

INSTALLATION INSTRUCTIONS

WALL MOUNTED PACKAGE HEAT PUMPS

MODELS

WH181

WH241

PATENT PENDING

DATE: 03-15-93

**MANUAL 2100-201 REV. D
SUPERSEDES REV. C
FILE VOL. III, TAB 17**

SECTION 1 --GETTING OTHER INFORMATION AND PUBLICATIONS

These publications can help you install the air conditioner or heat pump. You can usually find these at your local library or purchase them directly from the publisher. Be sure to consult current edition of each standard.

| | |
|---|----------------|
| National Electrical Code | -ANSI/NFPA 70 |
| Standard For The Installation Of Air Conditioning and Ventilating Systems | -ANSI/NFPA 90A |
| Standard For Warm Air Heating and Air Conditioning Systems | -ANSI/NFPA 90B |
| Load Calculation For Residential Winter and Summer Air Conditioning | -ACCA Manual J |
| Duct Design For Residential Winter and Summer Air Conditioning and Equipment Selection | -ACCA Manual D |

FOR MORE INFORMATION, CONTACT THESE PUBLISHERS

- ACCA:** AIR CONDITIONING CONTRACTORS OF AMERICA
1513 16th Street NW
Washington, DC 20036
Telephone: (202) 483-9370 Fax: (202) 234-4721
- ANSI:** AMERICAN NATIONAL STANDARDS INSTITUTE
11 West Street, 13th Floor
New York, NY 10036
Telephone: (212) 642-4900 Fax: (212) 302-1286
- ASHRAE:** AMERICAN SOCIETY OF HEATING REFRIGERATING AND
AIR CONDITIONING ENGINEERS, INCORPORATED
1791 Tullie Circle, N.E.
Atlanta, GA 30329-2305
Telephone: (404) 636-8400 Fax: (404) 321-5478
- NFPA:** NATIONAL FIRE PROTECTION ASSOCIATION
Batterymarch Park
P. O. Box 9101
Quincy, MA 02269-9901
Telephone: (800) 344-3555 Fax: (617) 984-7057

TABLE OF CONTENTS

PART 1 -- WALL MOUNT--GENERAL INSTALLATION INFORMATION

| | |
|---|---|
| Heat Pump Wall Mount Model Nomenclature | 1 |
| Shipping Damage | 1 |
| General | 4 |
| Duct Work | 4 |
| Filters | 5 |
| Fresh Air Intake | 5 |
| Condensate Drain | 5 |

PART 2 -- INSTALLATION

| | |
|-------------------------------------|---|
| Wall Mounting Information | 5 |
| Mounting The Unit | 5 |

WIRING

| | |
|--------------------------------------|---|
| Wiring--Main Power | 7 |
| Wiring: Low Voltage Wiring | 7 |

THERMOSTAT WIRING

| | |
|---|---|
| Compressor Cut-Off Thermostat and Outdoor Thermostats | 8 |
| Compressor Cut-Off and Outdoor Thermostat Wiring | 8 |
| Heat Anticipation | 9 |
| Thermostat Indicator Lamps | 9 |
| Compressor Malfunction Light | 9 |

PART 3 -- START-UP

| | |
|------------------------------------|----|
| Important Installer Note | 10 |
| Crankcase Heaters | 10 |
| Service Hints | 10 |
| Sequence of Operation | 11 |
| Pressure Service Ports | 11 |
| Defrost Cycle | 11 |

PART 4 -- TROUBLESHOOTING

| | |
|---|----|
| Solid State Heat Pump Control Troubleshooting Procedure | 13 |
| Checking Temperature Sensor Outside Unit Circuit | 14 |
| Fan Blade Setting Dimensions | 15 |
| Removal of The Fan Shroud | 15 |
| Refrigerant Charge | 15 |
| Pressure Tables | 17 |
| Optional Accessories. | 18 |

FIGURES AND TABLES

| | | |
|----------|--|----|
| Figure 1 | Unit Dimensions | 2 |
| Figure 2 | Mounting Locations | 6 |
| Figure 3 | Unit 24V Terminal Board | 7 |
| Figure 4 | Compressor Cut-Off--5 and 10KW | 8 |
| Figure 5 | Start-Up | 10 |
| Figure 6 | Defrost Control Board | 12 |
| Figure 7 | Fan Blade Setting | 15 |

| | | |
|----------|--|----|
| Table 1 | Electric Heat Table | 1 |
| Table 2 | Electrical Specifications | 3 |
| Table 3 | Thermostat Wire Sizes | 8 |
| Table 4 | Wall Thermostat and Subbase Combinations | 9 |
| Table 5 | Troubleshooting | 13 |
| Table 6 | Fan Blade Settings. | 15 |
| Table 7 | Refrigerant Charge | 15 |
| Table 8 | Indoor Blower Performance | 16 |
| Table 9 | Recommended Operating Ranges. | 16 |
| Table 10 | Maximum ESP of Operation | 16 |
| Table 11 | Cooling--Pressure (PSI) | 17 |
| Table 12 | Heating--Pressures (PSI) | 17 |
| Table 13 | Optional Accessories | 18 |

