MANUAL 2100 - 028

Bard®
SINCE 1914

MODELS
RPMH 30 and RPMH 36

ROOF MOUNT
PACKAGED HEAT PUMP

INSTALLATION INSTRUCTIONS

SPECIALLY DESIGNED FOR ROOFTOP HEATING / COOLING APPLICATIONS

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

Bard
SINCE 1914

ENERGY CONSERVING
ROOF MOUNT
PACKAGED HEAT PUMPS

MODELS
RPMH30
RPMH36

FEATURES

UPFLOW CONDENSER AIR DISCHARGE allows more freedom of unit placement. Condenser fan is less susceptible to wind effect than horizontal discharge models.

EASY TO SERVICE because all components and controls are accessible for inspection.

THREE-SPEED BLOWER MOTOR provides airflow adjustments for both high or low static operation. Standard on both models.

ELECTRIC HEAT STRIPS with automatic limit and thermal cutoff are available as a built-in option.

HIGH PRESSURE SWITCH provides additional protection for the heat pump system.

INTERNAL FUSING with single power circuit eliminates extra field wiring.

HEAT PUMP COMPRESSOR is equipped with crankcase heater and is protected with internal overload, high-pressure relief valve and an anti-slug device.

SUCTION ACCUMULATOR protects the compressor from refrigerant flood-back and prevents damage to the compressor bearing surfaces.

EMERGENCY HEAT RELAY permits continuous operation of the system.

HIGH AND LOW SIDE GAUGE PORTS are standard equipment for easier maintenance.

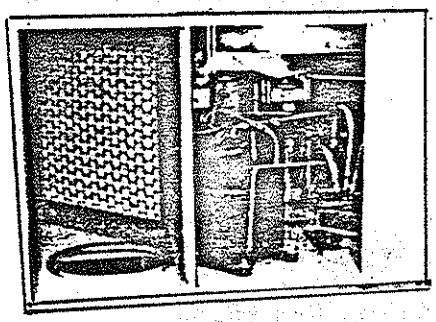
THERMOSTAT - Optional with non-cycling reversing valve or automatic changeover.

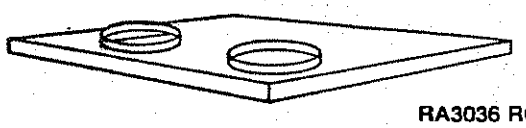
BUILT-IN THROWAWAY FILTER

OPTIONAL FRESH AIR INLET

DEFROST SYSTEM - Positive 30 minute time-temperature with 7 minute time safe override.

COMPRESSOR MALFUNCTION RELAY energizes system warning light located on the indoor thermostat. Standard on all 1-phase.



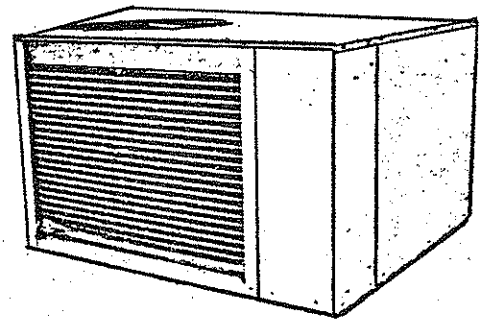


RA3036 ROOF ADAPTER

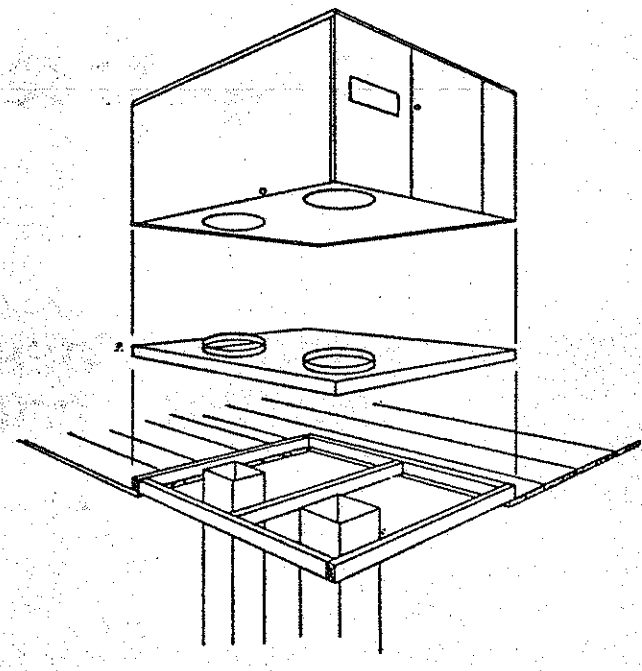
Painted galvannealed steel adapter permits installer to rough-in the duct work at the job site and install the RPM unit later.

