

MANUAL 2100-037

INSTALLATION INSTRUCTIONS



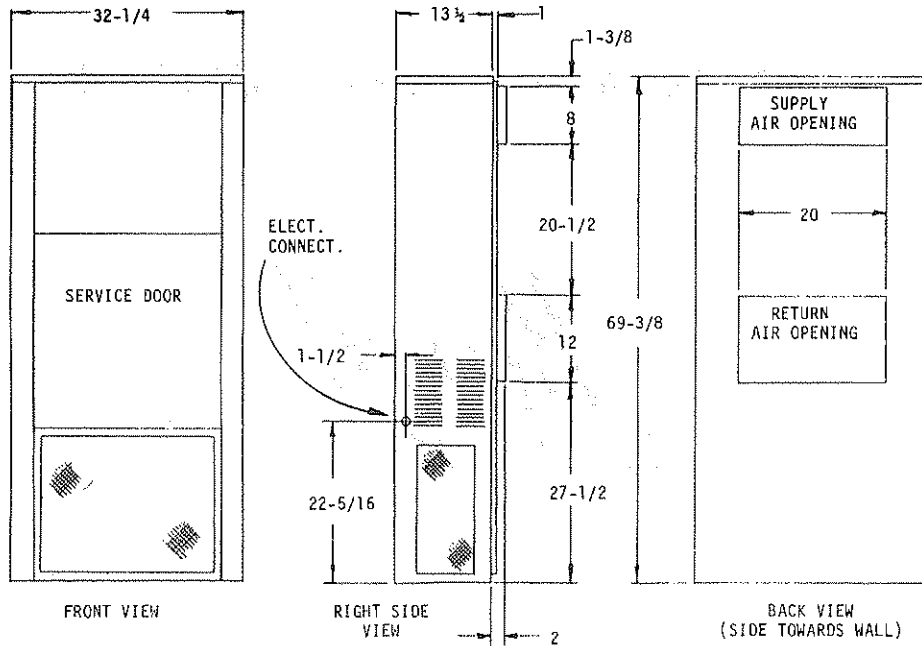
WALL MOUNTED PACKAGE HEAT PUMPS

MODELS

18WH2

24WH2

BARD MANUFACTURING COMPANY
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ELECTRICAL INFORMATION							WIRING INFORMATION**			
Model	Rated Volts & Ph	Operating Voltage Range	Heater Kw*	Max Unit Amps	No. Field Power Circuits	Req'd. Ext. Fuses Ckt.A /Ckt.B	Min. Ckt. Ampacity Ckt.A /Ckt.B	Field Power Wiring Ckt.A /Ckt.B	Ground Wire Size Ckt.A /Ckt.B	Wiring Diagram Number
18WH2	230/208-1	197-253	0	11.8	1	20	15	14	14	4011-110E -120C -130C
			4	28.5	1	35	35	8	10	
			8	45.1		35 / 25	35 / 21	6 / 10	10 / 10	
24WH2	230/208-1	197-253	0	16.3	1	30	20	12	12	4011-110E -120C -130C
			4	33	1	45	40	8	10	
			8	49.6		45 / 25	40 / 21	6 / 10	10 / 10	

*Electric heaters are nominal Kw @ 240V.

**Based on using 60°C copper wire. Other wiring materials must be rated for marked minimum circuit ampacity or greater. Not all models approved for aluminum wire.

APPLICATION AND INSTALLATION INSTRUCTIONS

GENERAL

Units are shipped completely assembled and internally wired, requiring only duct connections, thermostat wiring and external 220-240 volt AC power supply. The refrigerant system is completely assembled and charged.

These instructions and any instructions packaged with any separate equipment should be carefully read before beginning the installation. Note particularly 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.

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.

INSTALLATION

Size of unit for a proposed installation should be based on heat loss calculation made according to methods of National Warm Air Heating and Air Conditioning Association. The air duct should be installed in accordance with the Standards of the National Fire Protection Association for the Installation of Air Conditioning and Ventilating Systems of Other Than Residence Type, NFPA No. 90A, and Residence Type Warm Air Heating and Air Conditioning Systems, NFPA No. 90B. Where local regulations are at a variance with instructions, installer should adhere to local codes.

DUCTWORK

Design the ductwork according to methods given by the National Warm Air Heating and Air Conditioning Association. When duct runs through unheated spaces, it should be insulated with a minimum of two inches of insulation. Use insulation with a vapor barrier on the outside of the insulation. Flexible joints should be used to connect the ductwork to the equipment in order to keep the noise transmission to a minimum.

A one inch clearance to combustible material for the first three feet of duct attached to the outlet air frame is required. See page 4 for further details.

FILTER

A 1" throwaway filter is supplied with each unit. The filter slides into position making it easy to service. This filter can be serviced from the outside by removing the service door.

FRESH AIR INTAKE

All units are built with a fresh air inlet hole punched in the service panel. The fresh air damper assembly is shipped with each unit, and must be attached at the installation site. See Fig. 3 on page 8 for typical installation procedure.

The fresh air damper assembly is standard equipment with the unit because of the variety of state or local codes requiring fresh air capability.

All capacity, efficiency and cost of operation information as required for Department of Energy "Energyguide" Fact Sheets is based upon the fresh air blank off plate in place and is recommended for maximum energy efficiency.

The blank off plate is available upon request from the factory and is installed in place of the fresh air damper shipped with each unit.

WALL MOUNTING

1. Two holes, the size of the supply and return air openings must be cut through the wall as shown in Fig. 1 and 2 on page 6.
2. On wood-frame walls, the wall construction must be strong and rigid enough to carry the weight of the unit without transmitting any unit vibration.
3. Concrete block walls must be thoroughly inspected to insure that they are capable of carrying the weight of the installing unit.
4. Ducts through the walls must be insulated and all joints taped or sealed to prevent air or moisture entering the wall cavity.
5. Some installations may not require any return air duct. It is recommended that on this type of installation, a filter grille be located in the wall. Filters must be of sufficient size to allow a maximum velocity of 400 FPM.

WIRING - MAIN POWER

Refer to the unit rating plate for wiring size 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 1 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.

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.

CONDENSATE DRAIN

A plastic drain hose extends from the drain pan at the top of the unit down to the unit base. There are openings in the unit base for the drain hose to pass through. In the event the drain hose is connected to a drain system of some type, it must be an open or vented type system to assure proper drainage.

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. 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 contacts 3-5 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 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.

CRANKCASE HEATERS

All units are provided with some form of compressor crankcase heat. The 18WH2 and 24WH2 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 prevent liquid refrigerant migration.

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.

The following decal is affixed to all outdoor sections detailing start-up 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.

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COMPRESSOR CUT-OFF THERMOSTAT AND OUTDOOR THERMOSTATS

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 designated 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.

Outdoor thermostats are available to hold off various banks of electric heat until needed as determined by outdoor temperature.

Wall Mounted Heat Pumps (WH) - If mounted in lower coil area beneath compressor compartment (on fan shroud, for example), leave capillary coiled at thermostat. If mounted in compressor compartment, extend capillary down into lower coil compartment.

NOTE: In all cases, make sure the capillary DOES NOT contact any electrical connections or any refrigeration tubing.

NOTE: Use Part No. 8408-005 for compressor cut-off and set at 0°F.