2PART 1 -- WALL MOUNT GENERAL INFORMATION

HEAT PUMP WALL MOUNT MODEL NOMENCLATURE

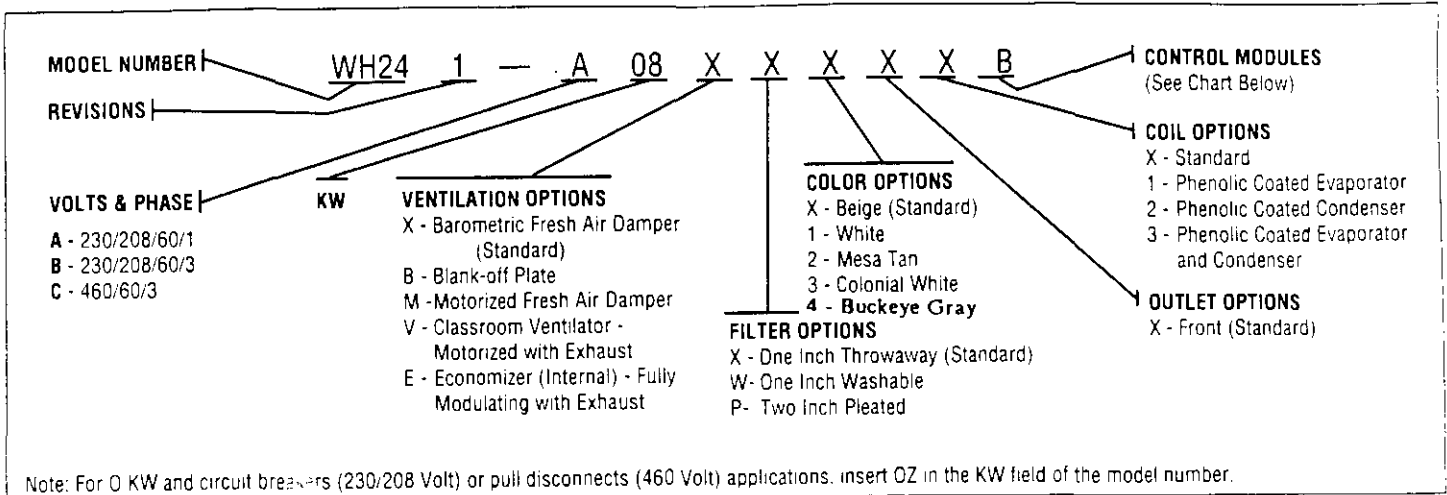


TABLE 1 ELECTRIC HEAT TABLE

| Models | WH181-A | | WH241-A | | | | WH241-B | | | | WH241-C | | | |
|--------|---------|-------|---------|-------|-------|-------|---------|-------|-------|-------|---------|-------|-------|-------|
| | 240-1 | | 208-1 | | 240-1 | | 208-1 | | 240-3 | | 208-3 | | 460-3 | |
| | KW | A | BTU | A | BTU | A | BTU | A | BTU | A | BTU | A | BTU | |
| 4 | 16.7 | 13650 | 14.4 | 10240 | 16.7 | 13650 | 14.4 | 10240 | | | | | | |
| 8 | 33.3 | 27300 | 28.8 | 20475 | 33.3 | 27300 | 28.8 | 20475 | | | | | | |
| 6 | | | | | | | | | 14.4 | 20500 | 12.5 | 15360 | 7.2 | 20475 |

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.

FIGURE 1
 SIZE SPECS FOR MIS-278

| UNIT | WIDTH (W) | DEPTH (D) | HEIGHT (H) | SUPPLY | | RETURN | | E | F | G | I | J | K | L | M | N | O | P | Q |
|---------|-----------|-----------|------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----|--------|----|--------|----|---------|--------|
| | | | | A | B | C | B | | | | | | | | | | | | |
| 18 & 24 | 32-7/8 | 16-7/8 | 70-1/2 | 7-7/8 | 19-7/8 | 11-7/8 | 19-7/8 | 34-7/8 | 18-1/4 | 25-3/4 | 20-3/4 | 26-3/4 | 28 | 29-1/4 | 27 | 2-9/16 | 34 | 22-1/16 | 10-1/2 |

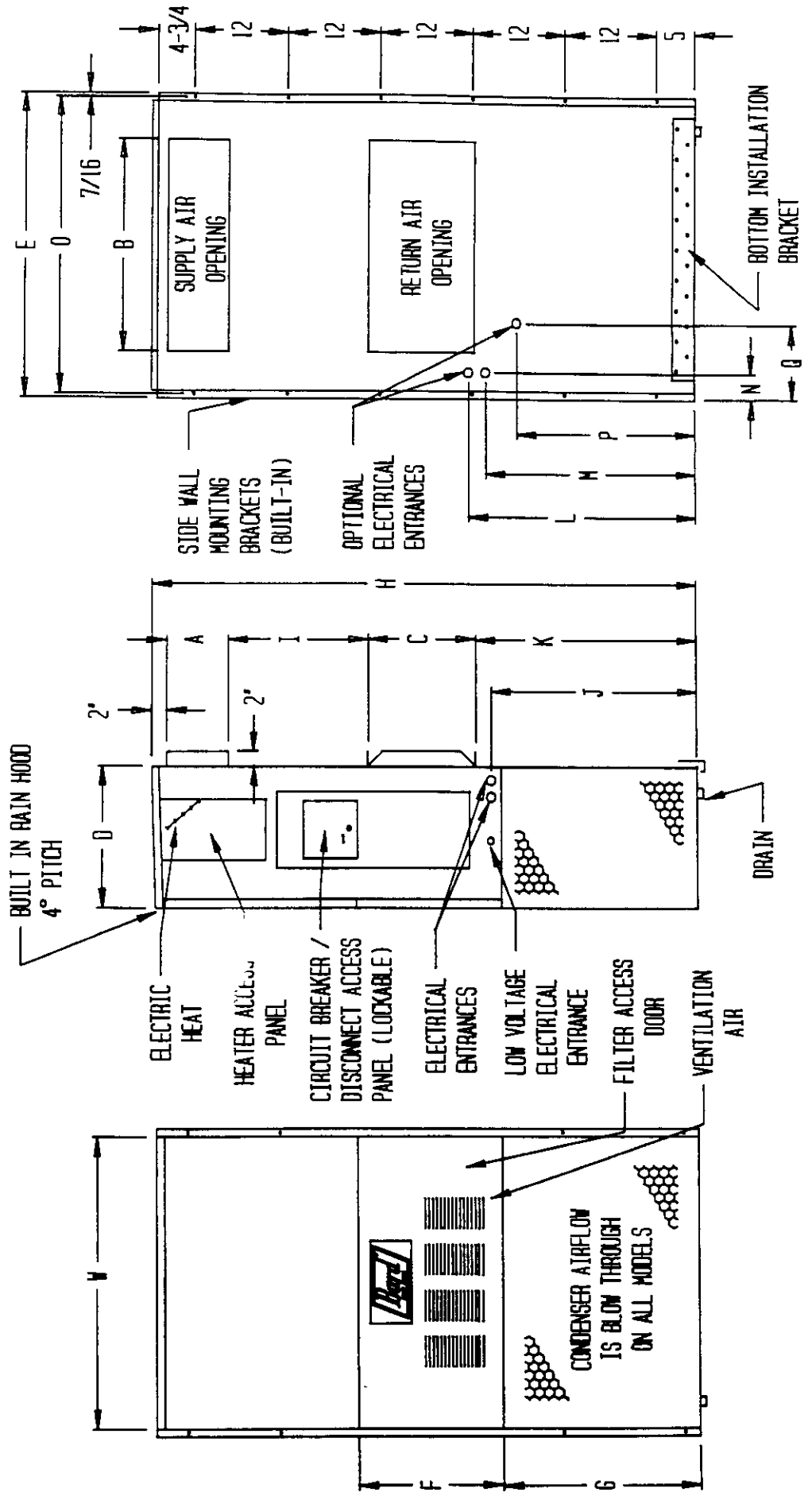


TABLE 2

| SINGLE CIRCUIT | | | | | | |
|----------------|-----------------------|-----------------------|------------------------------|--|---------------------------|----------------------|
| Model | Rated Volts and Phase | No. Field Power Ckts. | (4) Minimum Circuit Ampacity | (1) Maximum External Fuse Or Circuit Breaker | (2) Field Power Wire Size | (2) Ground Wire Size |
| WH181-A00,A0Z | 230/208-1 | 1 | 15 | 20 | 12 | 12 |
| A04 | | 1 | 36 | 40 | 10 | 10 |
| (3) A08 | | 1 | 57 | 60 | 6 | 10 |
| WH241-A00,A0Z | 230/208-1 | 1 | 16 | 25 | 12 | 12 |
| A04 | | 1 | 37 | 40 | 10 | 10 |
| (3) A08 | | 1 | 58 | 60 | 6 | 10 |
| WH241-B00,B0Z | 230/208-3 | 1 | 13 | 20 | 12 | 12 |
| B06 | | 1 | 31 | 35 | 8 | 10 |
| WH241-C00,COZ | 460-3 | 1 | 8 | 15 | 14 | 14 |
| C06 | | 1 | 17 | 20 | 12 | 12 |

(1) Maximum size of the time delay fuse or HACR type circuit breaker for protection of field wiring conductors.