COOLING CAPACITIES: 30,000 to 35,000 BTU
HEATING CAPACITIES: 32,000 to 35,500 BTU

230/208-1-60
230/208-3-60
460-3-60



RPM SERIES
PACKAGED ROOF MOUNT UNITS



SYSTEM CAPACITY RATINGS		ARI STANDARD RATINGS								
MODEL	Rated CFM/"H_2O	Cooling 95° F			Heating 47° F			Heating 17° F		
		Btuh	Kw	EER	Btuh	Kw	COP	Btuh	Kw	COP
RPMH30	1100/.5	30500	4.05	7.5	32000	3.45	2.7	16000	2.9	1.6
RPMH30 3-Ph	1100/.5	30500	3.95	7.7	32000	3.35	2.8	16000	2.9	1.6
RPMH36	1275/.22	35000	4.55	7.7	35500	3.75	2.8	18000	3.0	1.8
RPMH36 3-Ph	1275/.22	35000	4.45	7.9	35500	3.7	2.8	18000	3.0	1.8

INDOOR BLOWER PERFORMANCE CFM - Dry Coil With Filter			
E.S.P. Inches H_2O	RPMA30 - RPMH30 RPMA36 - RPMH36		
	High Speed	Medium Speed	Low Speed
.00	1425	1225	1130
.05	1405	1205	1120
.10	1385	1190	1115
.15	1355	1170	1100
.20	1330	1150	1085
.25	1300	1125	1065
.30	1275	1100	1050
.35	1240	1075	1025
.40	1205	1050	1005
.45	1165	1020	* 975
.50	1130	* 995	
.55	1095		
.60	*1060		

*Maximum allowable E.S.P.

MAXIMUM ALLOWABLE AIRFLOW RANGE		RATED CFM
RPMA30-RPMH30	975 Min. to 1210 Max.	1100
RPMA36-RPMH36	975 Min. to 1400 Max.	1275

ELECTRIC HEAT TABLE NO. 2			
MODEL		BTUH 240V	AMP
5Kw	1 Ph	17065	20.8
10Kw	1 Ph	34130	41.7
15Kw	1 Ph	51195	62.5
20Kw	1 Ph	68260	83.4
9Kw	3 Ph	30600	21.7
12Kw	3 Ph	40980	28.9
18Kw	3 Ph	61200	43.4

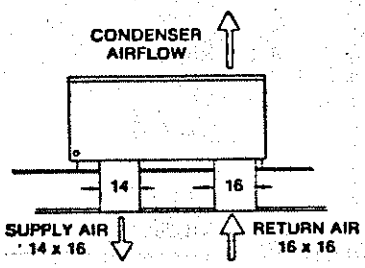
IMPORTANT: The AMP values listed in this Table No. 2 are for electric heating elements only. (Does not include compressor amps.)

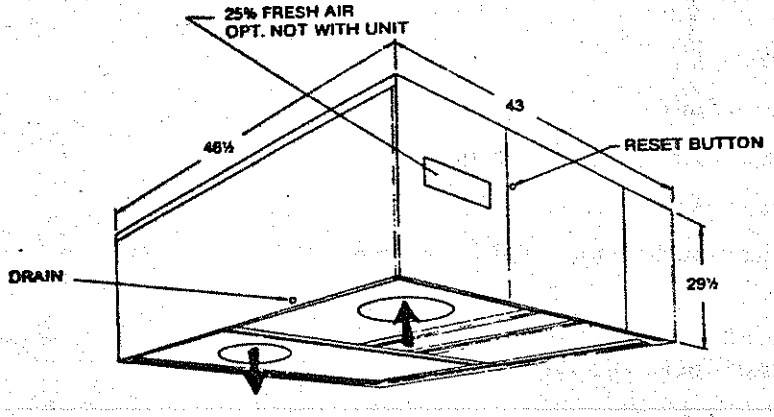
IMPORTANT: The AMP values listed in this Table No. 2 are for electric heating elements only. (Does not include compressor amps.)

