3/12	3.21 3/13	3.21 3/13	3.21 3/13	3.21 3/13	4.03 3/12	4.03 3/12	4.03 3/12	3.36 4.14	3.36 4.14	3.36 4.14
Refrigerant 22 (oz.)	47	47	89	91	91	91	104	104	104	122	122	122
Shipping Weight Lbs.	300	300	365	365	365	365	462	459	459	502	494	494

*Deduct 500 Btuh for units operating at 208V
**Deduct 1000 Btuh for units operating at 208V
†For additional heating capacity, add the KW from Electric Heat Tables Nos. 1 and 2. †Not U.L. Listed
††60°C copper wire size, basic unit only — does not include supplemental heaters. Refer to Electric Heat Tables Nos. 1 and 2

ELECTRIC HEAT TABLE NO. 1

MODEL	240V BTUH	240V AMPS
5KW	17 065	20.8
9KW-3ph	30 600	21.7
10KW	34 130	41.7
15KW	51 195	62.5
15KW-3ph	51,195	36.2
18KW-3ph	61 200	43.4
20KW	68 250	83.3

IMPORTANT: The AMP values listed in this Table No. 1 are for electric heating elements only. CIRCUIT B — Some units permit the electric heating element to be wired on the compressor Circuit A.

INDOOR BLOWER PERFORMANCE CFM — DRY COIL WITH FILTER

E.S.P. in H_2O	PH24 PH30	PH31-1 PH36-2	PH48-1 PH60-1
0	975	1420	2350
10	925	1370	2155
20	870	1320	1950
30	820	1270	1800
40	765	1200	1630
50		[illegible]	[illegible]

ELECTRIC HEAT TABLE NO. 2

MODEL	Rated Volts & Ph.	Heater Kw @ 240V	Max. Unit Amps	No. Field Power Circuits	*Req'd. Maximum External Fuses Ckt.A	Ckt.B	Min. Circuit Ampacity Ckt.A	Ckt.B	**Field Power Wiring Ckt.A	Ckt.B	**Ground Wire Size Circuit A/B
PH24	230 1	5	38.2	1	50		47		6		10
		10	59.0	2	50	30	47	26	6	10	10/10
PH30	230 1	5	41.7	1	60		51		6		10
		10	62.5	2	60	30	51	26	6	10	10/10
PH31-1	230/208 1	5	41.2	1	60		52		6		10
		10	62.0	2	60	30	52	26	6	10	10/10
		15	82.9	2	†60	†60	52	52	6	6	10/10
PH36-2	230/208 1	5	44.2	1	60		55		6		10
		10	65.0	2	60	30	55	26	6	10	10/10
		15	85.9	2	†60	†60	55	52	6	6	10/10
PH36-2	230/208 3	9	41.1	2	35	30	24	27	10	10	10/10
		15	55.6	2	35	45	24	45	10	6	10
PH36-2	460 3	9	20.5	1	30		26		10		10
		15	27.7	1	35		35		8		10
PH48-1	230/208 1	5	53.5	2	60	30	39	26	8	10	10/10
		10	74.3	2	60	60	39	52	8	6	10/10
		15	95.1	2	60	80	39	78	8	3	10/8
		20	115.9	2	60	110	39	104	8	1	10/6
PH48-1	230/208 3	9	47.4	2	45	30	30	27	10	10	10/10
		15	61.9	2	45	45	30	45	10	6	10/10
		18	69.1	2	45	60	30	54	10	6	10/10
PH48-1	460 3	9	20.7	1	25		25		10		10
		15	27.9	1	35		34		8		10
		18	31.6	1	40		39		8		10
PH60-1	230/208 1	5	58.0	2	60	30	44	26	6	10	10/10
		10	78.8	2	60	60	44	52	6	6	10/10
		15	99.6	2	60	80	44	78	6	3	10/8
		20	120.4	2	60	110	44	104	6	1	10/6
PH60-1	230/208 3	9	50.9	2	50	30	34	27	8	10	10/10
		15	65.4	2	50	45	34	45	8	6	10/10
		18	72.6	2	50	60	34	54	8	6	10/10
PH60-1	460 3	9	22.3	1	30		27		10		10
		15	29.5	1	40		36		8		10
		18	33.2	1	45		41		6		10

*May be fuse or circuit breaker. **Based on 60°C copper wire. †Must be time delay type fuse.

CERTIFIED

LISTED

IMPORTANT: While this electrical data is presented as a guide, it is important to electrically connect properly sized fuses and conductor wires in accordance with the National Electrical Code and all existing local codes.

Underwriters' Listed for outdoor installation.

Specifications subject to change without notice.

EER AND COP PERFORMANCE

MODEL	EER COOLING 85°F	EER COOLING 95°F	COP Hi-Temp HEATING 47°F	COP Lo-Temp HEATING 17°F
PH24	8.2	7.2	2.4	1.6
PH30	7.8	6.8	2.5	1.3
PH31	8.5	7.5	2.6	1.5
PH36-2	8.4	7.5	2.6	1.7
PH36-2(3)	8.4	7.5	2.6	1.6
PH48-1	8.6	7.6	2.6	1.6
PH48-1(3)	8.8	7.8	2.8	1.7
PH60-1	9.1	8.0	2.8	1.9
PH60-1(3)	9.3	8.2	2.9	1.9

INDOOR THERMOSTAT OPTIONS

For Models PH31-1 and PH36-2.

These Bard Systems feature the option of either using a thermostat with a non-cycling reversing valve or automatic changeover.

Non-Cycling Reversing Valve

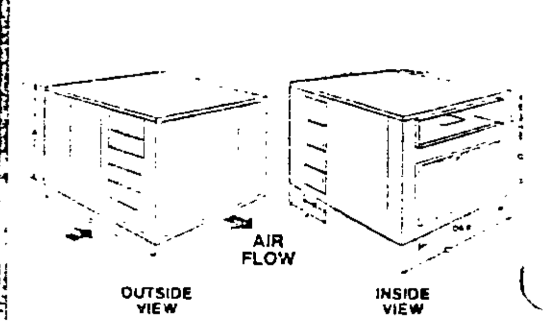
Thermostat — Part No. 8403-012 (Honeywell T872R1164)

Subbase — Part No. 8404-007 (Honeywell Q672L1185)

Automatic Changeover

Thermostat — Part No. 8403-015 (Honeywell T872N1063)

Subbase — Part No. 8404-008 (Honeywell Q672F1299)



NOMINAL CABINET DIMENSIONS (Inches) / DUCT OPENINGS (Inches)

MODEL	A	B	C	H	J	K	Discharge D	Discharge E	Return Air F	Return Air G
PH24, PH30	23¼	40	32	1⅞	21⅛	11	24	6	24	12
PH31-1, PH36-2	24¼	48³⁄₁₆	38⅞	⅞	26¼	17¼	33	6	33	14
PH48-1, PH60-1	31¼	50	42	1⅞	22⅞	16¼	38	10	38	16

BARD MANUFACTURING COMPANY • BRYAN, OHIO 43506

APPLICATION AND INSTALLATION INSTRUCTIONS
FOR SINGLE PACKAGE HEAT PUMP UNITS

MPORTANT

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians. Any heat pump is more critical of proper operating charge and an adequate duct system than a straight air conditioning unit. All duct work, supply and return, must be properly sized for the design air flow requirement of the equipment. NESCA is an excellent guide to proper sizing. All duct work or portions thereof not in the conditioned space should be properly insulated in order to both conserve energy and prevent condensation or moisture damage.

SHIPPING DAMAGE

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

LOCATION

General - The unit must be located outside, or in a well ventilated area. It must not be in the space being heated or cooled. A sound absorbing material should be considered if the unit is to be installed in such a position or location that might cause transmission of sound or vibration to the living area or adjacent buildings.

Slab Mounting - In areas where winter temperatures DO NOT go below 32°F for periods over twelve hours, the unit may be slab mounted at grade level. When installing unit at grade level, install on a concrete slab at least four inches above finished grade level. Slab should have a slope tolerance away from the building structure of at least 1/4 inch per foot, while being level from side to side. This will prevent ice buildup under the unit during defrost cycles. Place slab in a location where run-off water from higher ground will not collect around unit. See Figure 1.

A minimum of 18 inches should be provided between the coil inlet and any building surfaces. Provide at least four feet between coil outlet and any building wall, fences or other vertical structures. Provide a minimum of three feet clearance on the service access side of the unit. See Figure 2.