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 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.

WALL THERMOSTAT AND SUBBASE COMBINATIONS

Group	Thermostat	Subbase	Predominant Feature
A	8403-012 (T872R1164)	8404-007 (Q672L1185)	Heat or Cool ¹ No Auto
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. Heat Switch, and two (2) indicator lamps—one for Emergency Heat 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

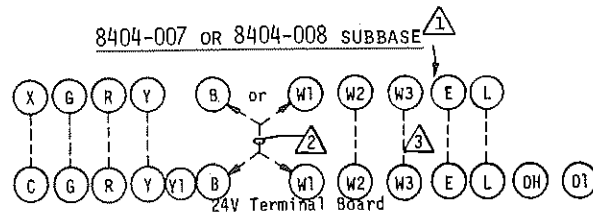
The operator of the equipment must manually place the system switch in this position. This is done when there is a known problem with the outdoor section, or when the green "check" lamp comes on indicating a problem.

COMPRESSOR MALFUNCTION RELAY

Actuation of the green "check" lamp is accomplished by a voltage type relay which is factory installed. Any condition 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

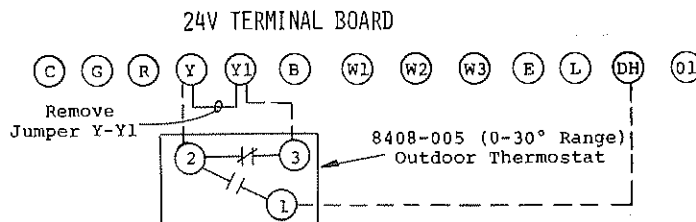
Nine (9) wires should be run from thermostat subbase to 24V terminal board in unit. A nine conductor, color-coded, 18 gauge thermostat cable is recommended. The connection points are as shown below.



- 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.

COMPRESSOR CUT-OFF WIRING



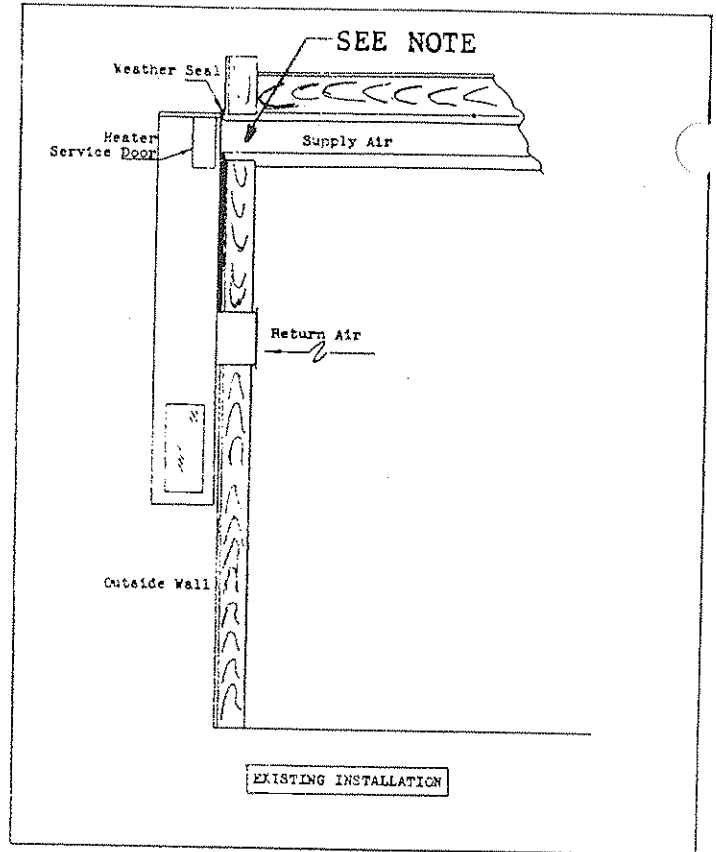
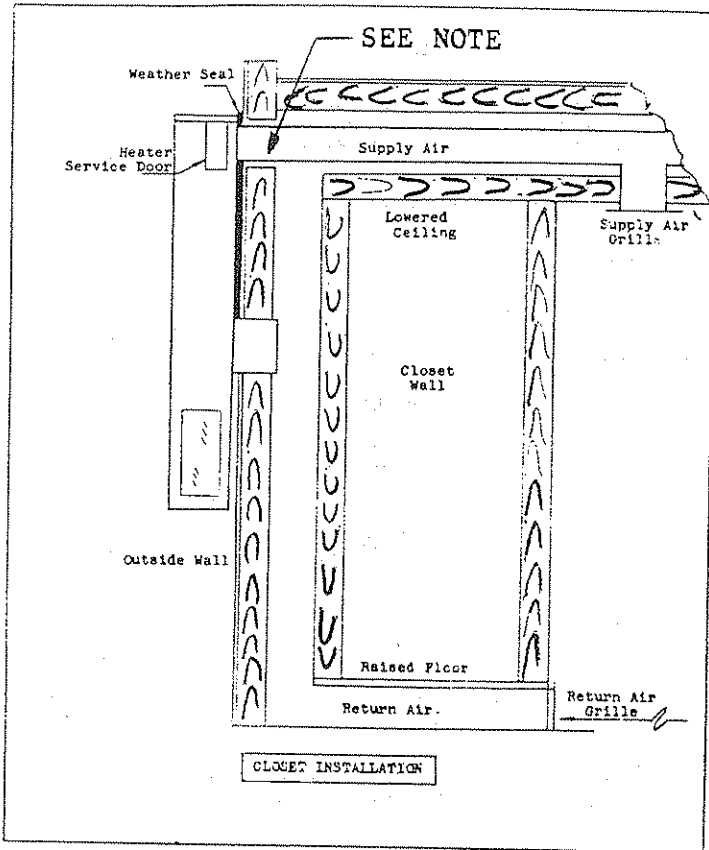
NOTE: All other 24V wiring remains as shown above.