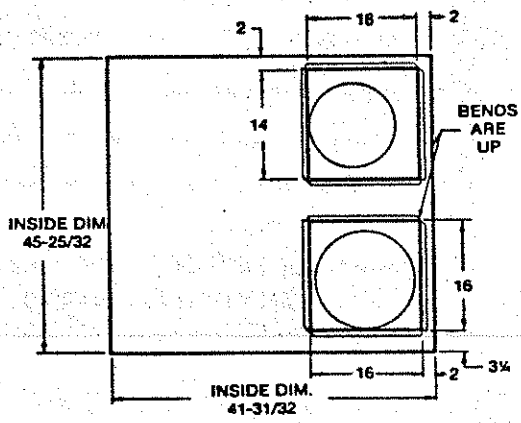
ELECTRIC HEAT TABLE NO. 1				
MODEL	RPMH30	RPMH30 (3)	RPMH36	RPMH36 (3)
Standard KW	*10	9	*10	9
Max Installed KW	*20	18	*20	18

*Internal Fusing Built In.

NOTE: Maximum amount of electric heat which can be operated in conjunction with the compressor during heating mode is 10Kw on 1 phase and 12Kw on 3 phase. The balance of the electric heat can be operated only during compressor cut off or emergency heat mode.







Bottom view
RA3036 ROOF ADAPTER

All Specifications Subject To Change Without Notice

MODEL	Volts-Ph	Heater Kw (1)	Max Unit Amps	No. of Field Power Ckts.	Internal Fuses	Max. External Fuse Size (2)	Minimum Circuit Ampacity	Field Wire Size (4)	Ground Wire Si
RPMH30/0Kw	230/208-1	0	22	1		40	27	10	10
/5Kw		5	42.8	1		60	53	6	8
/10Kw		10	63.6	1	60/30	80 (3)	79	2	8
☐ /15Kw		15	65	1	60/60	90 (3)	81	2	8
☐ /20Kw		20	85.7	1	60/60	110 (3)	107	1	6
RPMH30/0Kw	230/208-3	0	16	1		30	19	12	12
/6Kw		6	30.4	1		45	37	8	8
/9Kw		9	37.7	1		50	46	6	8
/12Kw		12	37.7	1		50	46	6	8
☐ /18Kw		18	45.9	1		60	58	4	8
RPMH30/0Kw	460/3	0	8.1	1		15	15	14	14
/6Kw		6	15.3	1		20	19	12	12
/9Kw		9	18.9	1		25	21	10	10
/12Kw		12	18.9	1		25	21	10	10
☐ /18Kw		18	23	1		30	29	10	10
RPMH36/0Kw	230/208-1	0	24	1		45	29	10	10
/5Kw		5	44.8	1		60	55	6	8
/10Kw		10	65.6	1	60/30	90 (3)	82	2	8
☐ /15Kw		15	65.6	1	60/60	90 (3)	82	2	8
☐ /20Kw		20	85.7	1	60/60	110 (3)	107	1	6
RPMH36/0Kw	230/208-3	0	17	1		30	20	12	12
/6Kw		6	31.4	1		45	38	8	
/9Kw		9	38.7	1		50	48	6	
/12Kw		12	38.7	1		50	48	6	8
☐ /18Kw		18	45.9	1		60	58	4	8
RPMH36/0Kw	460/3	0	9.1	1		15	15	14	14
/6Kw		6	16.3	1		25	20	12	12
/9Kw		9	19.9	1		25	25	10	10
/12Kw		12	19.9	1		25	25	10	10
☐ /18Kw		18	23	1		30	29	10	10

(1) Heater Kw at either 240 or 480V.

(2) Use Dual-Element Time Delay Type fuses.

(3) These models approved for circuit breaker or fuses.

(4) Based upon the use of 60°C copper wire.

(5) Based upon use of copper wire and sized per Table 250-95 of 1978 N.E.C.