Roof Mounting - When a unit is installed in areas where low ambient temperatures or strong winter winds exist, it should be placed so prevailing winter winds are not in direct line with the heat pump coil. If this is not possible, a wind barrier should be constructed. Place barrier 24 inches from the coil inlet side of the unit and in the direction of prevailing winds. Size barrier at least the same height and width as the unit. This may also be necessary on ground level installations. See Figure 3.

Winter Installation Below 32°F - In areas where winter conditions go below 32°F for extended periods, the unit must be elevated above the mounting surface to prevent snowfall or defrost ice accumulation from interfering with the operation of the unit. A minimum of twelve inch elevation is recommended, while greater elevation may be required for areas of high snow accumulation. Poured concrete, steel framework, brick, cement block, etc. can be utilized to construct a suitable raised mounting platform. See Figure 4.

TYPICAL INSTALLATIONS

1. Roof-Mounted - The unit is mounted on a sturdy base on the roof of the building. Return air to the unit is brought through a single return grille (grilles with built-in filters are best, since they enable easy access for filter changing). Return air ducts are attached to the lower section of the front panel. Supply air is brought from the unit to attic duct work or to a furred down hall. Supply air duct is attached to the top of the front panel. CAUTION: All outdoor duct work must be thoroughly insulated and weatherproofed. All attic duct work must be thoroughly insulated. Two inch thick insulation with suitable vapor barrier is recommended for both outdoor and attic runs. In rooftop installations, as in all installations, the heat pump must be level from side to side. However, the unit should have a pitch along the length to assure complete external drainage of precipitation and of defrost condensate.

2. Crawl Space - Duct work installed in crawl space must be well insulated and provided with a vapor barrier. In addition, the crawl space must be thoroughly ventilated and provided with a good vapor barrier as a ground cover. It is most desirable to install the unit outdoors, rather than inside the crawl space, so that it will be readily accessible for service. In addition, it is necessary to dispose of the condensate from the outdoor coil on the heating cycle, and this is virtually impossible with the unit installed inside the crawl space.

3. Slab Mounted at Ground Level - This type installation is ideal for homes with slab floor construction, where a roof-mounted unit is not desired. The supply and return duct work can be run through a furred closet space.

4. Thru-The-Wall - This type installation requires a suitable framework to be fabricated capable of withstanding the unit weight. Normally the unit will be installed so as to minimize supply and return duct work.

5. Other Installations - Many other installations are possible with the packaged heat pump. No matter what the installation, always consider the following facts:

   a. Insure that the discharge air is not obstructed in any way so as to cause operation difficulties.

   b. The indoor coil drain pan is equipped with a coupling that must be piped through a condensate drain trap to a suitable drain.

   c. Always mount the unit in such a position that it may be easily reached for servicing and maintenance.

   d. Insure that the unit is clear so that proper air flow over the outdoor coil will be maintained.

IMPORTANT: Models PH24 and PH30 have a single fan motor driving both the indoor blower and outdoor fan. This type of unit is particularily sensitive to natural air currents during defrost and some type of wind barrier is recommended. See Figure 3.

Figure 3

ROOFTOP APPLICATION

(May also be required for ground level installations)

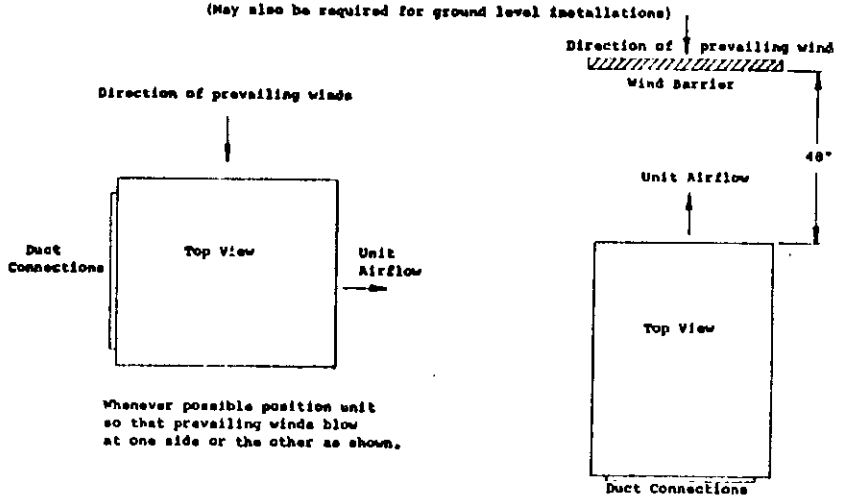


Figure 1

SLAB MOUNTING AT GROUND LEVEL

(Above 32°F Outside Temperature)

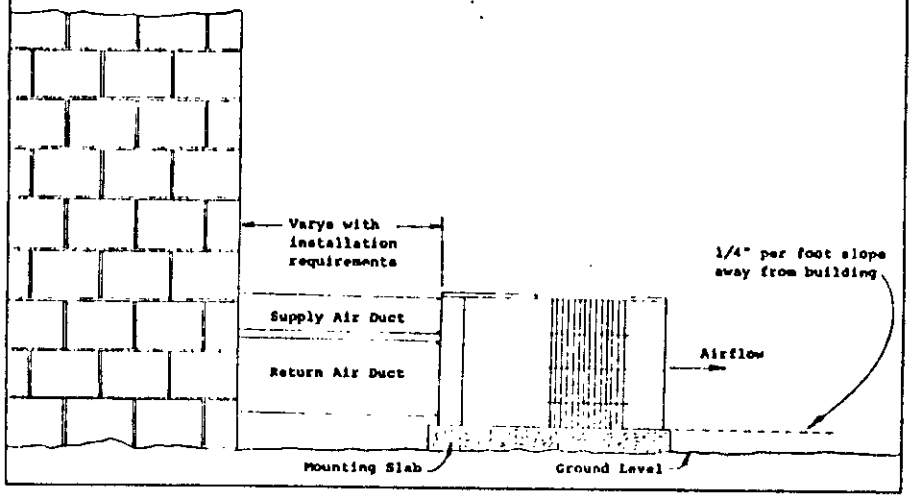


Figure 4

ELEVATED MOUNTING PLATFORMS

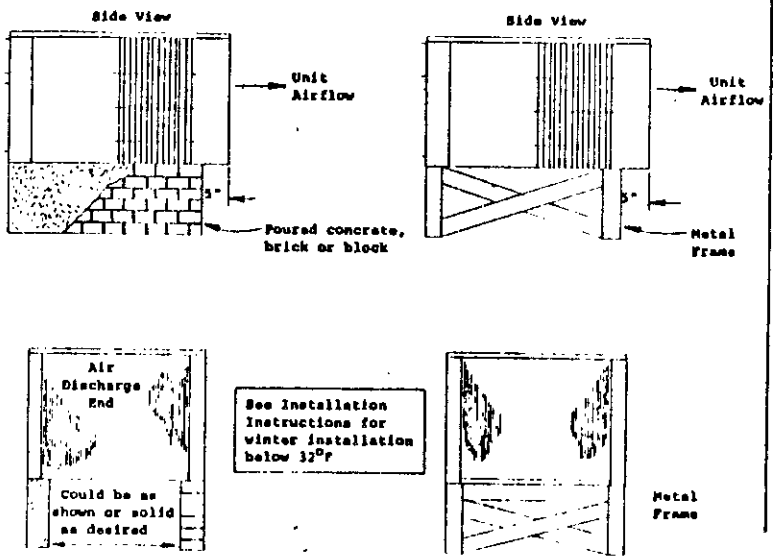
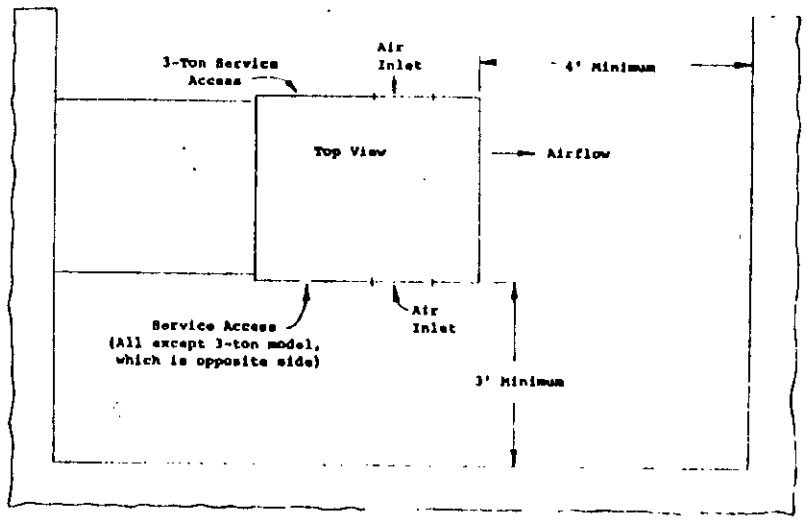
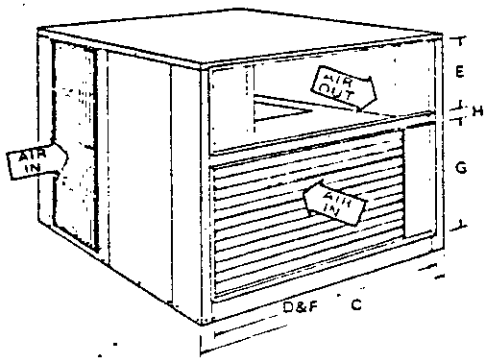