REFRIGERANT CHARGE

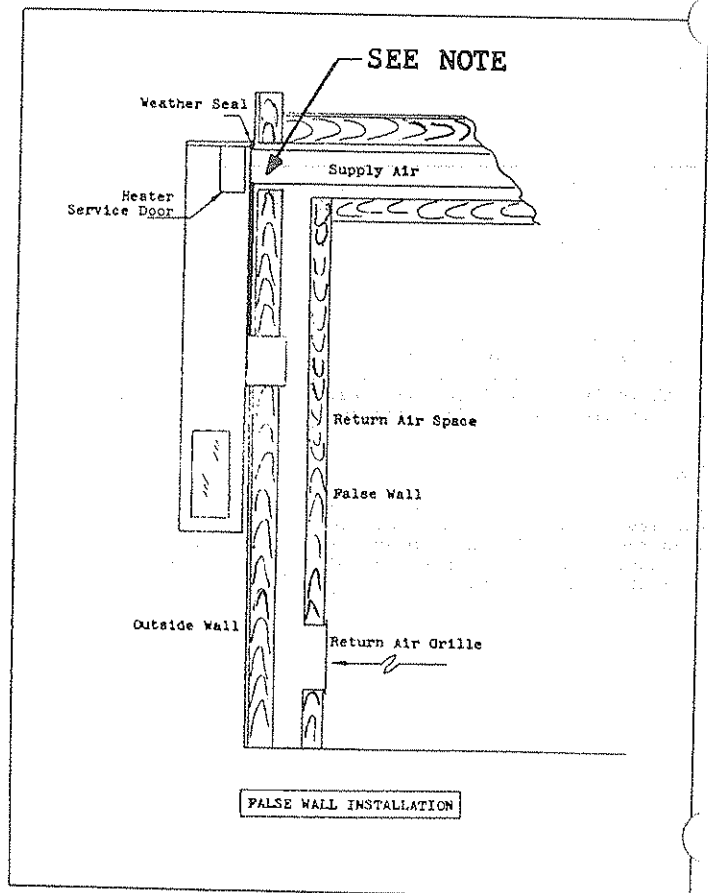
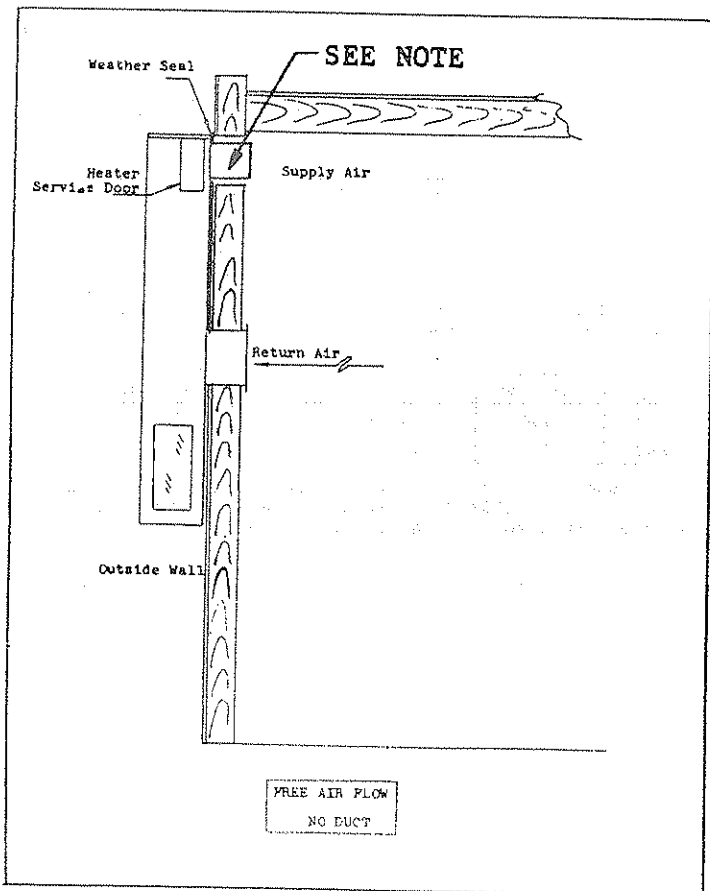
The correct system R-22 charge is shown on the unit rating plate. Optimum unit performance will occur with a refrigerant charge resulting in a suction line temperature (6" from compressor) as shown in the following table:

Model	Rated Airflow	95°F OD Temp.	82°F OD Temp.
18WH2	650	54-56	66-68
24WH2	825	63-66	71-73

The above suction line temperatures are based upon 80°F dry bulb/67°F wet bulb (50% R.H.) temperature and rated airflow across the evaporator during cooling cycle.



NOTE: 1" clearance to combustable materials required for first 3 feet of supply air duct system.



Models 18WH2 & 24WH2

MOUNTING ON WOOD FRAME WALLS

Locate and cut out two openings as shown in (Fig. 2). Cut away the outside siding to the depth of the sheathing. Install metal weather stripping at the top and caulk or otherwise seal joints between siding and sheathing. Frame in the openings between the wall studs as necessary for the particular wall involved with the plates at the bottom of each wall opening being sufficiently strong to carry the weight of the unit.

Install the two side brackets to the unit (15 in. down from the top). Mount unit on wall and pull in firmly using three 3/8 in. lag screws through each of the wall mounting brackets.

For additional mounting rigidity, each air opening collar may be screwed to the plate at the bottom of each wall opening. Drill two 1/4 in. holes in the bottom flange of each collar before hanging the unit, then fasten to wall plate with No. 10 by 1-1/2 in. wood screws.

OUTSIDE FRAME WALL SCHEMATIC

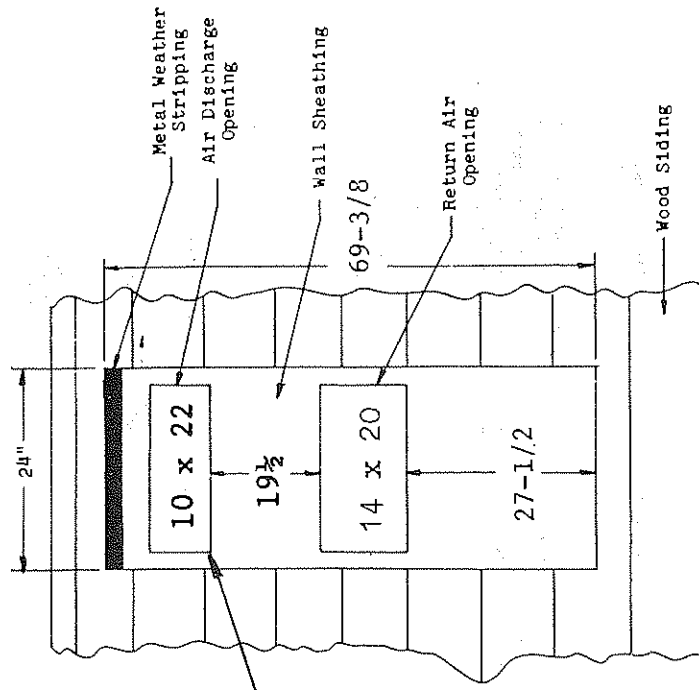


Fig. 2

Allows 1" clearance from supply air duct to combustible materials.

Models 18WH2 & 24WH2

MOUNTING ON CONCRETE BLOCK WALL

These units are secured by wall mounting brackets which secure the unit to the outside wall surface at both sides and at the bottom. (Fig. 1).

In a standard 8 x 16 in. block wall, saw or knock out two 22 inch sections of concrete blocks normally the 7th, 8th and 11th course of blocks above floor level. In both cases this should be one whole block plus 3 in. of the block on each side.

On the wall, lay out approximately the position for the bottom and side brackets. Fasten these brackets to the wall firmly with 3/8 in. lag screws.

The side brackets should be located approximately 15 in. down from the top of the unit and fastened to both sides with metal screws. After mounting the unit on the wall a metal weather stripping should be installed at the top to insure a water tight application.