(2) Based on 75°C copper wire. All wiring must conform to NEC and all local codes.

(3) Maximum KW that can operate with heat pump on.

(4) These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. Refer to the National Electric Code (latest revision), article 310 for power conductor sizing. Caution: When more than one field power conductor circuit is run thru one conduit, the conductors must be derated. Pay special attention to note 8 of table 310 regarding Ampacity Adjustment Factors when more than 3 are in a raceway.

GENERAL

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians.

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. See Page 1 for information on codes and standards.

Size of unit for a proposed installation should be based on heat loss calculation made according to methods of Air Conditioning Contractors of America (ACCA). 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.

DUCT WORK

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. Air Conditioning Contractors of America (ACCA) 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.

Refer to Table 10 for maximum static pressure available for duct design.

Design the duct work according to methods given by the Air Conditioning Contractors of America (ACCA). When duct runs through unheated spaces, it should be insulated with a minimum of one inch of insulation. Use insulation with a vapor barrier on the outside of the insulation. Flexible joints should be used to connect the duct work to the equipment in order to keep the noise transmission to a minimum.

Ducts through the walls must be insulated and all joints taped or sealed to prevent air or moisture entering the wall cavity.

Some installations may not require any return air duct. It is recommended that on this type of installation that a filter grille be located in the wall. Filters must be of sufficient size to allow a maximum velocity of 400 FPM.

NOTE: If no return air duct is used, applicable installation codes may limit this cabinet to installation only in a single story structure.

FILTERS

A 1-inch 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. A 1-inch washable filter and 2-inch pleated filter are also available as optional accessories. The internal filter brackets are adjustable to accommodate the 2-inch filter by loosening 2 screws in each bracket assembly and sliding the brackets apart to the required width and retightening the 4 screws.

FRESH AIR INTAKE

All units are built with a fresh air inlet slots punched in the service panel.

The fresh air damper assembly is standard equipment with the unit because of the variety of state or local codes requiring fresh air capability. It is shipped already attached to each unit.

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.

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.

PART 2 -- INSTALLATION INSTRUCTIONS

WALL MOUNTING INFORMATION

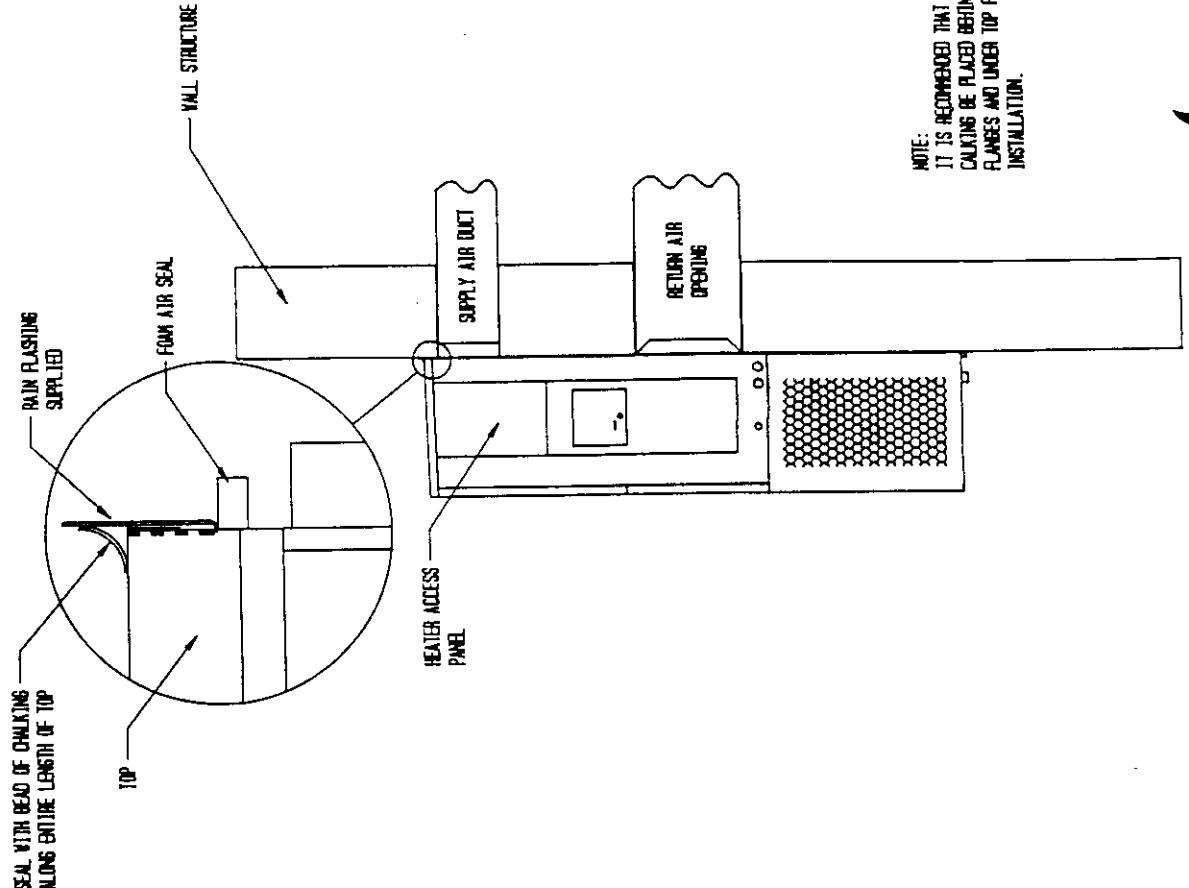
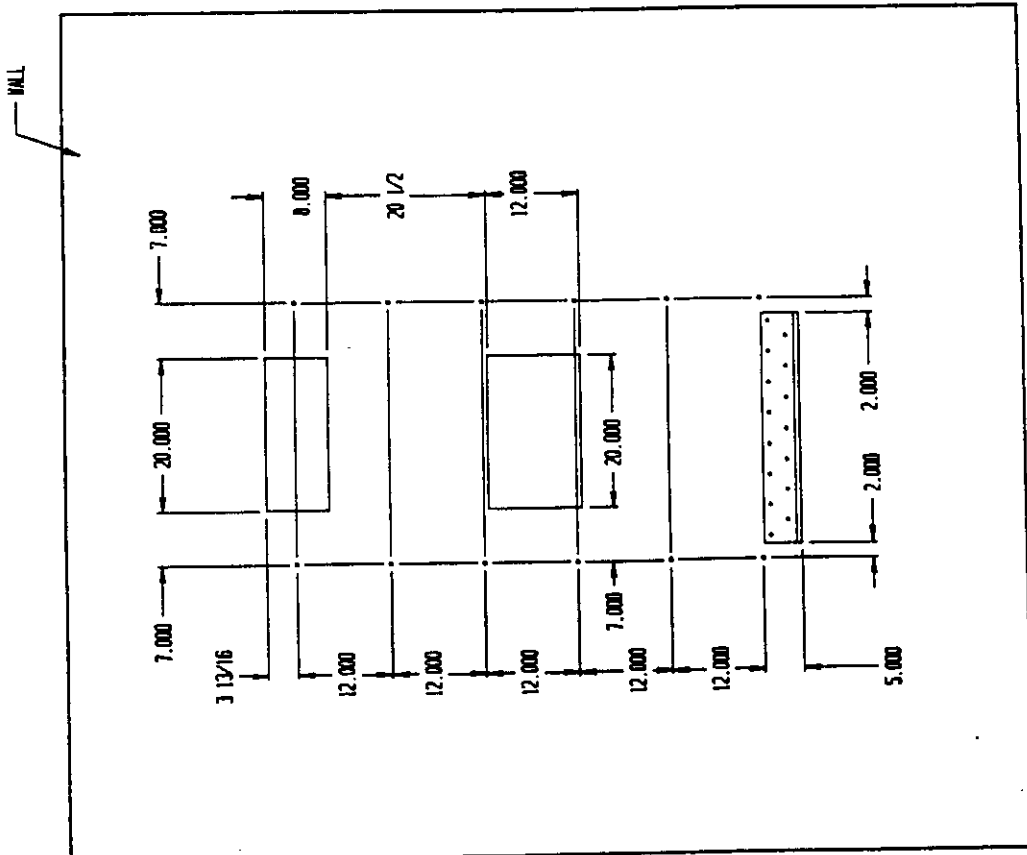
1. These units are secured by wall mounting brackets which secure the unit to the outside wall surface at both sides. A bottom mounting bracket is provided for ease of installation, but is not required.
2. On wood-frame walls, the wall construction must be strong and rigid enough to carry the weight 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. The unit is suitable for 0 inch clearance from the unit and from the supply and return air ducts.