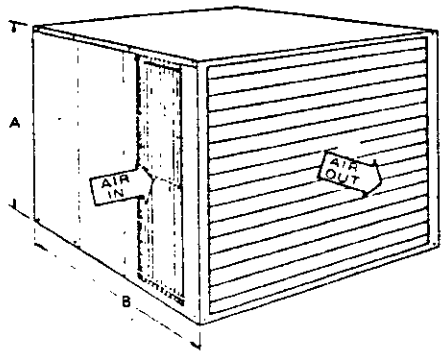
Figure 2

AIRFLOW AND SERVICE ACCESS CLEARANCES



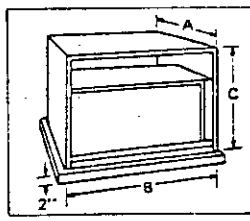
DIMENSIONS





MODEL	A	B	C	D	E	F	G	H
PH24, PH30	23-1/4	40	32	24	6	24	12	1-7/8
PH31-1, PH36-2	24-1/4	48 3/16	38-1/8	33	6	33	14	7/8
PH48-1, PH60-1	31-1/4	50	42	38	10	38	16	1-3/8

All dimensions are in inches.



ROOF HOOD

MODEL	A	B	C
RH24, 30	38-1/4	32	23-1/4
RH36	38-1/4	38-1/8	24-1/4
RH48, 60	38-1/4	42	31-1/4

ROOF HOOD — STATIC RESISTANCE — IWG

(To Be Included With Duct System Static Resistance)

MODEL					
PH24	PH30	PH31-1	PH36-2	PH48-1	PH60-1
CFM		CFM		CFM	
800	1000	1200	1400	1600	2000
.06	.09	.06	.09	.06	.10

FILTERS

PRIOR THOUGHT SHOULD BE GIVEN TO RETURN AIR LOCATION AND PLACEMENT OF THE AIR FILTER(S). The air filter(s) must be of adequate size and readily accessible to the homeowner. Filters must be adequate in size and properly maintained for proper operation. If this is not done, excessive energy use and multiple service problems will result. IT IS IMPOSSIBLE TO OVERSIZE AIR FILTERS. Generous sizing will result in cleaner air and coils, as well as lower operating costs and extend time between required changes. The following is minimum recommended filter sizes, suggested total static and expected air flows with dry coil.

MODEL	PH24	PH30	PH31-1	PH36-2	PH48-1	PH60-1
Total Static	.17"	.10"	.5"	.20	.30"	.20"
CFM	880	900	1070	1285	1760	1860
Air Filter	2.18 sq.ft. 314 sq.in.	2.25 sq.ft. 324 sq.in.	3.56 sq.ft. 513 sq.in.	3.56 sq.ft. 513 sq.in.	4.5 sq.ft. 648 sq.in.	5 sq.ft. 720 sq.in.
Approx.Size Example	16x20	16x20	20x25	20x25	(2) 16x20	(2) 20x20

INSTALLER NOTE: Optimum unit performance will occur with a refrigerant charge resulting in a suction line temperature (near the compressor) of 53° to 58°F with 95°F outdoor temperature and 80°F dry bulb/67°F wet bulb (50% R.H.) indoor temperatures and rated airflow across the indoor coil.

WIRING - MAIN POWER

Refer to the unit rating plate for wire sizing information and maximum fuse size. Each outdoor unit is marked with a "Minimum Circuit Ampacity." This means that the field wiring used must be sized to carry that amount of current. Depending on the installed Kw of electric heat, there may be two field power circuits required. If this is the case, the unit serial plate will so indicate. Some models are suitable only for connection with copper wire, while others can be wired with either copper or aluminum wire. Each unit and/or wiring diagram will be marked "Use Copper Conductors Only" or "Use Copper or Aluminum Conductors." These instructions MUST BE adhered to. Refer to the National Electrical Code for complete current carrying capacity data on the various insulation grades of wiring material.

The electrical specifications on page 2 lists fuse and wire sizes (60°F copper) for all models, including the most commonly used heater sizes. Also shown are the number of field power circuits required for the various models with heaters.

The unit rating plate lists a "Maximum Time Delay Fuse" that is to be used with the equipment. The correct size fuse must be used for proper circuit protection and also to assure that there will be no nuisance tripping due to the momentary high starting current of the compressor motor.

WIRING - CONTROL CIRCUIT

All units are provided with a 24 volt terminal board which is marked C, G, R, Y, W1, W2 and E. DO NOT wire to terminal C. This will cause transformer burnout. Refer to specific unit wiring diagram for details.

GENERAL

The refrigerant system is completely assembled and charged. All internal wiring is complete.

The unit is designed for use with or without duct work. Flanges are provided for attaching the supply and return ducts.

These instructions explain the recommended method to install the air cooled self-contained unit and the electrical wiring connections to the unit.

These instructions and any instructions packaged with any separate equipment required to make up the entire air conditioning system should be carefully read before beginning the installation. Note particularly "Starting Procedure" and any tags and/or labels attached to the equipment.

While these instructions are intended as a general recommended guide, they do not supersede any national and/or local codes in any way. Authorities having jurisdiction should be consulted before the installation is made.

PRESSURE SERVICE PORTS

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure curves can be found later in the manual covering all models on both cooling and heating cycles. It is imperative to match the correct pressure curve to the unit by model number.

CRANKCASE HEATERS

All units are provided with some form of compressor crankcase heat. Single phase units utilize the compressor motor start winding in series with a portion of the run capacitor to generate heat within the compressor shell to prevent liquid refrigerant migration.

Three phase units utilize a wraparound type of crankcase heater that warms the compressor oil from the outside.

Some form of crankcase heat is essential to prevent liquid refrigerant from migrating to the compressor, causing oil pump out on compressor start-up and possible valve failure due to compressing a liquid.

See sample of "IMPORTANT" decal on page 7. This decal is affixed to all units.

COMPRESSOR CUT-OFF THERMOSTAT

Heat pump compressor operation at outdoor temperatures below 0°F are neither desirable nor advantageous in terms of efficiency. Since most equipment at time of manufacture is not designed for any specific destination of the country, and most of the equipment is installed in areas not approaching the lower outdoor temperature range, the compressor cut-offs are not factory installed.

Typical wiring diagrams showing the application of a compressor cut-off can be found later in the manual. NOTE: There are three of the "Typical" wiring diagrams mentioned above contained in this manual, one covering models PH24 and PH30, one covering models PH31 and PH36-1, and one covering models PH48-1 and PH60-1. All of the "Typical" diagrams are for 1-phase units with maximum Kw of electric heat shown. From the 24V control circuit standpoint there is no difference between 1-phase and 3-phase units, only the 240V compressor and heater wiring is different.

SEQUENCE OF OPERATION (ALL MODELS)

Cooling - R-Y at thermostat pulls in the compressor contactor starting the compressor and outdoor fan. The same R-Y also feeds G, which pulls in the fan relay for blower operation. The reversing valve is not energized, so the system is in the cooling cycle.

Heating - R-W (or W1) make at thermostat on a call for heat. This pulls in the changeover relay. Terminals 6-4 of changeover relay make R-Y circuit which pulls in compressor contactor starting the compressor and outdoor fan, also R-Y at thermostat completes G circuit, pulling in fan relay starting indoor blower. Terminals 1-3 on changeover relay make, energizing the reversing valve to put the system into the heating cycle. SEE REFRIGERANT FLOW DIAGRAM. The system will now be producing warm air indoors.