INSTALLATION SCHEMATIC

CONCRETE BLOCK WALL

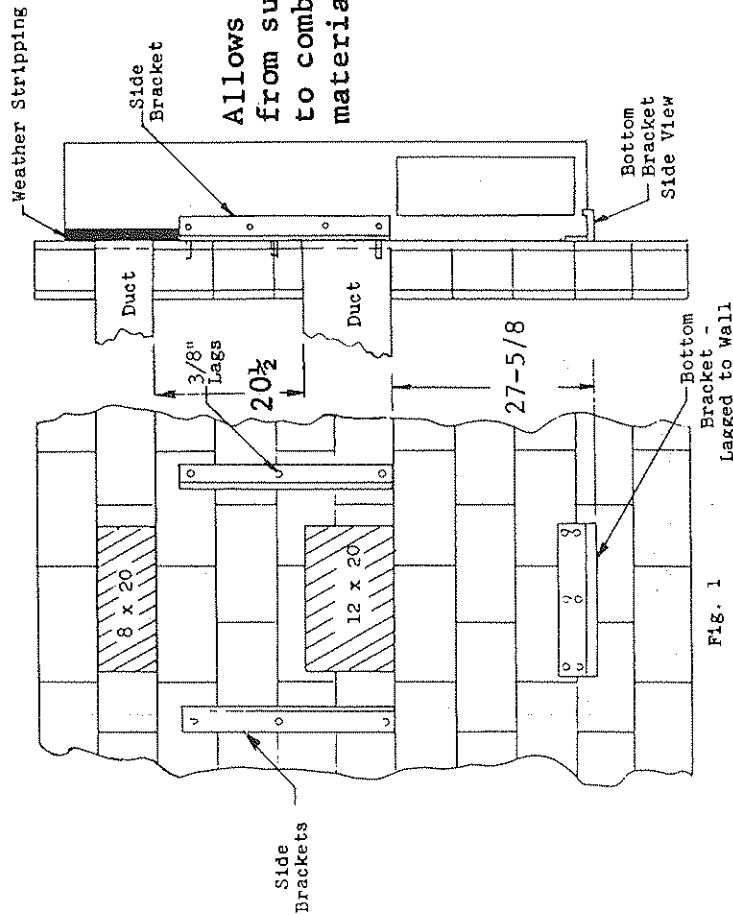
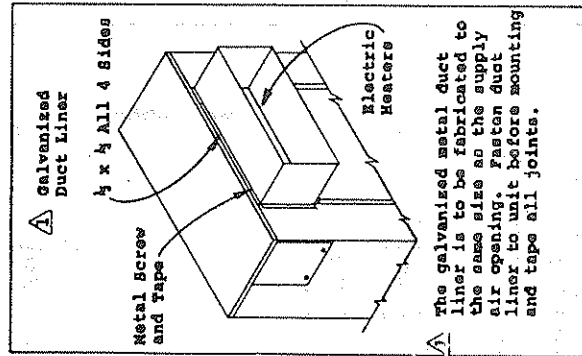
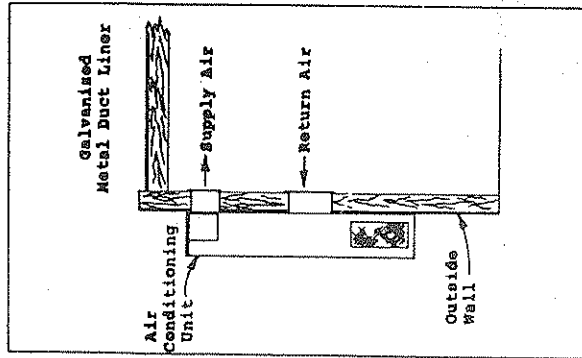


Fig. 1

**SUPPLY AIR METAL DUCT LINER
MODELS WA AND WH**

The cabinets on all models, with or without electric heaters, are approved for 0" clearance to combustible material. The outlet duct on all models with electric heaters must have 1" clearance to combustible materials for at least the first 3 feet of duct.

Whenever a model WA or WH is installed, a galvanized metal duct liner must always be attached (Fig.). Before installing, determine the wall thickness. If the installation is free air flow, with no external duct, then the liner should be cut flush with the inside wall opening. In order to insure no sweating, the duct liner should be wrapped with a minimum of 1" insulation.



**COOLING AND HEATING ANTICIPATION
FOR WALL THERMOSTATS**

All 24V wall thermostats are built with both cooling and heating anticipators. The purpose of these anticipators is to compensate the thermostat for various system controls and allow the best possible cycle rates.

The cooling anticipator for all thermostats, and the heating anticipator on a limited number, are fixed and require no adjustment. Most heating anticipators are adjustable and DO REQUIRE ADJUSTMENT to match the current rating of the relay, contactor or other control being cycled by that heating stage. In the case of a two stage heating thermostat there will be an anticipator for each stage, either both adjustable, one fixed and one adjustable, or both fixed.

The fixed anticipators are rated for a maximum of 1.5A. The adjustable anticipators generally have a range of .2 - 1.2A, and MUST BE ADJUSTED. Failure to adjust the anticipator lever to correspond to the actual current draw passing through that stage mercury switch and anticipator will cause severe short cycling conditions if set too low and room temperature may never attain the thermostat set point, and if set too high, will cause room temperature over-shoot.

While oil burner primary controls and gas valves are normally marked with the nominal current rating, the contactors and relays installed in air conditioners and heat pumps are not. Listed below are some of the more popularly used controls and their nominal current ratings.

Contactors or Relays	Nominal Current Rating
Honeywell - R850B Series	.55
- R8210 Series	.40
- R8212 Series	.40
- R8217 Series	.40
- R8227 Series	.38
- R8276 Series	.38
- R8243 Series	.38
- R8245 Series	.38
RBH	
- Type 84	.12
- Type 91	.34
- Type 112	.34
- Type 143	.34
- Type 154	.76
- Type 184	.12
Elmwood	
- 30B020	.39
- 30C020	.39
- 30C020	.21
- 30F020	.21
- 30D030	.21
- 30E030	.21

Below is a procedure which allows accurate low amperage current measurements with a standard clamp-on ammeter with a 0-6A range. It is actually recommended that this measurement always be taken, since variations in voltage, thermostat wire length, etc. can all cause some change in current draw.

1. Wrap exactly 10 loops of thermostat wire (W1) around the prongs of an amprobe.
2. Let the heating system operate for one minute before reading the W1 or W2 current draw.
3. Divide the reading obtained in Step 2 by 10.
4. Use the value calculated in step 3 to set the heat anticipator.
5. Repeat the procedure for (W2) if 2-stage heat.