MOUNTING THE UNIT

1. Two holes, for the supply and return air openings, must be cut through the wall as shown in Figure 2.
2. Locate and mark lag bolt locations and bottom mounting bracket location, if desired. See Figure 2.
3. Mount bottom mounting bracket, if used.
4. Hook top rain flashing under back bend of top. Top rain flashing is shipped secured to the right side of the back.
5. Position unit in opening and secure with 5/16 lag bolts; use 7/8" diameter flat washers on the lag bolts.
6. Secure rain flashing to wall and caulk across entire length of top. See Figure 7.
7. For additional mounting rigidity, the return air and supply air frames or collars can be drilled and screwed or welded to the structural wall itself (depending upon wall construction). Be sure to observe required clearance if combustible wall.
8. On side by side installations, maintain a minimum of 20 inches clearance on right side of unit to allow access to control panel and heaters, and allow proper airflow to the outdoor coil.

FIGURE 2
MOUNTING INSTRUCTIONS

NOTE: IT IS RECOMMENDED THAT A BEAD OF SILICONE CAULKING BE PLACED BEHIND THE SIDE MOUNTING FLANGES AND UNDER THE TOP FLASHING AT TIME OF INSTALLATION.



NOTE: IT IS RECOMMENDED THAT A BEAD OF SILICONE CAULKING BE PLACED BEHIND THE SIDE MOUNTING FLANGES AND UNDER TOP FLASHING AT TIME OF INSTALLATION.

WIRING--MAIN POWER

Refer to the unit rating plate for wire sizing information and maximum fuse or "HACR Type" circuit breaker 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. All models are suitable only for connection with copper wire. Each unit and/or wiring diagram will be marked "Use Copper Conductors Only". These instructions MUST BE adhered to. Refer to the National Electrical Code (NEC) for complete current carrying capacity data on the various insulation grades of wiring material. All wiring must conform to NEC and all local codes.

The electrical data lists fuse and wire sizes (75°C 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 Relay Fuse" or "HACR Type" circuit breaker that is to be used with the equipment. The correct size 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.

The disconnect access door on this unit may be locked to prevent unauthorized access to the disconnect. To convert for the locking capability, bend the tab located in the bottom left hand corner of the disconnect opening under the disconnect access panel straight out. This tab will now line up with the slot in the door. When shut, a padlock may be placed through the hole in the tab preventing entry.

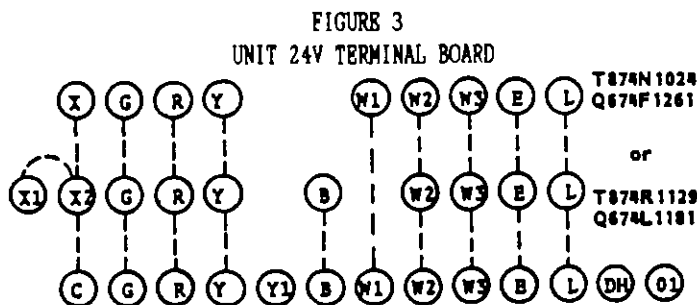
WIRING: LOW VOLTAGE WIRING

230/208V, 1 phase and 3 phase equipment dual primary voltage transformers. All equipment leaves the factory wired on 240V tap. For 208V operation, reconnect from 240V to 208V tap. The acceptable operating voltage range for the 240 and 208V taps are:

| TAP | RANGE |
|-----|-----------|
| 240 | 253 - 216 |
| 208 | 220 - 187 |

NOTE: The voltage should be measured at the field power connection point in the unit and while the unit is operating at full load (maximum amperage operating condition).