DEFROST CYCLE (MODELS PH48-1 AND PH60-1 ONLY)

The defrost cycle is controlled by time and temperature. When the outdoor temperature is in the lower 40°F temperature range or colder, the outdoor coil temperature is 32°F or below. This temperature is sensed by a defrost thermostat mounted low and at the return bend end of the outdoor coil. The defrost thermostat makes at approximately 32°F refrigerant temperature. The MAKE of the contacts starts the defrost timer motor. The defrost timer motor can run only when the heat pump is in operation. After approximately 30 minutes of heat pump running time, with the outdoor coil below 32°F, the defrost timer contacts make. This causes the defrost relay to pull in.

Terminals 4-5 of the defrost relay open, breaking power to the outdoor fan and the reversing valve. The outdoor fan motor stops and the reversing valve shifts to the cooling cycle. Terminals 7-9 of the defrost relay make, which pulls in W2, second stage strip heaters, with the indoor blower continuing to operate.

As the heat pump continues to operate in the defrost cycle, the outdoor coil warms up from the hot gas flow. As the temperature rises to approximately 57°F at the defrost thermostat location, the contacts now open. This de-energizes the defrost timer and defrost relay. All the components then return to the normal heating cycle as before.

DEFROST CYCLE (ALL MODELS EXCEPT PH48-1 AND PH60-1)

The defrost cycle is controlled by time and temperature. The 240V timer motor runs all the time the compressor is in operation. When the outdoor temperature is in the lower 40°F temperature range or colder, the outdoor coil temperature is 32°F or below. This temperature is sensed by the defrost thermostat mounted near the bottom of the outdoor coil on a return bend. The defrost thermostat closes at approximately 32°F. Every 30 minutes that the compressor is running, contacts 3-5 close for 7 minutes, with contacts 3-4 closed for the first 40 seconds of that 7 minutes. If the defrost thermostat is closed, the defrost relay energizes and places the system in defrost mode. An interlocking circuit is created with timer contact 3-5 and defrost relay contact 7-9 in series.

During the defrost mode, the refrigerant cycle switches back to the cooling cycle, and hot gas passing through the outdoor coil melts any accumulated frost. When the temperature rises to approximately 57°F the defrost thermostat opens, de-energizing the defrost relay and returning the system to heating operation.

If some abnormal or temporary condition such as a high wind causes the heat pump to have a prolonged defrost cycle, contacts 3-5 of the defrost timer will open after 7 minutes and restore the system to heating operations automatically.

There is a manual advance knob located on the top of the timer, with access through a punched hole in sheet metal barrier just above timer. This can be used to advance timer to contact closure point if it is desired to check out defrost cycle operation, without waiting for time to elapse.

SERVICE HINTS

1. Caution homeowner to maintain clean air filters at all times. Also, not to needlessly close off supply and return air registers. This reduces airflow through the system, which shortens equipment service life as well as increasing operating costs.

2. Switching to heating cycle at 75°F or higher outside temperature may cause a nuisance trip of the manual reset high pressure switch.

3. The heat pump wall thermostats perform multiple functions. Be sure that all function switches are correctly set for the desired operating mode before trying to diagnose any reported service problems.

4. Check all power fuses to be sure they are correct rating and are the time-delay type.

5. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

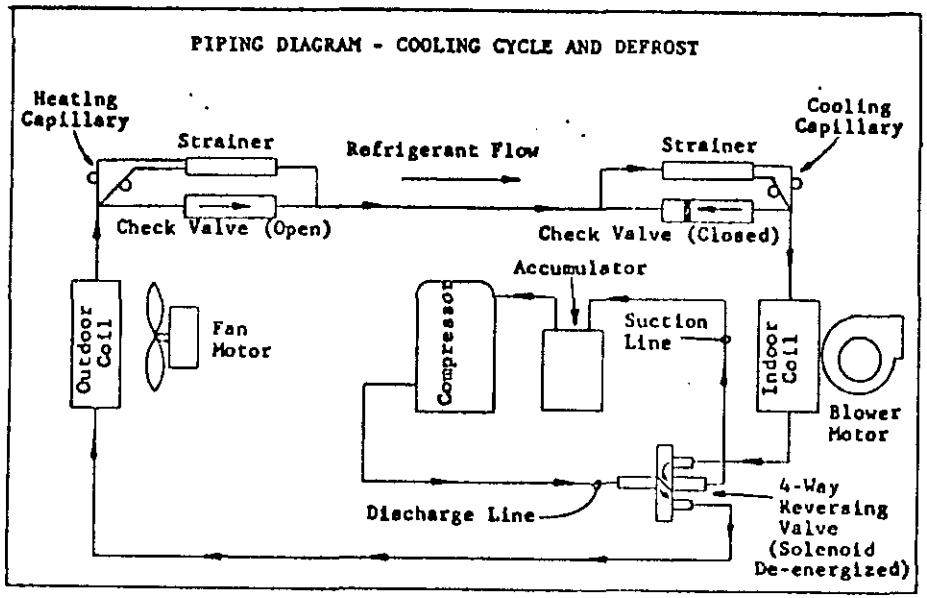
6. System operating pressures may be checked against the appropriate pressure curves. These are included with the indoor coil section installation instructions.

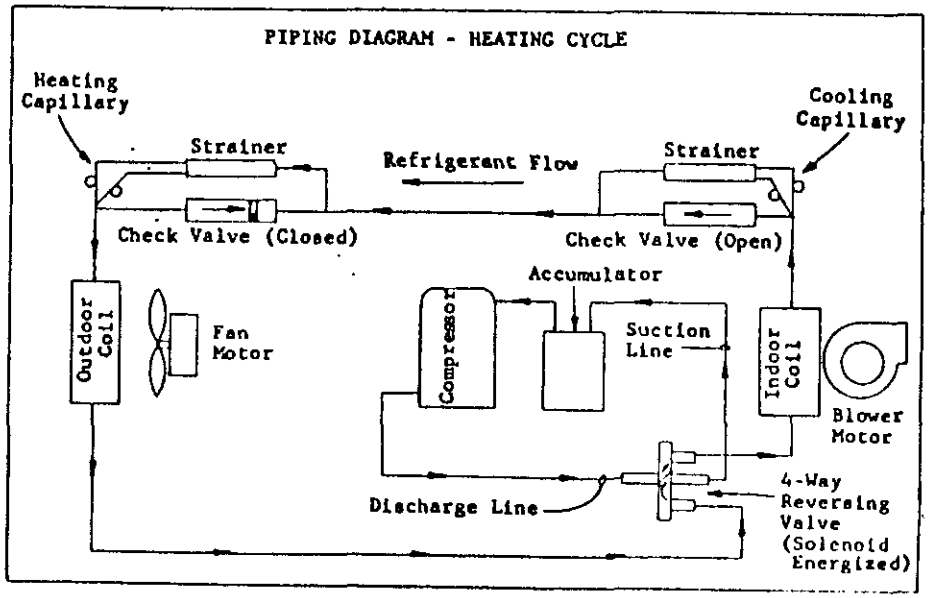
PARTS LIST

SINGLE PACKAGE HEAT PUMPS

Effective 1/1/80
Supersedes 1/1/79

PART NO.	DESCRIPTION	PH24	PH30
5202-001	Accumulator	x	
5202-006	Accumulator		x
5152-020	Blower Housing S1110-6AT	x	x
5152-009	Blower Wheel 10 x 5-1/2	x	x
8552-007	Capacitor 20/15 - 370V	x	x
8552-002	Capacitor 5/370V	x	x
5811-021	Cap Tube - Cool	x	
5811-019	Cap Tube - Heat	x	
5811-027	Cap Tube - Cool		x
5811-023	Cap Tube - Heat		x
5651-006	Check Valve	x	x
5051-009	Condenser Coil	x	x
8000-005	Compressor AH141FT	x	
8000-006	Compressor AH152GT		x
8401-006	Contactor - Compressor 20A	x	x
8401-006	Contactor - Heater 20A	x	x
8408-004	Defrost Mounting Plate	x	x
8408-006	Defrost Thermostat	x	x
5060-005	Evaporator Coil	x	x
5151-009	Fan Blade FF1827-4	x	x
8604-042	Heat Strip 5Kw	x	x
8604-044	Heat Strip 10Kw	x	x
8406-010	High Pressure Switch	x	x
8402-015	Limit Switch L130-2.0	x	x
8106-005	Motor - Blower and Fan 1/2 hp	x	x
8201-008	Relay - Blower	x	x
8201-013	Relay - Changeover	x	x
8201-018	Relay - Defrost	x	x
8201-015	Relay - Emergency Heat	x	x
8201-011	Relay - Interlock	x	x
5650-004	Reversing Valve	x	
5650-005	Reversing Valve		x
5650-002	Solenoid Coil	x	x
5210-002	Strainer	x	x
8607-006	Terminal Board 24V	x	x
8607-001	Terminal Block 230V	x	x
8607-003	Terminal Block 230V	x	x
8402-026	Thermal Cut-off	x	x
8612-010	Timer	x	x
8407-015	Transformer	x	x