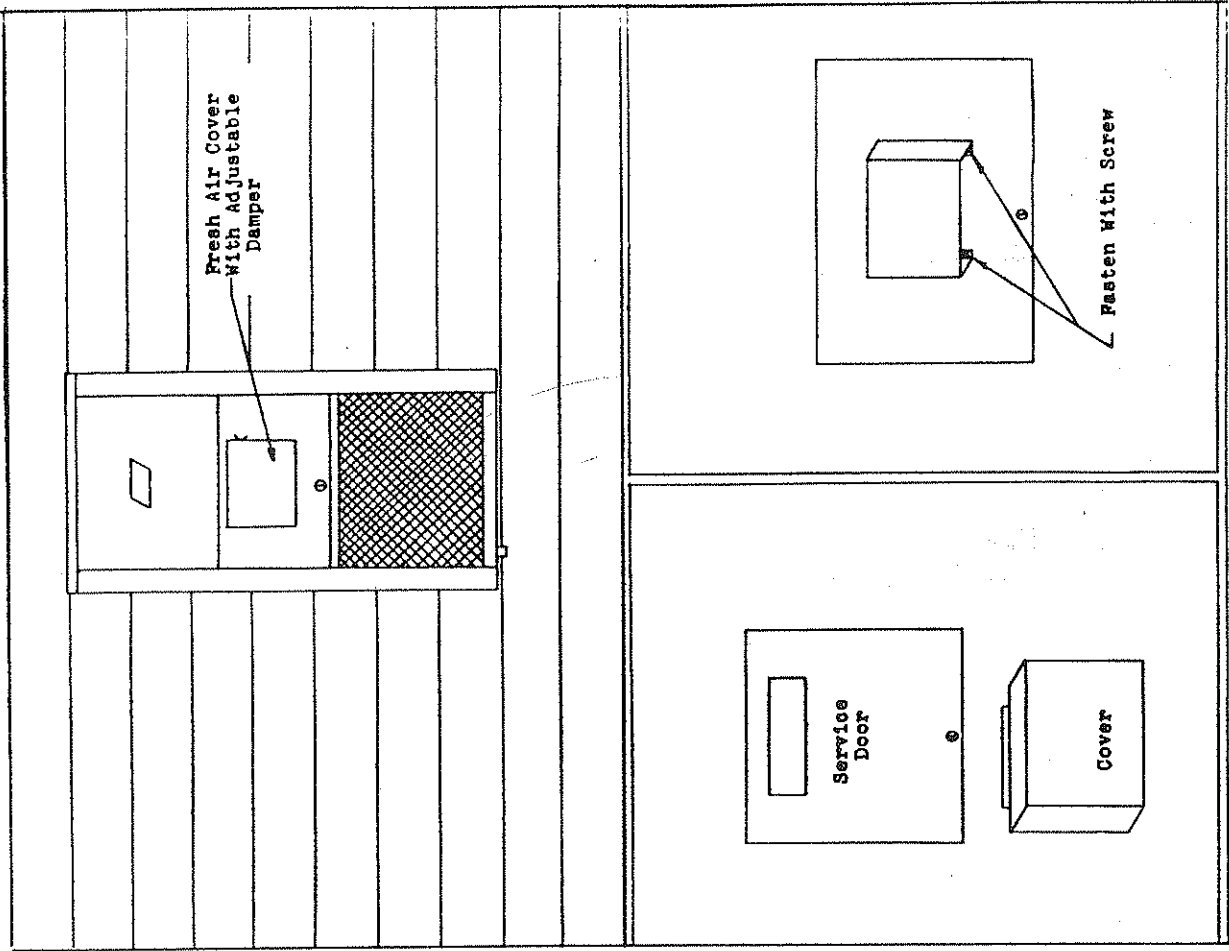
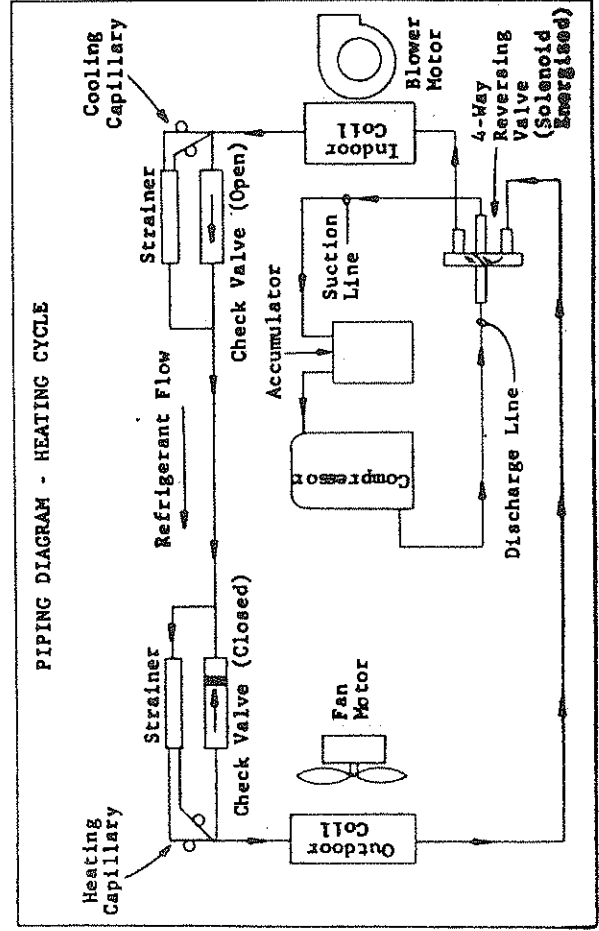
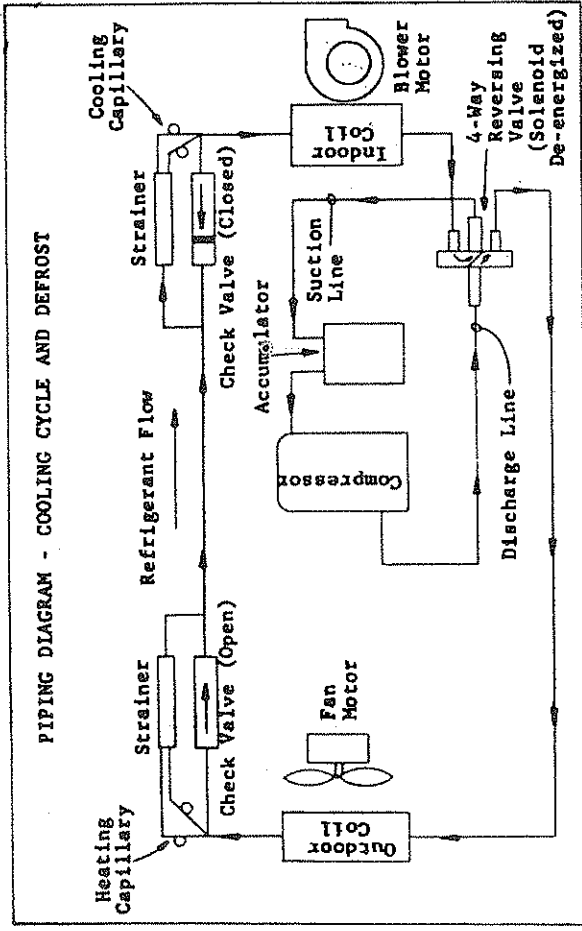
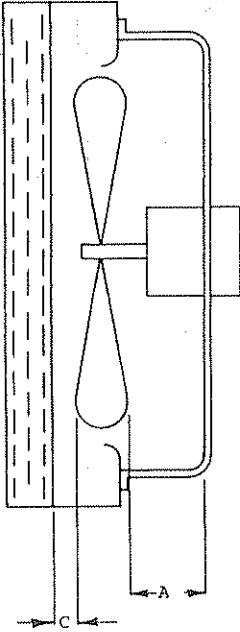


Fig. 3

FAN BLADE SETTING DIMENSIONS

Shown in the drawing below are the correct fan blade setting dimensions for proper air delivery across the outdoor coil.

Any service work requiring removal or adjustment in the fan and/or motor area will require that the dimensions below be checked and blade adjusted in or out on the motor shaft accordingly.