☐ Maximum of 10Kw 1-Ph and 12Kw 3-Ph can operate with heat pump. Full Kw operates during emergency heat and/or compressor cut-off.

IMPORTANT

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.

GENERAL

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

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.

UNPACKING THE SELF-CONTAINED UNIT

It is recommended that the unit be unpacked at the installation site to minimize damage due to handling.

1. Cut and remove the metal band from around unit.
2. Remove the carton from the unit.
3. The installation manual is contained in an envelope shipped with the unit. Make sure that it does not get lost.
4. Carefully block up the unit and remove the shipping skid.
5. CAUTION - DO NOT tip the unit on its side. Oil may enter the compressor cylinders and cause starting or operating trouble. If unit has set on its side, restore to upright position and do not run for several hours. Also run intermittently for a few seconds. Do this three or four times with three minutes in between. Observe abnormal compressor noise.

LOCATING THE UNIT

A location on the roof must be chosen that will provide adequate support to the unit, while at the same time allowing clearance for the supply air and return air duct connections to the RA3036 roof adapter—see layout and dimensions on
NOTE: The RA3036 Roof Adapter MUST BE USED to assure a leak-free installation, and the U.L. approval is contingent upon the use of this mating adapter.

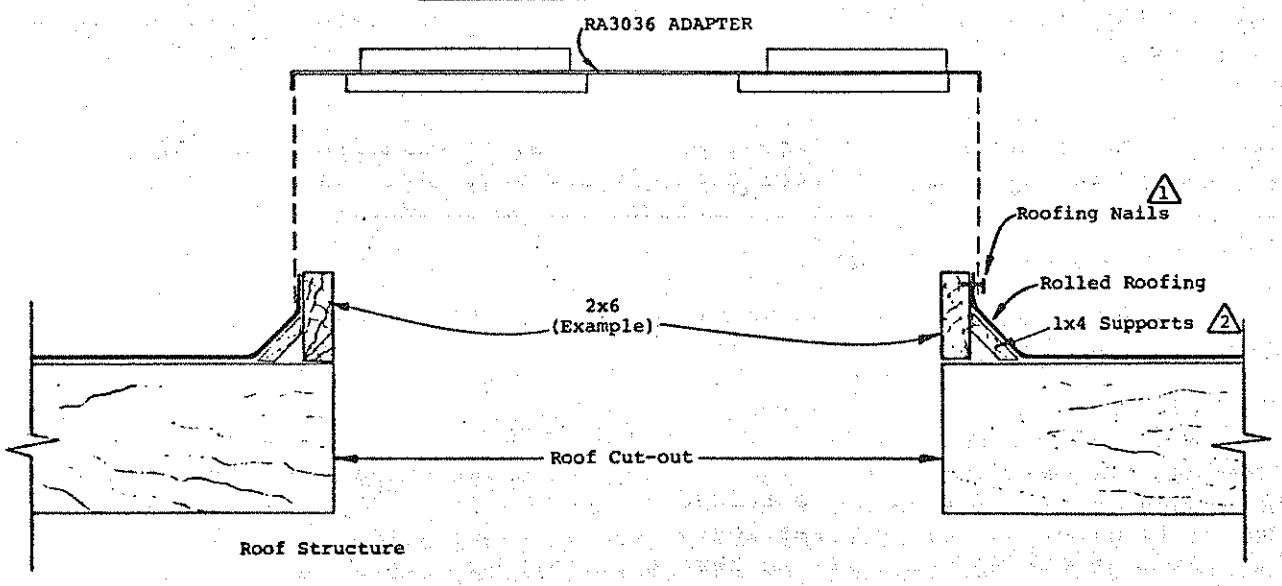
ROOF CURB FABRICATION

The roof curb (extension section between actual roof and RA3036 roof adapter) could be fabricated from either sheet steel or nominal dimensional lumber. In either case, the O.D. dimension of the extension section must be sized to fit the RA3036 adapter dimensions as shown on page

All corners, seams, or joints must be sealed to assure a leak-free installation. The height of the curb section is determined by installation requirements such as degree slope of roof, direction that the outdoor (exposed) coil faces, and geographic location. The unit MUST SET LEVEL when installed, and should be high enough to provide proper defrost drainage from outdoor coil during heating cycle.