PARTS LIST

SINGLE PACKAGE HEAT PUMPS

Effective 1/1/80
Supersedes 1/1/79

PART NO.	DESCRIPTION	PH31-1	PH36-2	PH36-2 3-Ph	PH36-2 460V 3-Ph
5202-003	Accumulator	x			
5202-004	Accumulator		x	x	x
*	Blower Housing 10-8	x	x	x	x
5152-013	Blower Wheel 0010-8A	x	x	x	x
8552-020	Capacitor - Comp. 35/370V	x			
8552-022	Capacitor - Comp. 20/370V	x			
8552-002	Capacitor - Fan & Blower 5/370V	x	x	x	x
8552-024	Capacitor - Comp. 40/370V		x		
8552-015	Capacitor - Comp. 25/370V		x		
5811-014	Capillary Tube - Cool	(2)			
5811-029	Capillary Tube - Heat	x			
5811-033	Capillary Tube - Cool		(2)	(2)	(2)
5811-019	Capillary Tube - Heat		x	x	x
5651-006	Check Valve	x	x	x	x
5051-003	Condenser Coil	x	x	x	x
8000-042	Compressor H2EA293AB	x			
8000-051	Compressor H2EA363AB		x		
8000-059	Compressor CRJ1-0300-TF5-270			x	
8000-060	Compressor CRJ1-0300-TF0-270				x
8401-007	Contactor - Compressor 1P25A	x	x		
8401-006	Contactor - Heater 2P20	x	x	x	
8401-002	Contactor - Compressor			x	x
8401-010	Contactor - Heater 2P30			x	
8408-004	Defrost Mounting Plate	x	x	x	x
8408-002	Defrost Thermostat	x	x	x	x
5060-023	Evaporator Coil	x	x	x	x
5151-004	Fan Blade TP2026 cw	x	x	x	
5151-025	Fan Blade L10H08-2027 ccw				x
8614-013	Fuse Block 15Kw	x	x		
8614-022	Fuse 60A (Comp.)	x	x		
8614-007	Fuse 60A (Heater)	x	x		
8604-042	Heat Strip 5Kw	x	x		
8604-044	Heat Strip 10Kw	x	x		
8604-047	Heat Strip 15Kw	x	x	x	
8604-048	Heat Strip 9Kw			x	
8604-046	Heat Strip 12Kw			x	
8604-050	Heat Strip 9Kw				x
8604-051	Heat Strip 12Kw				x
8604-052	Heat Strip 15Kw				x
8504-010	Hi Pressure Switch	x	x	x	x
8402-012	Limit Switch 130°	x	x	x	x
8105-020	Motor - Blower 1/3 hp ccw	x	x	x	
8105-018	Motor - Blower 1/3 hp ccw				x
8103-009	Motor - Fan 1/5 hp	x	x	x	
8105-016	Motor - Fan 1/3 hp				x

*Please order by model number.

PARTS LIST

SINGLE PACKAGE HEAT PUMPS

Effective 1/1/80
Supersedes 1/1/79

PART NO.	DESCRIPTION	PH31-1	PH36-2	PH36-2 3-Ph	PH36-2 460V 3-Ph
8200-003	Motor Mount - Blower	x	x	x	x
8200-001	Motor Mount - Fan	x	x	x	x
5451-011	Motor Mounting Parts	x	x	x	x
8201-009	Relay - Blower	x	x	x	
8201-032	Relay - Blower				x
8201-023	Relay - Defrost	x	x	x	
8201-033	Relay - Defrost				x
5650-005	Reversing Valve	x			
5650-006	Reversing Valve		x	x	x
5650-008	Solenoid Coil	x	x	x	x
5210-004	Strainer	x	x	x	x
5210-002	Strainer	x	x	x	x
8607-010	Terminal Board 24V	x	x	x	x
8607-001	Terminal Block 230V	x	x		
8607-003	Terminal Block 230V	x	x		
8607-002	Terminal Block 230V			x	x
8402-026	Thermal Cut-off	x	x	x	x
8612-010	Timer	x	x	x	x
8407-015	Transformer	x	x	x	x
8407-028	Transformer - Stepdown				x
8201-031	Relay - Compressor Fault	x	x		
8201-013	Relay - Emergency Heat	x	x	x	x

PARTS LIST

SINGLE PACKAGE HEAT PUMPS

Effective 1/1/80
Supersedes 1/1/79

PART NO.	DESCRIPTION	PH48-1	PH48-1 3-Ph	PH60-1	PH60-1 3-Ph	PH48-1 460V 3-Ph	PH60-1 460V 3-Ph
5202-007	Accumulator	x	x	x	x	x	x
*	Blower Housing 10-10	x	x	x	x	x	x
5152-015	Blower Wheel D010-10A	x	x	x	x	x	x
8552-017	Capacitor 45/440V	x		x			
8552-005	Capacitor 10/370V	x	x	x	x	x	x
8552-004	Capacitor 7½/370V			x	x		x
8552-026	Capacitor 15/370V	x	x			x	
5811-013	Capillary Tube - Heat			(2)	(2)		(2)
5811-025	Capillary Tube - Cool			(2)	(2)		(2)
5811-008	Capillary Tube - Cool	(3)	(3)			(3)	
5811-032	Capillary Tube - Heat	x	x			x	
5551-006	Check Valve	x	x	x	x	x	x
5051-021	Condenser Coil	x	x			x	
5051-022	Condenser Coil			x	x		x
8000-026	Compressor AG111ET	x					
8000-030	Compressor AG111RT		x				
8000-027	Compressor AG122ET			x			
8000-031	Compressor AG122RT				x		
8000-047	Compressor AG111UT					x	
8000-048	Compressor AG122UT					-	x
83494	Compressor Overload	x					
83493	Compressor Overload		x				
83672	Compressor Overload			x			
83694	Compressor Overload				x		
8401-003	Contactor - Comp. 30A	x					
8401-002	Contactor - Comp. 25A		x		x	x	x
8401-016	Contactor - Comp. 35A			x			
8401-006	Contactor - Heater 20A	x	x	x	x		
8408-004	Defrost Mounting Plate	x	x	x	x	x	x
8403-002	Defrost Thermostat	x	x	x	x	x	x
5060-001	Evaporator Coil	x	x			x	
5060-011	Evaporator Coil			x	x		x
5151-021	Fan Blade 82430-4	x	x			x	
5151-022	Fan Blade 82425-4			x	x		x
8614-022	Fuse - Comp. 60A	x		x			
8614-007	Fuse - Heater 60A	x		x			
8614-006	Fuse - Heater 30A	x		x			
8614-014	Fuse Block 15Kw	x		x			
8614-019	Fuse Block 20Kw	x		x			
8604-044	Heat Strip 10Kw	x		x			
8604-047	Heat Strip 15Kw	x	x	x	x		
8604-050	Heat Strip 9Kw					x	x
8604-057	Heat Strip 15Kw					x	x
8604-046	Heat Strip 12Kw		x		x		
8604-043	Heat Strip 9Kw		x		x		

*Please order by model number.