MODEL	DIM. A	DIM C
18WH2	3/4"	1-5/8"
24WH2	1-1/4"	3/4"

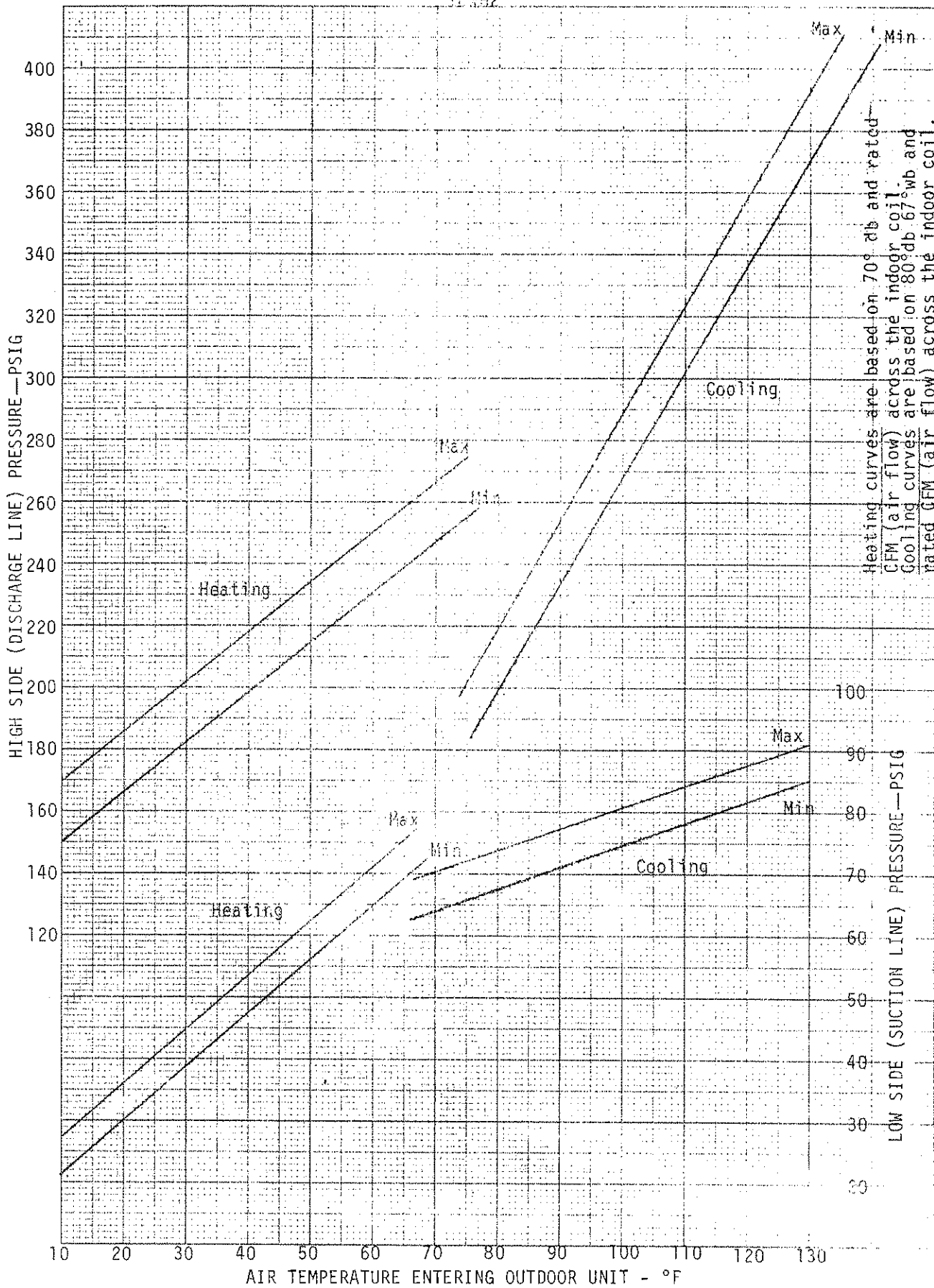
FAN BLADE REMOVAL

To facilitate removal of the fan blade for replacement or inspection, it is easiest to remove the air inlet grille on the right side (located under the electrical connections to the cabinet), and then to remove the three screws securing the fan enclosure to the coil and the three screws securing the fan enclosure to the unit base. The three screws at the opposite end that secure the fan enclosure to the coil remain in place. The fan enclosure can then be swung back towards the rear of the unit, gaining enough clearance for the fan blade to be extruded from the unit.

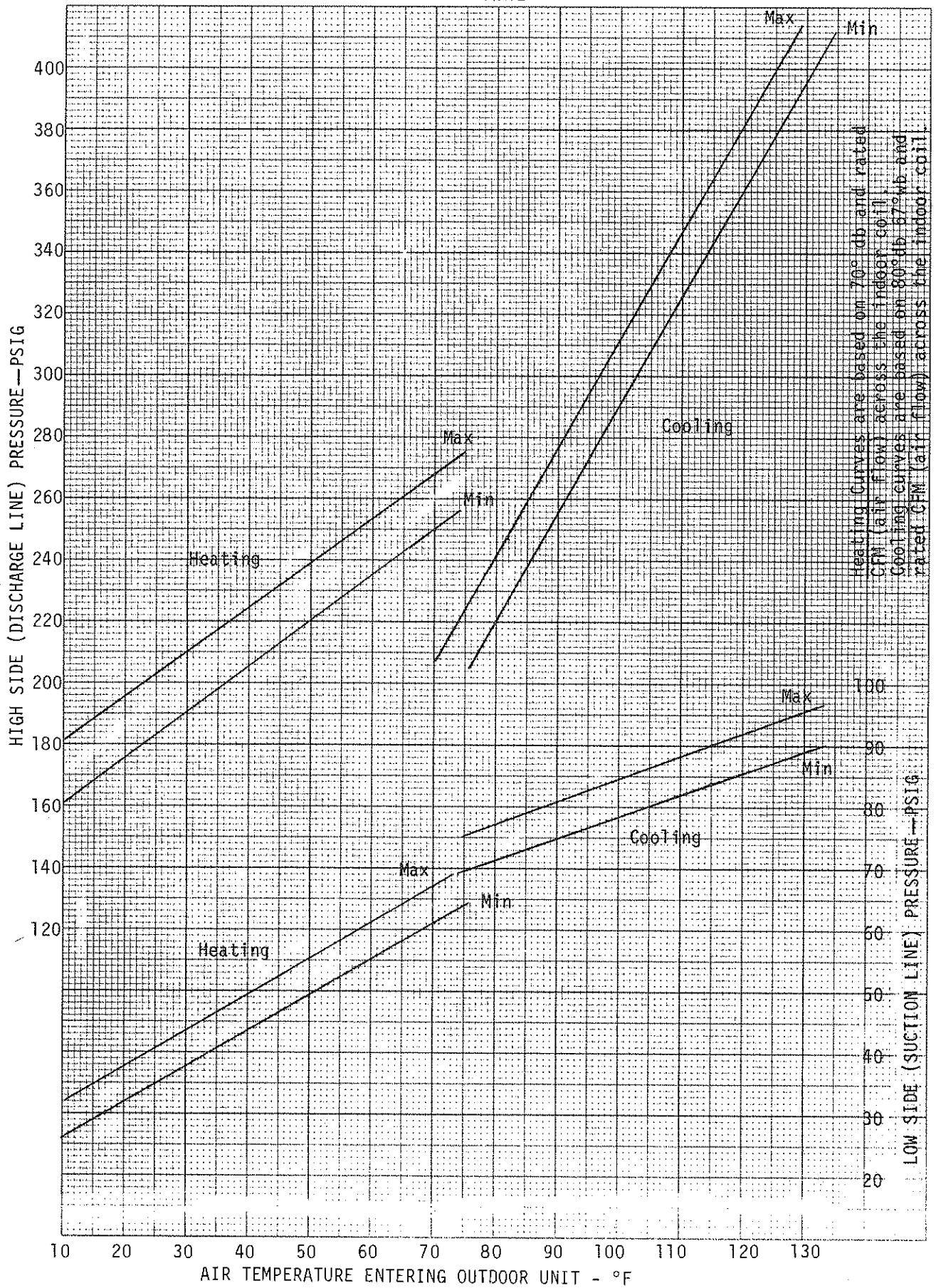
Reverse the above procedure to put the unit back into an operating condition. Be sure to adjust the fan blade to the correct setting as shown under "Fan Blade Setting Dimensions" before locking down the set screws on to the flats of the motor shaft.