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



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

| Transformer VA | THERMOSTAT WIRE SIZE | | Maximum Distance In Feet |
|----------------|----------------------|------------|-----------------------------|
| | FLA | Wire Gauge | |
| 55 | 2.3 | 20 Gauge | 45 |
| | | 18 " | 60 |
| | | 16 " | 100 |
| | | 14 " | 160 |
| | | 12 " | 250 |

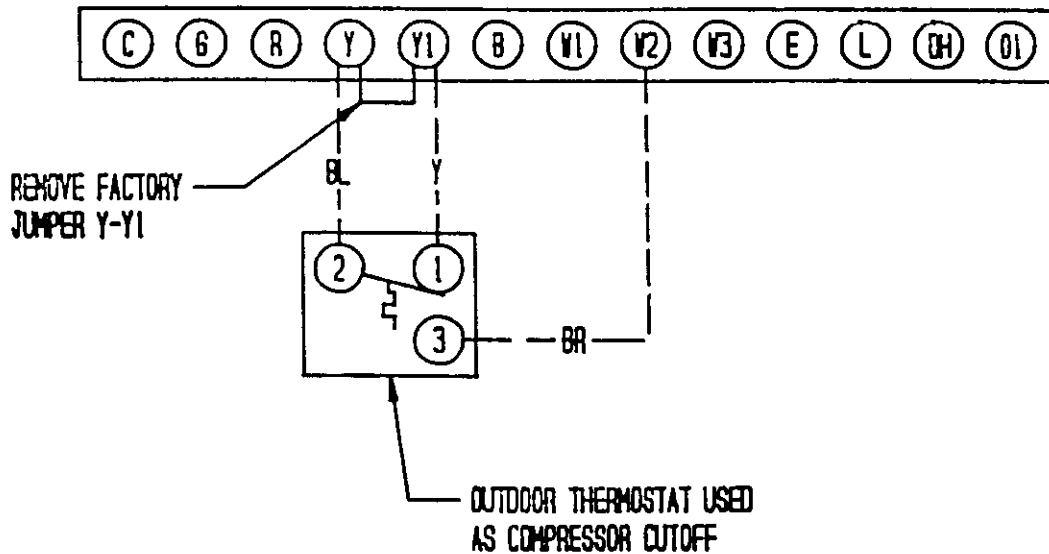
COMPRESSOR CUT-OFF THERMOSTAT AND OUTDOOR THERMOSTATS

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. The set point of either type of thermostat is variable with geographic region and sizing of the heating equipment to the structure. Utilization of the Heating Application Data and the heat loss calculation of the building are useful in determining the correct set points.

COMPRESSOR CUT-OFF AND OUTDOOR THERMOSTAT WIRING

FIGURE 4
4 & 8KW 1-ph --- 6KW 3-ph



HEAT ANTICIPATION

Both of the thermostats shown below have a fixed heat anticipator for stage 1 with no adjustment required. Stage 2 has an adjustable anticipator for the W2 connection and fixed for the W3 connection. Both the W2 and W3 circuits are controlled by the stage 2 bulb. The only heat anticipator that needs to be checked is stage 2 and it should be set to match the load carried by the W2 circuit. The normal factory wiring provides for only one electric heat contactor to be controlled by W2, and the anticipator should be set at .40A. If special field wiring is done, it is best to actually measure the load but a good rule is .40A for EACH heat contactor controlled by W2.

TABLE 4

| WALL THERMOSTAT AND SUBBASE COMBINATIONS | | | |
|--|-------------------------|-------------------------|--|
| Group | Thermostat | Subbase | Predominant Features |
| A | 8403-017 (T874R1129) | 8404-009 (0674L1181) | Heat or Cool (1) No Auto |
| B | 8403-018 (T874N1024) | 8404-010 (0674F1261) | Automatic Heat-Cool (2) Changeover Position |

- (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 subbase 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 green lamp marked "check" will come on if there is any problem that prevents the compressor from running when it is supposed to be.

COMPRESSOR MALFUNCTION LIGHT

Actuation of the green "check" lamp is accomplished by a relay output from the heat pump control board which is factory installed. Any condition such as loss of charge, high head pressure, 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.

PART 3 -- START-UP

IMPORTANT INSTALLER NOTE

For improved start-up performance, wash the indoor coil with a dishwasher detergent.

CRANKCASE HEATERS

All units are provided with some form of compressor crankcase heat.

All single and three phase models have an insertion well-type heater located in the lower section of the compressor housing. This is a self-regulating type heater that draws only enough power to maintain the compressor at a safe temperature.

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 decal in Figure 5 is affixed to all outdoor units detailing start-up procedure. This is very important. Please read carefully.

FIGURE 5

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.

7961-061

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 air flow 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 remote reset high pressure switch. Turn thermostat off, then on to reset the 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 or circuit breakers to be sure they are the correct rating.
5. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

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.

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.

DEFROST CYCLE

The defrost cycle is controlled by temperature and time on the solid state heat pump control.

When the outdoor temperature is in the lower 40°F temperature range or colder, the outdoor coil temperature is 32°F or below. This coil temperature is sensed by the coil sensor mounted near the bottom of the outdoor coil. Once coil temperature reaches 30°F or below, the coil sends a signal to the control logic of the heat pump control and the defrost timer will start.

After 60 (90 or 30) minutes at 30°F or below, the heat pump control will place the system in the defrost mode.

During the defrost mode, the refrigerant cycle switches back to the cooling cycle, the outdoor motor stops, electric heaters are energized, and hot gas passing through the outdoor coil melts any accumulator frost. When the temperature rises to approximately 57°F, the coil sensor will send a signal to the heat pump control which will return the system to heating operations automatically.

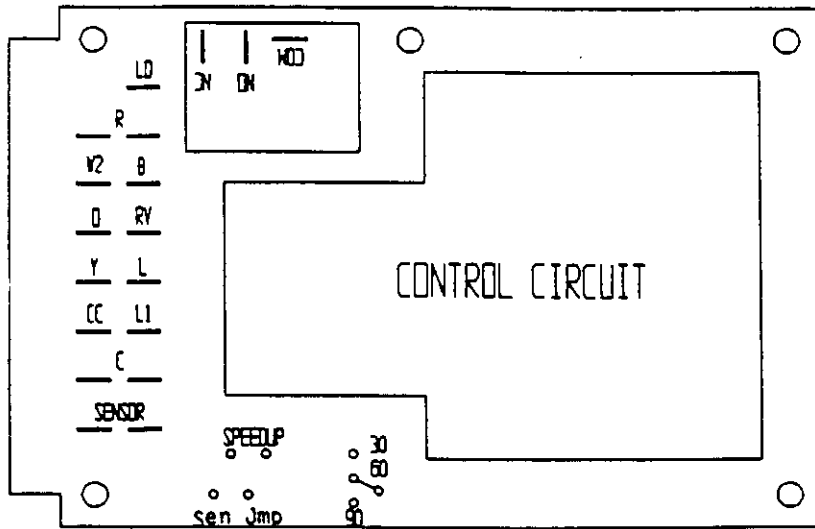
If some abnormal or temporary condition such as a high wind causes the heat pump to have a prolonged defrost cycle, the heat pump control will restore the system to heating operation automatically after 10 minutes.