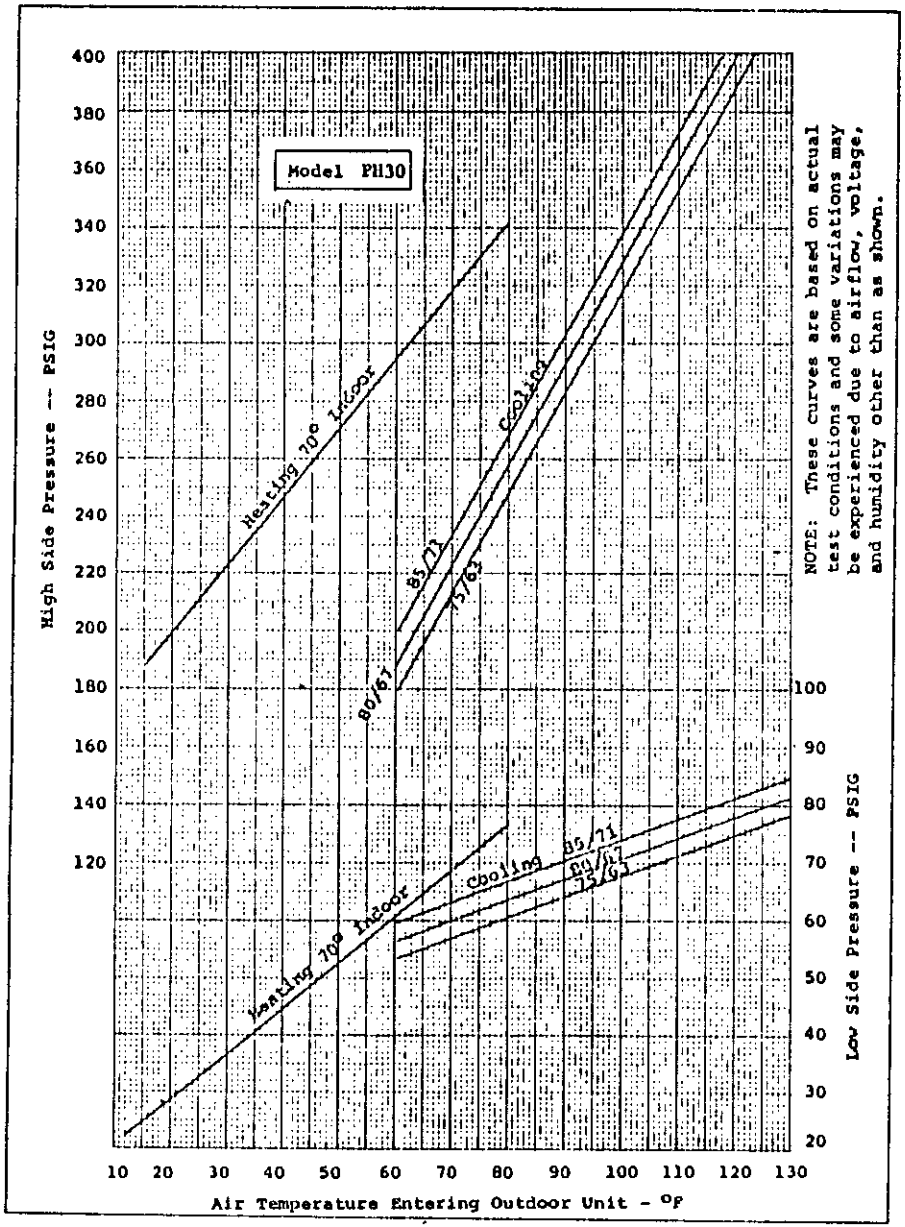
PARTS LIST

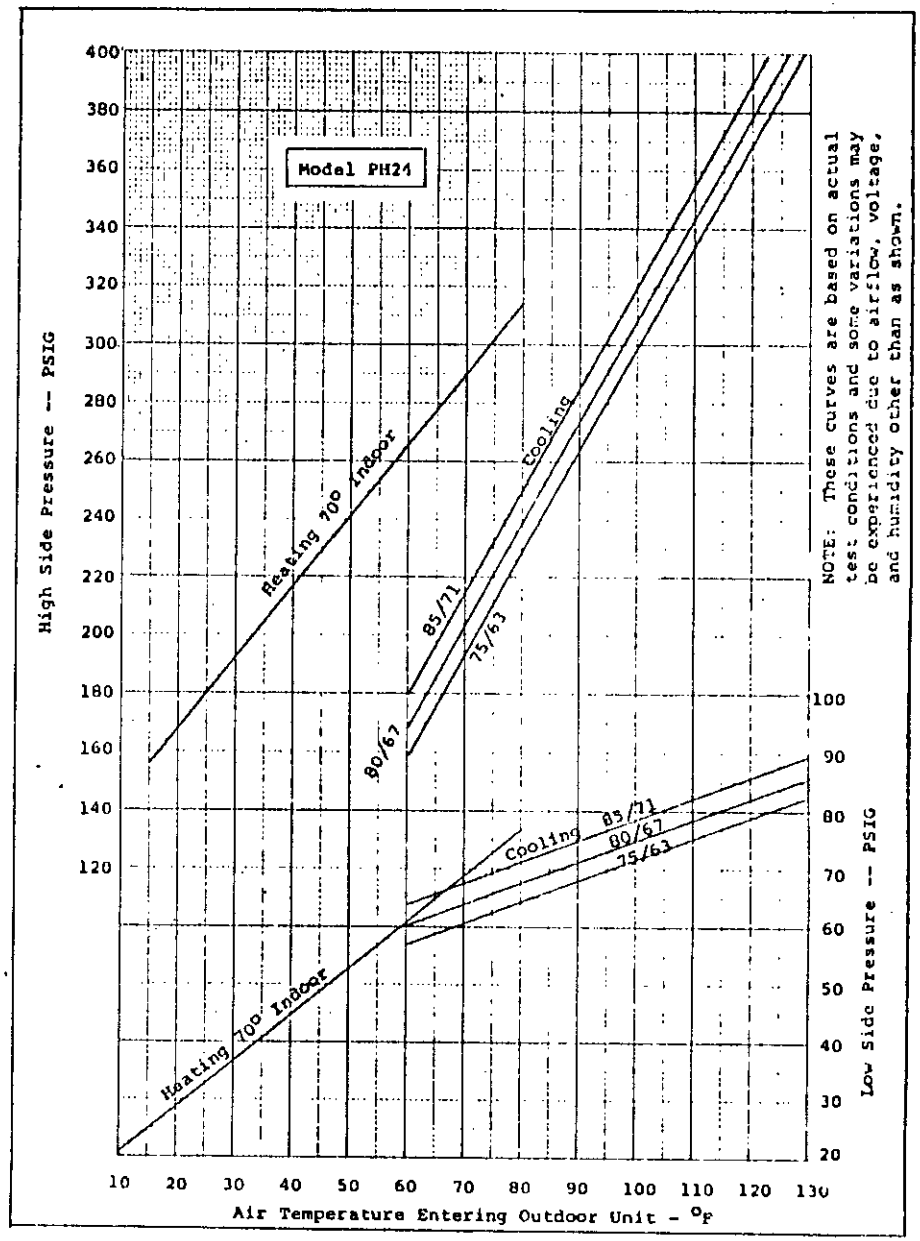
SINGLE PACKAGE HEAT PUMPS

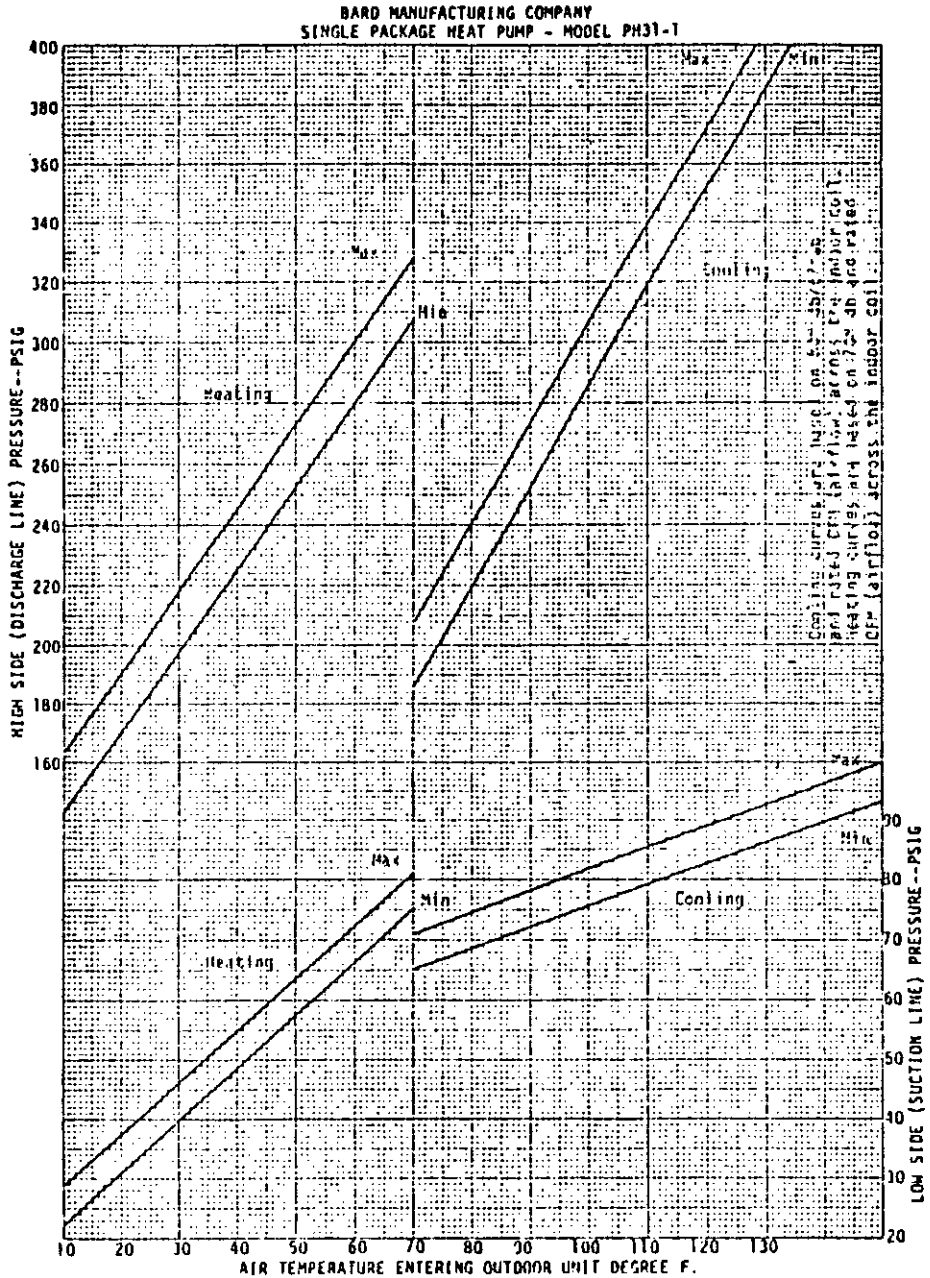
Effective 1/1/80
Supersedes 1/1/79

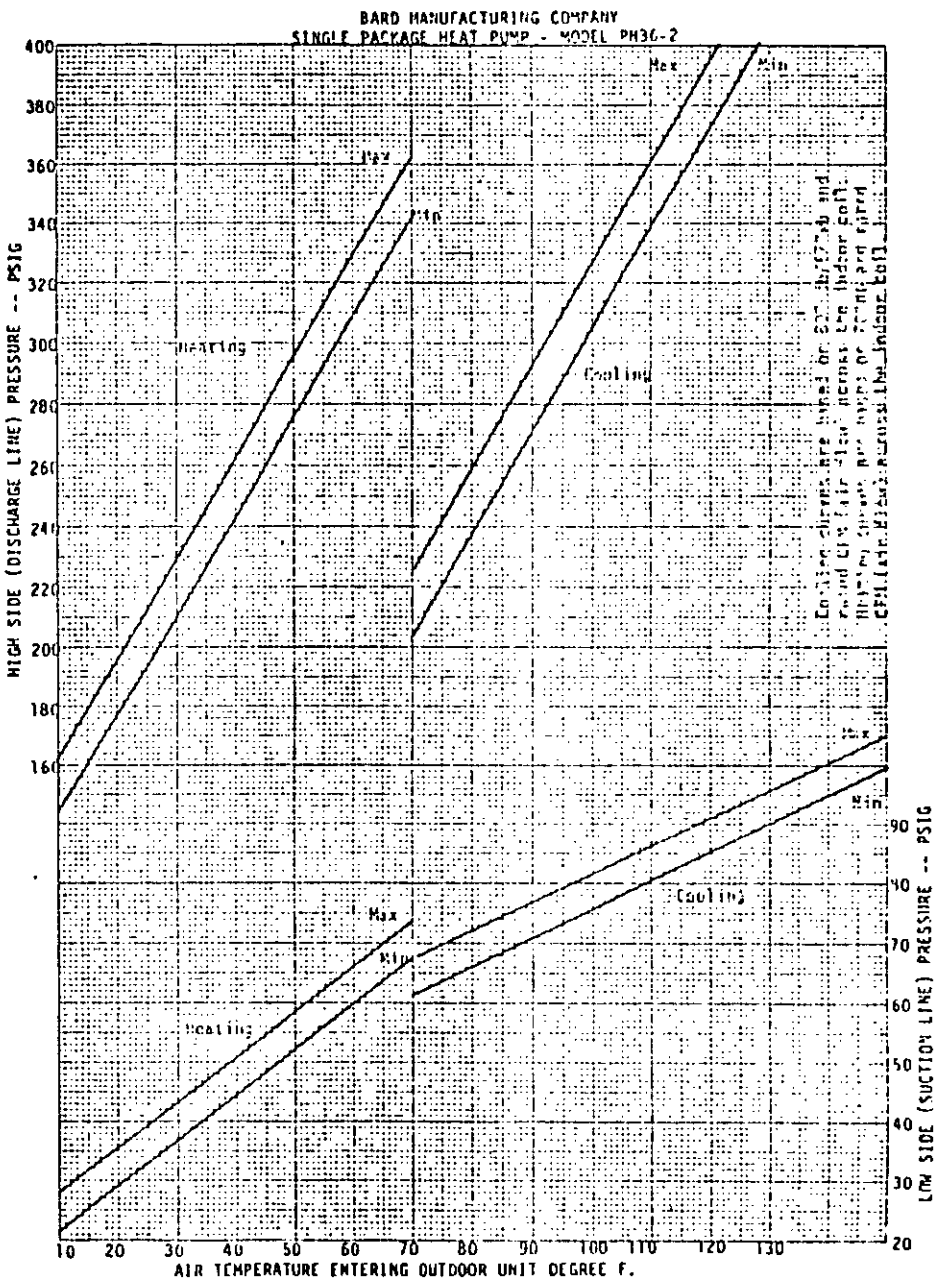
PART NO.	DESCRIPTION	PH48-1	PH48-1 3-Ph	PH60-1	PH60-1 3-Ph	PH48-1 460V 3-Ph	PH60-1 460V 3-Ph
8406-010	High Pressure Switch	x	x	x	x	x	x
8402-012	Limit Switch 130-115°	x	x	x	x	x	x
8106-015	Motor - Blower 1/2 hp	x	x	x	x	x	x
8105-021	Motor - Fan 1/3 hp	x	x			x	
8106-016	Motor - Fan 1/2 hp			x	x		x
8200-001	Motor Mount - Blower	x	x	x	x	x	x
8200-004	Motor Mount - Fan	x	x	x	x	x	x
5451-011	Motor Mounting Parts	x	x	x	x	x	x
8201-008	Relay - Blower	x	x	x	x	x	x
8201-013	Relay - Changeover	x	x	x	x	x	x
8201-018	Relay - Defrost	x	x	x	x	x	x
8201-015	Relay - Emergency Heat	x	x	x	x	x	x
5650-006	Reversing Valve	x	x	x	x	x	x
5650-002	Solenoid Coil	x	x	x	x	x	x
5210-002	Strainer	x	x			x	
5210-003	Strainer	x	x			x	
5210-005	Strainer			x	x		x
8607-006	Terminal Board 24V	x	x	x	x	x	x
8607-001	Terminal Block 230V	x		x		x	x
8607-002	Terminal Block 230V		x		x	x	x
8607-003	Terminal Block 230V	x		x			
8402-025	Thermal Cut-off	x	x	x	x	x	x
8612-008	Timer	x	x	x	x	x	x
8407-015	Transformer	x	x	x	x	x	x
8407-004	Transformer - Stepdown					x	x