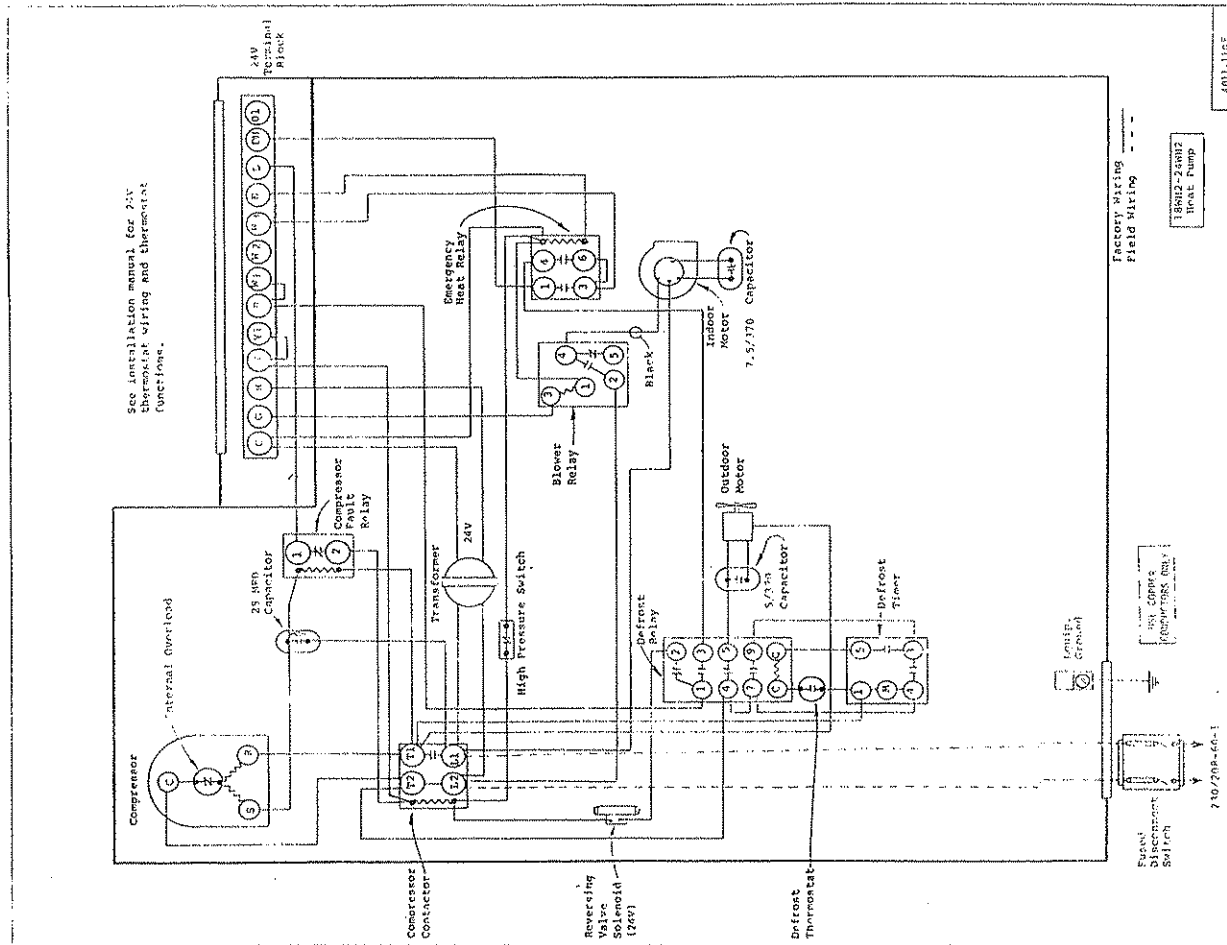
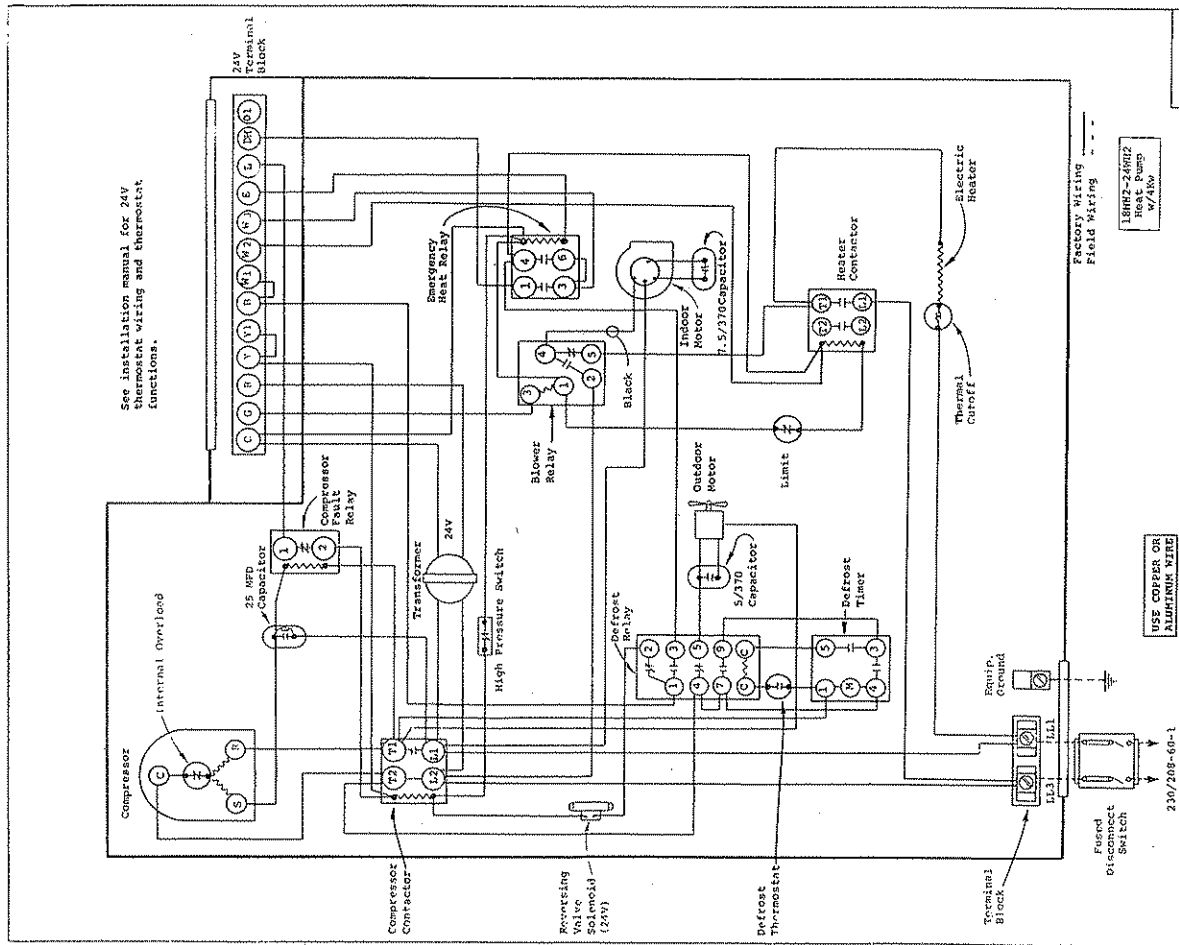
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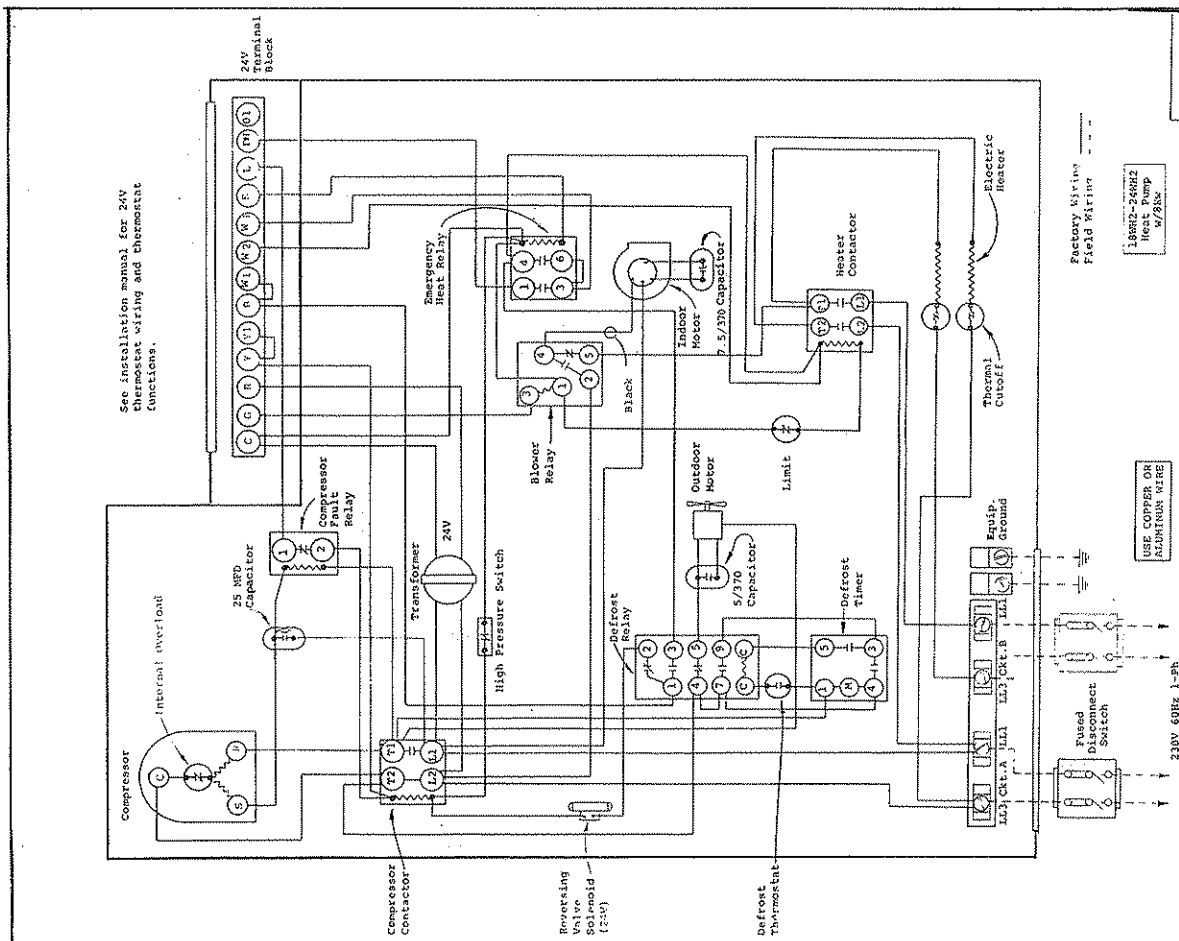
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BARD MANUFACTURING COMPANY
24WH2