A suggested design for a wood frame type construction is shown below:

TYPICAL CONSTRUCTION FOR DIMENSIONAL LUMBER EXTENSION CONSTRUCTION



1 Nail 3/4" from top.

2 Provides support to roofing material, prevents sharp bends and cracking.

CONDENSATE AND DEFROST DRAINAGE

A 3/4" FPT coupling is provided to connect a condensate drain line to, and is located on side opposite outdoor coil. See illustration on page

An optional accessory outdoor coil drain pan, DP3036, is available to collect normal condensate run-off and defrost cycle condensate in applications where it may not be desirable to drain on to mounting surface, or may not be permitted by local codes.

There is a space beneath the outdoor coil for the DP3036 to slide in without unit modification, and the DP3036 is also supplied with a 3/4" FPT coupling for drain line connection.

AIR FILTER

A 24"x24"x1" disposable fiberglass type filter is located inside the unit for air filtration of both return air from structure and for optional fresh air intake (see below).

Access to the filter is by removing the corner panel where either the fresh air blank off panel or fresh air intake hood is located.

OPTIONAL FRESH AIR INTAKE

The optional fresh air intake cover is a manual damper operated device to allow intake of fresh air whenever the indoor blower is operating. The damper position can be manually set and locked in position with a wing nut. It is held in place by two screws and has a hardware cloth screen to prevent entry of birds or rodents.

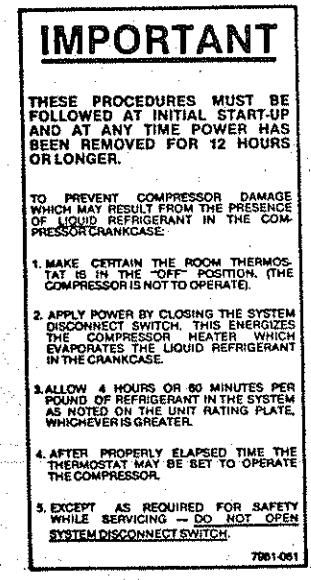
PRESSURE SERVICE PORTS

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

CRANKCASE HEATERS

An immersion type solid state crankcase heater is built into the bottom of each compressor. It is a self-regulating type design that draws only enough power to maintain the compressor at correct temperature to prevent liquid refrigerant from migrating to the compressor, which causes possible valve damage and/or oil pump out.

The following decal is affixed to all units detailing startup procedure. This is very important. Please read carefully.



IMPORTANT

THESE PROCEDURES MUST BE FOLLOWED AT INITIAL START-UP AND AT ANY TIME POWER HAS BEEN REMOVED FOR 12 HOURS OR LONGER.

TO PREVENT COMPRESSOR DAMAGE WHICH MAY RESULT FROM THE PRESENCE OF LIQUID REFRIGERANT IN THE COMPRESSOR CRANKCASE:

1. MAKE CERTAIN THE ROOM THERMOSTAT IS IN THE "OFF" POSITION. (THE COMPRESSOR IS NOT TO OPERATE).
2. APPLY POWER BY CLOSING THE SYSTEM DISCONNECT SWITCH. THIS ENERGIZES THE COMPRESSOR HEATER WHICH EVAPORATES THE LIQUID REFRIGERANT IN THE CRANKCASE.
3. ALLOW 4 HOURS OR 60 MINUTES PER POUND OF REFRIGERANT IN THE SYSTEM AS NOTED ON THE UNIT RATING PLATE, WHICHEVER IS GREATER.
4. AFTER PROPERLY ELAPSED TIME THE THERMOSTAT MAY BE SET TO OPERATE THE COMPRESSOR.
5. EXCEPT AS REQUIRED FOR SAFETY WHILE SERVICING — DO NOT OPEN SYSTEM DISCONNECT SWITCH.

7981-061

WALL THERMOSTAT AND SUB-BASE COMBINATIONS

Group	Thermostat	Subbase	Predominant Feature
A	8403-012 (T872R1164)	8404-007 (Q672L1185)	Heat or Cool - No Auto (1)
B	8403-015 (T872N1036	8404-008 (Q672F1299)	Automatic Heat-Cool Changeover Position (2)

(1) No automatic changeover position—must manually place in heat or cool. Reversing valve remains energized at all times system switch is in heat position (except during defrost cycle). No pressure equalization noise when thermostat is satisfied on either heating or cooling.