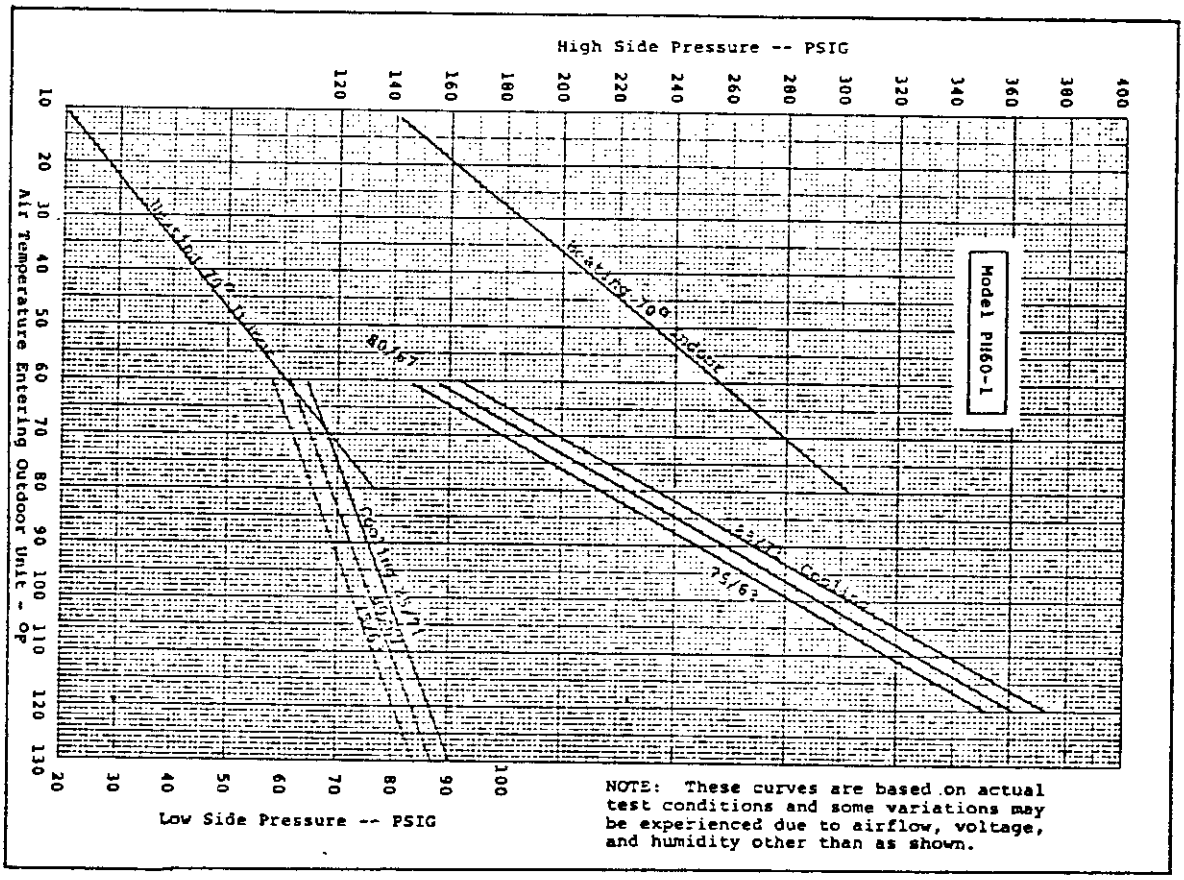
Minimum Net Billing $15.00. Supersedes all previous lists.
Subject to change without notice. F.O.B. Bryan, Ohio.

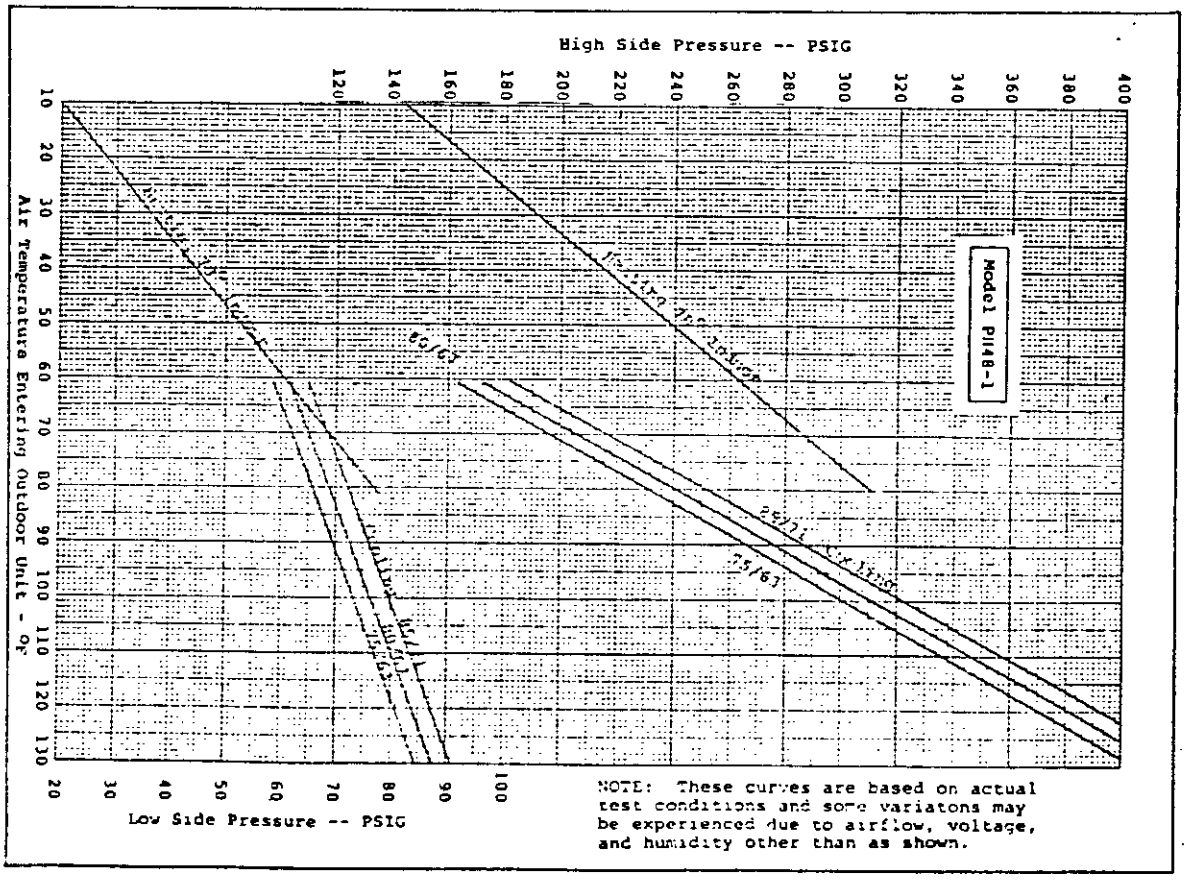

Model PH30
High Side Pressure -- PSIG
Low Side Pressure -- PSIG
Air Temperature Entering Outdoor Unit - °F
Heating 70° Indoor
Cooling
85/71
80/67
75/63
NOTE: These curves are based on actual test conditions and some variations may be experienced due to airflow, voltage, and humidity other than as shown.


Model PH24
High Side Pressure -- PSIG
Low Side Pressure -- PSIG
Air Temperature Entering Outdoor Unit - °F
Heating 70° Indoor
Cooling
85/71
80/67
75/63
NOTE: These curves are based on actual test conditions and some variations may be experienced due to airflow, voltage, and humidity other than as shown.


BARD MANUFACTURING COMPANY
SINGLE PACKAGE HEAT PUMP - MODEL PH31-1
HIGH SIDE (DISCHARGE LINE) PRESSURE--PSIG
LOW SIDE (SUCTION LINE) PRESSURE--PSIG
AIR TEMPERATURE ENTERING OUTDOOR UNIT DEGREE F.
Max
Min
Heating
Cooling


BARD MANUFACTURING COMPANY
SINGLE PACKAGE HEAT PUMP - MODEL PH36-2
HIGH SIDE (DISCHARGE LINE) PRESSURE -- PSIG
LOW SIDE (SUCTION LINE) PRESSURE -- PSIG
AIR TEMPERATURE ENTERING OUTDOOR UNIT DEGREE F.
Max
Min
Heating
Cooling


High Side Pressure -- PSIG
Model PH60-1
80/67
75/63
Low Side Pressure -- PSIG
Air Temperature Entering Outdoor Unit - °F
NOTE: These curves are based on actual test conditions and some variations may be experienced due to airflow, voltage, and humidity other than as shown.


High Side Pressure -- PSIG
Model PH48-1
80/67
75/63
Low Side Pressure -- PSIG
Air Temperature Entering Outdoor Unit - °F
NOTE: These curves are based on actual test conditions and some variations may be experienced due to airflow, voltage, and humidity other than as shown.

IMPORTANT

PURCHASER'S RESPONSIBILITIES

Below are the responsibilities of the purchaser and these items cannot be considered as defects in workmanship or material.

1. Air filter cleaning or replacement.
2. Failure to operate due to improper air distribution over indoor and outdoor equipment sections.
3. Failure to start due to voltage conditions, blown fuses or other damage due to inadequacy or interruption of electrical service.
4. Damage caused directly or indirectly by improper installation.
5. Damage due to lack of proper and periodic maintenance.
6. Damage resulting from transportation, moving or storage of unit.
7. Unit must be readily accessible for servicing and/or repair at all times.
8. Any adjustment or service to the unit should be made by qualified service personnel.
9. Misapplication of product.

MODEL NO._____ SERIAL NO._____ DATE INSTALLED_____

INSTALLER: Please fill in above blanks and leave this manual with equipment owner/operator.