PARTS LIST
SINGLE PACKAGE HEAT PUMPS

PART NO.	DESCRIPTION	18WH2	24WH2
5202-001	Accumulator	x	
5202-003	Accumulator		x
5152-030	Blower Housing 9-7	x	x
5152-028	Blower Wheel 9-7	x	x
5152-029	Blower Wheel 9-7	x	x
8552-027	Capacitor 25/370V	x	x
8552-002	Capacitor 5/370V	x	x
5811-017	Capillary Tube - Cool	x	
5811-018	Capillary Tube - Heat	x	
5811-021	Capillary Tube - Cool & Heat		(2)
5651-006	Check Valve	x	x
8000-061	Compressor RES3-0175-PFV-270	x	
8000-062	Compressor AB224FT-014-A4		x
5051-008	Condenser Coil	x	
5051-026	Condenser Coil		x
8401-007	Contactator-Compressor 25A	x	x
8401-006	Contactator - Heater 2P18	x	x
8408-004	Defrost Mounting Plate	x	x
8408-002	Defrost Thermostat	x	x
5060-005	Evaporator Coil	x	
5060-024	Evaporator Coil		x
5151-024	Fan Blade A-1831-5 ccw	x	x
7004-006	Filter 14x25	x	x
8604-041	Heat Strip 4Kw	x	x
8604-043	Heat Strip 8Kw	x	x
8406-011	High Pressure Switch	x	x
8402-029	Limit Switch 160°	x	x
8102-008	Motor - Blower 1/6 hp	x	x
8103-009	Motor - Fan 1/5 hp	x	x
8201-009	Relay - Blower	x	x
8201-023	Relay - Defrost	x	x
8201-024	Relay - Compressor Fault	x	x
8201-013	Relay - Emergency Heat	x	x
5650-004	Reversing Valve	x	
5650-009	Reversing Valve		x
5650-008	Solenoid Coil	x	x
5210-002	Strainer	(2)	(2)
8607-010	Terminal Board	x	x
8607-001	Terminal Block 230V	x	x
8607-003	Terminal Block 230V	x	x
8402-030	Thermal Cut-off	x	x
8612-010	Timer	x	x
8407-015	Transformer	x	x
8552-004	Capacitor 7.5/370V	x	x

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.