(2) Allows thermostat to control both heating and cooling operation when set in "auto" position. Reversing valve de-energizes at end of each "on" heating cycle.

IMPORTANT NOTE: Both thermostat and sub-base combinations shown above incorporate the following features: Man-auto fan switch, Off-Heat-Cool-Em. Ht. Switch, and two (2) indicator lamps—one for Em. Ht. and one for compressor malfunction.

THERMOSTAT INDICATOR LAMPS

The red lamp marked "Em. Ht." comes on and stays on whenever the system switch is placed in the Em. Ht. position. The green lamp marked "check" will come on if there is any problem that prevents the compressor from running when it is supposed to be.

EMERGENCY HEAT POSITION

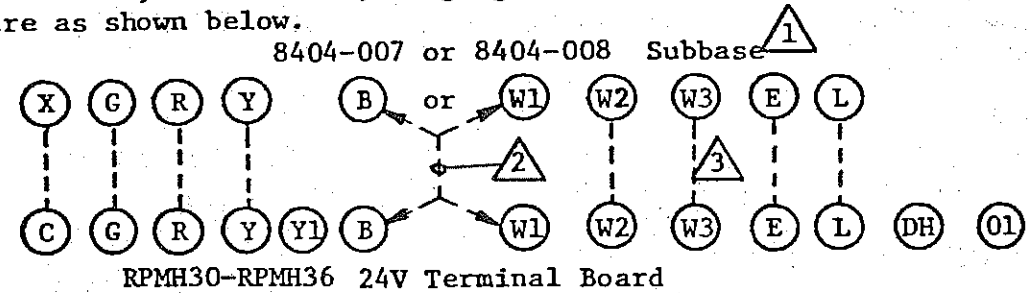
The operator of the equipment must manually place the system switch in this position. This is done when there is a known problem with the outdoor section, or when the green "check" lamp comes on indicating a problem.

COMPRESSOR MALFUNCTION RELAY

Actuation of the green "check" lamp is accomplished by a voltage type relay which is factory installed. Any conditon such as loss of charge, defective capacitor, defective contactor, etc., that will prevent compressor from operating will cause green lamp to activate. This is a signal to the operator of the equipment to place system in emergency heat position.

24V WIRING - CONTROL CIRCUIT

Nine (9) wires should be run from thermostat subbase to 24V terminal board in unit. A nine conductor, color-coded, 18 gauge thermostat cable is recommended. The connection points are as shown below.



RPMH30-RPMH36 24V Terminal Board

(1) See description above for selection of thermostat/subbase combination.

(2) "B" terminals only are used for Group A 8403-012 Stat and 8404-007 Subbase. "W1" terminals only are used for Group B 8403-015 Stat and 8404-008 Subbase.

(3) W3 connections required only on 15 and 20Kw models.

IMPORTANT NOTE: Only the thermostat and subbase combinations as shown above will work with this equipment. The stat and subbase must be matched, and correct operation can be assured only by proper selection and application of these parts.

SEQUENCE OF OPERATION

Cooling - Circuit R-Y makes at thermostat pulling in compressor contactor, starting the compressor and outdoor motor. The G (indoor motor) circuit is automatically completed on any call for cooling operation, or can be energized by manual fan switch on subbase for constant air circulation.

Heating - A 24V solenoid coil on reversing valve controls heating cycle operation. Two thermostat options, one allowing "Auto" changeover from cycle to cycle and the other constantly energizing solenoid coil during heating season and thus eliminating pressure equalization noise except during defrost, are to be used. On "Auto" option, a circuit is completed from R-W1 and R-Y on each heating "on" cycle, energizing reversing valve solenoid and pulling in compressor contactor, starting compressor and outdoor motor. R-G also make starting indoor blower motor. Heat pump heating cycle now in operation. The second option has no "Auto" changeover position, but instead energizes the reversing valve solenoid constantly whenever the system switch on subbase is placed in "Heat" position, the "B" terminal being constantly energized from R. A thermostat demand for heat completes R-Y circuit, pulling in compressor contactor, starting compressor and outdoor motor. R-G also make, starting indoor blower motor.