There are three settings on the heat pump control--30 minute, 60 minute, and 90 minute. Most models are shipped wired on the 60 minute setting for greatest operating economy. If special circumstances require a change to another time, remove wire connected to terminal 60 and reconnect to desired terminal.

There is a cycle speed up jumper on the control. This can be used to reduce the time between defrost cycle operation without waiting for time to elapse.

There is an initial defrost (sen jmp) jumper on the control that can be used at any outdoor ambient during the heating cycle to simulate a 0° coil temperature. This can be used to check defrost operation of the unit without waiting for the outdoor ambient to fall into the defrost region.

FIGURE 6
DEFROST CONTROL BOARD



PART 4 -- TROUBLESHOOTING

SOLID STATE HEAT PUMP CONTROL TROUBLESHOOTING PROCEDURE

1. Turn on AC power supply to indoor and outdoor units.
2. Turn thermostat blower switch to fan on--the indoor blower should start. (If it doesn't, troubleshoot indoor unit and correct problem).
3. Turn thermostat blower switch to auto position. Indoor blower should stop.
4. Set system switch to heat or cool. Adjust thermostat to call for heat or cool--The indoor blower, compressor, and outdoor fan should start.

NOTE: If there was no power to 24 volt transformer, the compressor and outdoor fan motor will not start for 5 minutes. This is because of the compressor short cycle protection.

TABLE 5 TROUBLESHOOTING

| Symptom | Possible Causes | What to Check | How To Check Or Repair |
|---|---|--|---|
| Compressor contactor does not energize (cooling or heating) | Control circuit wiring | Check for R connection at unit, and 24V between R-C. | Run R connection to outdoor unit to power heat pump control. |
| | Compressor lock out | 1. Check for 24V between Ll-C on heat pump control. 2. Check across high pressure switch. | 1. If no voltage between Ll-C turn thermostat off and on again to reset high pressure switch. 2. If high pressure switch is open and will not reset, replace high pressure switch. |
| | Compressor short cycle protection | Check for 24V between CC-C and Y-C on heat pump control. | 1. If no voltage between CC-C jumper speed up terminal and within 10 seconds power should appear between CC-C. Remove speed up jumper after 10 seconds. |
| | Heat pump control defective | Check all other possible causes. Manual 2100-065 | Replace heat pump control. |
| | Contactors defective | Check for open or shorted coil winding. | Replace contactor. |
| Fan outdoor motor does not run (cooling or heating except during defrost) | Motor defective | Check for open or shorted motor winding | Replace motor. |
| | Motor capacitor defective | Check capacitor rating. Check for open or shorted capacitor. | Replace capacitor. |
| | Heat pump control defective | Check across fan relay on heat pump control. (Com-NC) | Replace heat pump control. |
| Reversing valve does not energize (heating only) | Reversing valve solenoid coil defective | Check for open or shorted coil. | Replace solenoid coil. |
| | Heat pump control defective | Check for 24V between RV-C and B-C. | 1. Check control circuit wiring. 2. Replace heat pump control. |
| Unit will not go into defrost (heating only) | Temperature sensor or heat pump control defective | Disconnect temperature sensor from board and jumper across speed up terminals and sen jmp terminals. This should cause the unit to go through a defrost cycle within one minute. | 1. If unit goes through defrost cycle, replace temperature sensor. 2. If unit does not go through defrost cycle, replace heat pump control. |
| Unit will not come out of defrost (heating only) | Temperature sensor or heat pump control defective | Jumper across speed up terminals. This should cause the unit to come out of defrost within one minute. | 1. If unit comes out of defrost cycle, replace temperature sensor. 2. If unit does not come out of defrost cycle, replace heat pump control. |

CHECKING TEMPERATURE SENSOR OUTSIDE UNIT CIRCUIT

1. Disconnect temperature sensor from board and from outdoor coil.
2. Use an ohmmeter and measure the resistance of the sensor. Also use ohmmeter to check for short or open.
3. Check resistance reading to chart of resistance use sensor ambient temperature. (Tolerance of part is $\pm 10\%$).
4. If sensor resistance reads very low, then sensor is shorted and will not allow proper operation of the heat pump control.
5. If sensor is out of tolerance, shorted, open, or reads very low ohms then it should be replaced.