DEFROST CYCLE

The defrost cycle is controlled by time and temperature. The 240V timer motor runs all the time the compressor is in operation. Then 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 contacts 3-4 and defrost relay contacts 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 fibre 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.

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.

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.

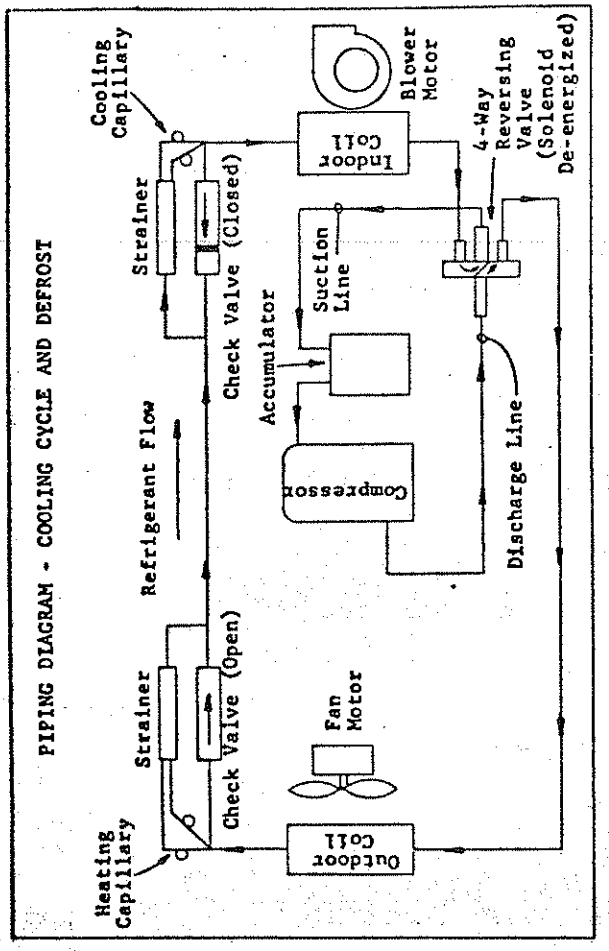
2. Switching to heating cycle at 75°F or higher outside temperature may cause a nuisance trip of the manual reset high pressure switch.

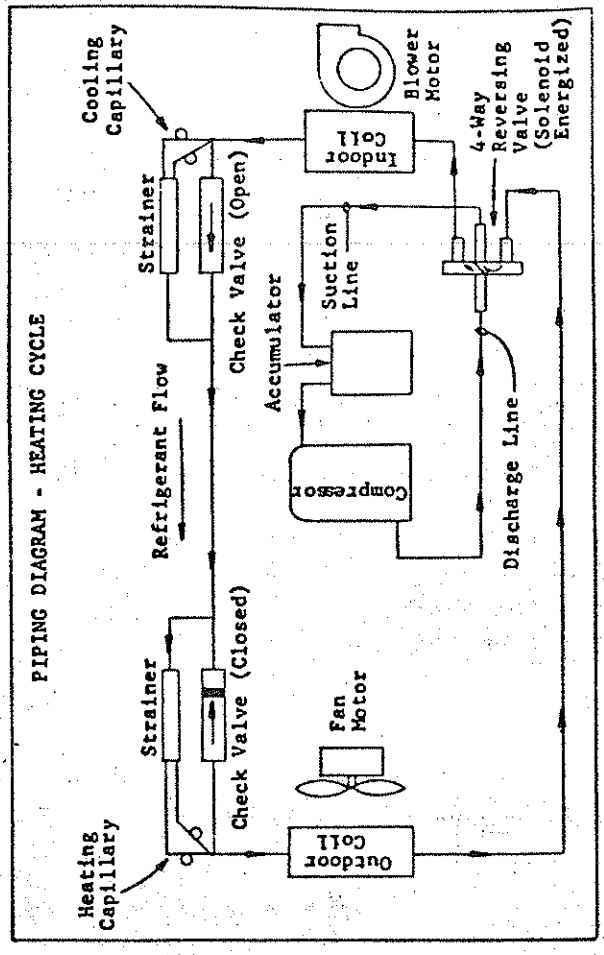
3. The heat pump wall thermostats perform multiple functions. Be sure that all function switches are correctly set for the desired operating mode before trying to diagnose any reported service problems.

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

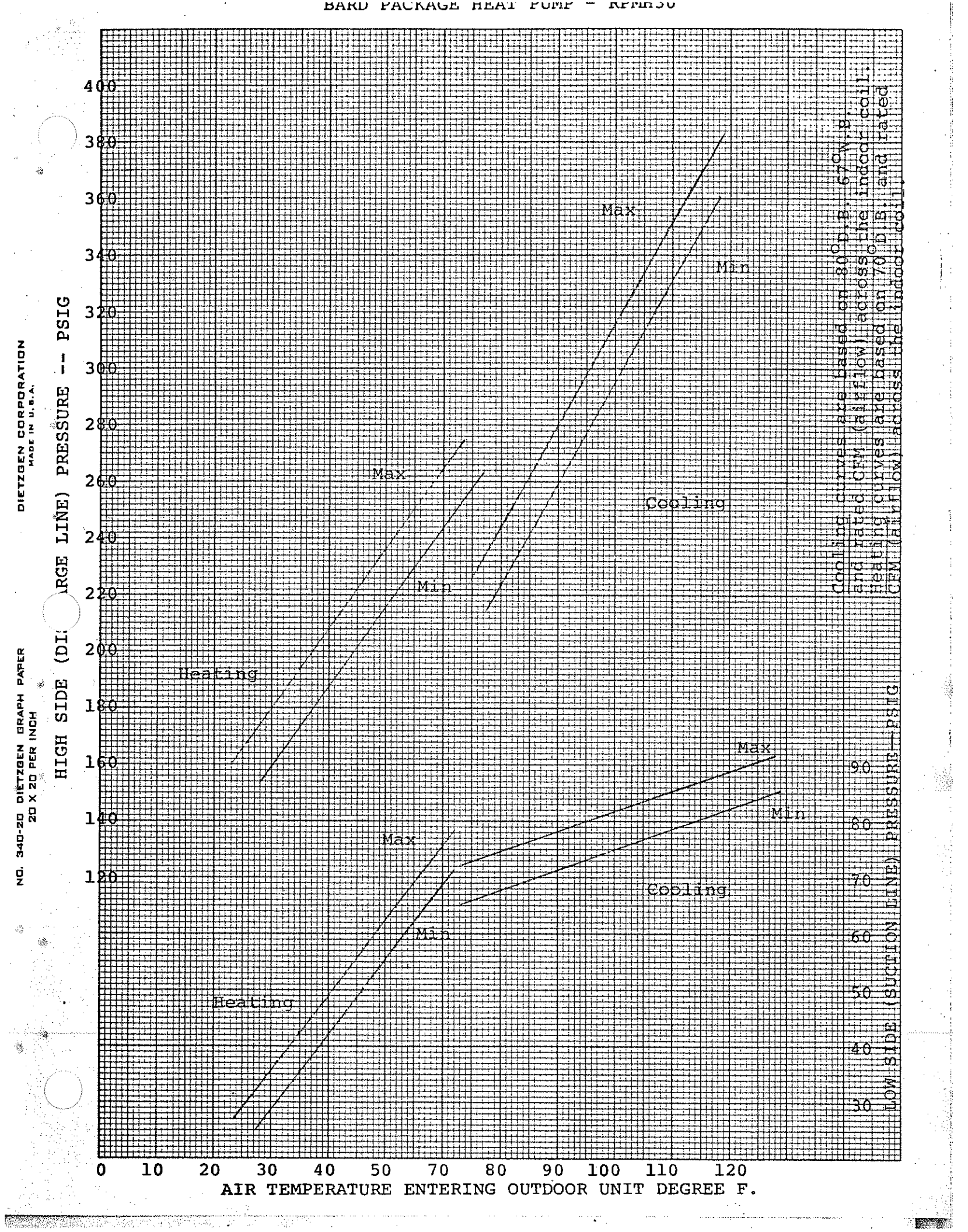
5. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

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





BARD PACKAGE HEAT PUMP - RPHA30



BARD PACKAGE HEAT PUMP - RPMH36