TEMPERATURE F VS RESISTANCE R OF TEMPERATURE SENSOR

| F | R | F | R | F | R |
|-------|--------|------|-------|-------|-------|
| -25.0 | 196871 | 25.0 | 39898 | 75.0 | 10501 |
| -24.0 | 190099 | 26.0 | 38757 | 76.0 | 10247 |
| -23.0 | 183585 | 27.0 | 37652 | 77.0 | 10000 |
| -22.0 | 177318 | 28.0 | 36583 | 78.0 | 9760 |
| -21.0 | 171289 | 29.0 | 35548 | 79.0 | 9526 |
| -20.0 | 165487 | 30.0 | 34545 | 80.0 | 9299 |
| -19.0 | 159904 | 31.0 | 33574 | 81.0 | 9077 |
| -18.0 | 154529 | 32.0 | 32634 | 82.0 | 8862 |
| -17.0 | 149355 | 33.0 | 31723 | 83.0 | 8653 |
| -16.0 | 144374 | 34.0 | 30840 | 84.0 | 8449 |
| -15.0 | 139576 | 35.0 | 29986 | 85.0 | 8250 |
| -14.0 | 134956 | 36.0 | 29157 | 86.0 | 8057 |
| -13.0 | 130506 | 37.0 | 28355 | 87.0 | 7869 |
| -12.0 | 126219 | 38.0 | 27577 | 88.0 | 7686 |
| -11.0 | 122089 | 39.0 | 26823 | 89.0 | 7507 |
| -10.0 | 118108 | 40.0 | 26092 | 90.0 | 7334 |
| -9.0 | 114272 | 41.0 | 25383 | 91.0 | 7165 |
| -8.0 | 110575 | 42.0 | 24696 | 92.0 | 7000 |
| -7.0 | 107010 | 43.0 | 24030 | 93.0 | 6840 |
| -6.0 | 103574 | 44.0 | 23384 | 94.0 | 6683 |
| -5.0 | 100260 | 45.0 | 22758 | 95.0 | 6531 |
| -4.0 | 97064 | 46.0 | 22150 | 96.0 | 6383 |
| -3.0 | 93981 | 47.0 | 21561 | 97.0 | 6239 |
| -2.0 | 91008 | 48.0 | 20989 | 98.0 | 6098 |
| -1.0 | 88139 | 49.0 | 20435 | 99.0 | 5961 |
| 0.0 | 85371 | 50.0 | 19896 | 100.0 | 5827 |
| 1.0 | 82699 | 51.0 | 19374 | 101.0 | 5697 |
| 2.0 | 80121 | 52.0 | 18867 | 102.0 | 5570 |
| 3.0 | 77632 | 53.0 | 18375 | 103.0 | 5446 |
| 4.0 | 75230 | 54.0 | 17898 | 104.0 | 5326 |
| 5.0 | 72910 | 55.0 | 17434 | 105.0 | 5208 |
| 6.0 | 70670 | 56.0 | 16984 | 106.0 | 5094 |
| 7.0 | 68507 | 57.0 | 16547 | 107.0 | 4982 |
| 8.0 | 66418 | 58.0 | 16122 | 108.0 | 4873 |
| 9.0 | 64399 | 59.0 | 15710 | 109.0 | 4767 |
| 10.0 | 62449 | 60.0 | 15310 | 110.0 | 4663 |
| 11.0 | 60565 | 61.0 | 14921 | 111.0 | 4562 |
| 12.0 | 58745 | 62.0 | 14544 | 112.0 | 4464 |
| 13.0 | 56985 | 63.0 | 14177 | 113.0 | 4367 |
| 14.0 | 55284 | 64.0 | 13820 | 114.0 | 4274 |
| 15.0 | 53640 | 65.0 | 13474 | 115.0 | 4182 |
| 16.0 | 52051 | 66.0 | 13137 | 116.0 | 4093 |
| 17.0 | 50514 | 67.0 | 12810 | 117.0 | 4006 |
| 18.0 | 49028 | 68.0 | 12492 | 118.0 | 3921 |
| 19.0 | 47590 | 69.0 | 12183 | 119.0 | 3838 |
| 20.0 | 46200 | 70.0 | 11883 | 120.0 | 3757 |
| 21.0 | 44855 | 71.0 | 11591 | 121.0 | 3678 |
| 22.0 | 43554 | 72.0 | 11307 | 122.0 | 3601 |
| 23.0 | 42295 | 73.0 | 11031 | 123.0 | 3526 |
| 24.0 | 41077 | 74.0 | 10762 | 124.0 | 3452 |

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.

FIGURE 7

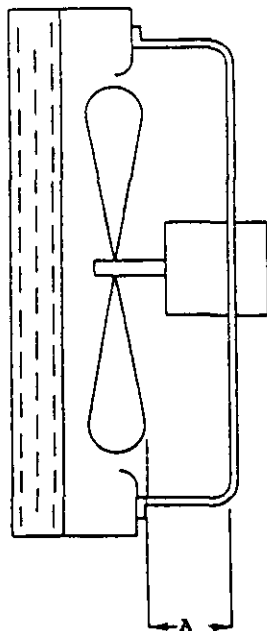


TABLE 6

| Model | Dimension A |
|-------|-------------|
| WH181 | 1.00 |
| WH241 | |

REMOVAL OF THE FAN SHROUD

1. Disconnect all power to unit.
2. Remove the screws holding both grills--one on each side of unit--and remove grills.
3. Remove screws holding fan shroud to condenser and bottom. (9) screws.
4. Unwire condenser fan motor.
5. Slide complete motor, fan blade, and shroud assembly out the left side of the unit.
6. Service motor/fan as needed.
7. Reverse steps to reinstall.

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:

TABLE 7

| Model | Rated Airflow | ° 95 F OD Temperature | ° 82 F OD Temperature |
|-------|---------------|-----------------------|-----------------------|
| WH181 | 650 | 56 - 58 | 63 - 65 |
| WH241 | 800 | 57 - 59 | 65 - 67 |

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.

TABLE 8 INDOOR BLOWER PERFORMANCE--CFM @ 230V

| E.S.P. In H ₂ O | WH181, WH241 |
|-------------------------------|--------------|
| | Dry / Wet |
| .0 | 1020 / 975 |
| .1 | 960 / 905 |
| .2 | 865 / 800 |
| .3 | 820 / 735 |
| .4 | 735 / 650 |
| .5 | 615 / 535 |
| .6 | --- |

TABLE 9

| Model | Rated CFM* | Rated ESP* | Recommended Airflow Range |
|-------|---------------|---------------|------------------------------|
| WH181 | 650 | .40 | 575 - 725 |
| WH241 | 800 | .20 | 700 - 950 |

*Rated CFM and ESP on high speed tap.

TABLE 10 MAXIMUM ESP OF OPERATION

| Model | ESP |
|-----------|-----|
| A00 | .50 |
| WH181 A04 | .50 |
| WH241 A08 | .40 |
| B00 | .50 |
| WH241 B06 | .50 |
| C00 | .50 |
| WH241 C06 | .50 |

Values shown are for units equipped with STD 1" throw-away filter or 1" washable filter. Derate ESP by .15 for 2" pleated filters.

TABLE 11

COOLING

Air Temperature Entering Outdoor Coil °F

| Model | Return Air Temperature | Pressure | ° | ° | ° | ° | ° | ° | ° | ° | ° |
|-------|------------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 |
| WB181 | 75 deg. DB | Low Side | 77 | 78 | 80 | 81 | 83 | 84 | 86 | 87 | 89 |
| | 62 deg. WB | High Side | 193 | 209 | 224 | 240 | 255 | 271 | 287 | 302 | 318 |
| | 80 deg. DB | Low Side | 82 | 84 | 85 | 87 | 89 | 90 | 92 | 93 | 95 |
| | 67 deg. WB | High Side | 198 | 214 | 230 | 246 | 262 | 278 | 294 | 310 | 326 |
| WB241 | 85 deg. DB | Low Side | 88 | 90 | 92 | 94 | 95 | 97 | 99 | 100 | 102 |
| | 72 deg. WB | High Side | 205 | 222 | 238 | 255 | 271 | 288 | 304 | 321 | 337 |
| | 75 deg. DB | Low Side | 75 | 76 | 77 | 79 | 80 | 81 | 83 | 84 | 86 |
| | 62 deg. WB | High Side | 216 | 229 | 242 | 256 | 271 | 286 | 302 | 318 | 336 |
| WB241 | 80 deg. DB | Low Side | 80 | 81 | 83 | 84 | 85 | 87 | 88 | 90 | 92 |
| | 67 deg. WB | High Side | 221 | 235 | 248 | 263 | 278 | 293 | 310 | 327 | 344 |
| | 85 deg. DB | Low Side | 86 | 88 | 89 | 90 | 92 | 93 | 95 | 97 | 99 |
| | 72 deg. WB | High Side | 229 | 243 | 257 | 272 | 288 | 304 | 321 | 338 | 356 |

TABLE 12

HEATING

Air Temperature Entering Outdoor Coil °F

| Model | Return Air Temperature | Pressure | 0 | 5 | 10 | 15 | 17 | 20 | 25 | 30 | 35 | 40 | 45 | 47 | 50 | 55 | 60 |
|-----------|------------------------|-----------|-------|-----|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | | WB181 | 70° | Low Side | 20 | 24 | 27 | 31 | 32 | 35 | 39 | 44 | 49 | 54 | 59 | 62 |
| High Side | 178 | 181 | | | 184 | 189 | 191 | 194 | 201 | 208 | 216 | 225 | 235 | 239 | 246 | 257 | 270 |
| WB241 | 70° | Low Side | 30 | 30 | 31 | 32 | 33 | 34 | 37 | 41 | 45 | 50 | 56 | 59 | 63 | 71 | 79 |
| | | High Side | 158 | 158 | 159 | 162 | 164 | 167 | 175 | 184 | 195 | 208 | 223 | 230 | 241 | 260 | 281 |

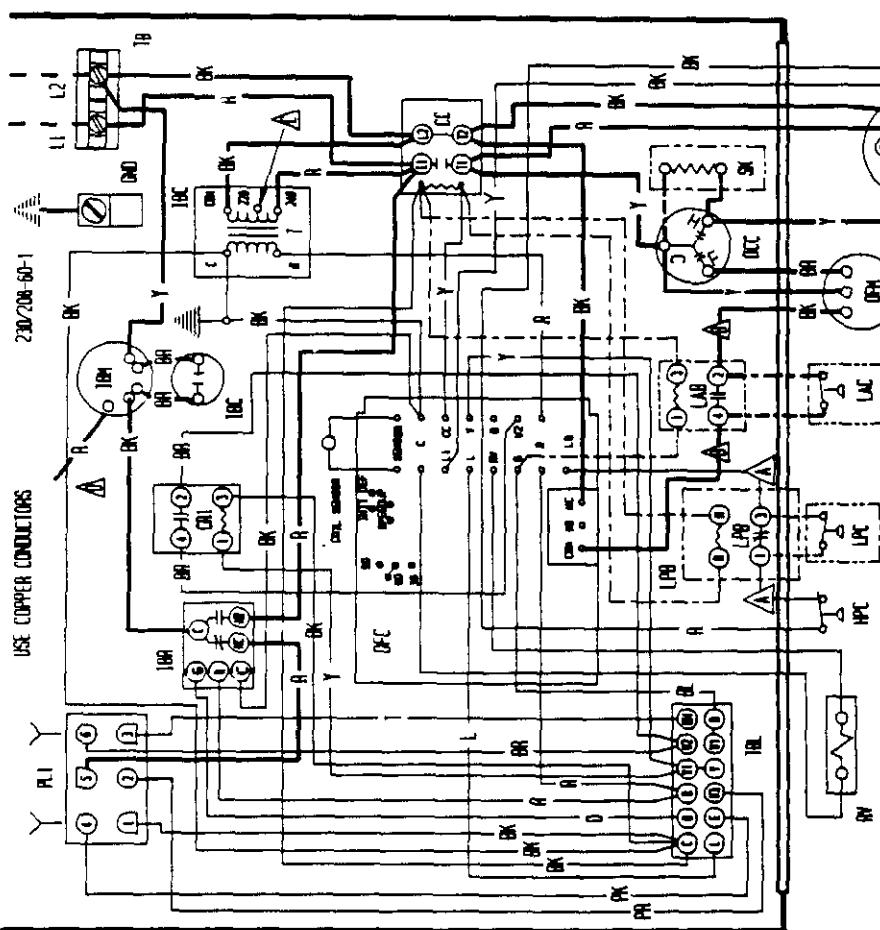
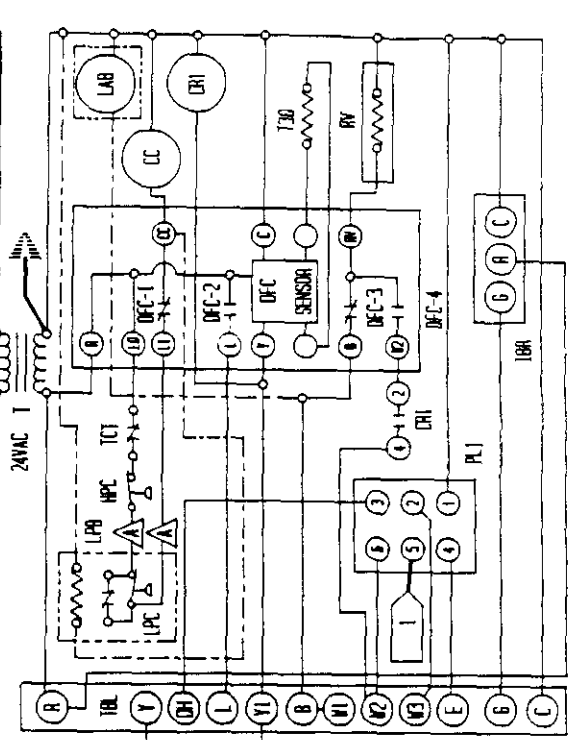
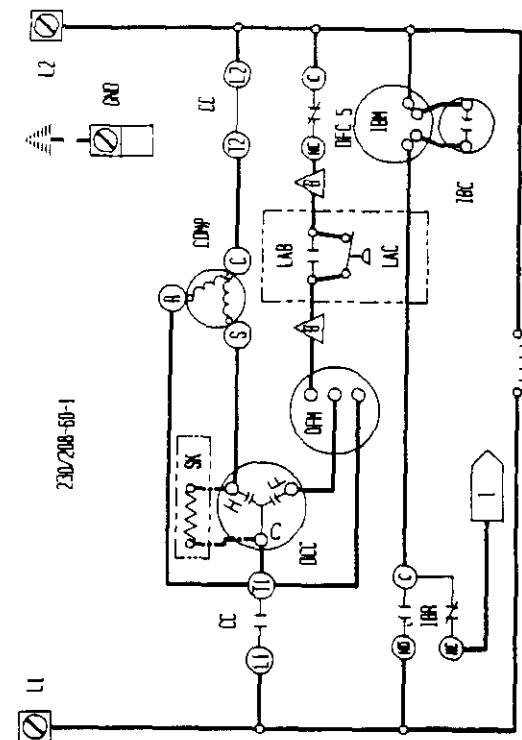
Low side pressure \pm 2 PSIGHigh side pressure \pm 5 PSIG

Tables are based upon rated CFM (airflow) across the evaporator coil and should be found under section titled "Refrigerant Charge" elsewhere in manual. If there is any doubt as to correct operating charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate instructions.

TABLE 13

OPTIONAL ACCESSORIES

| Model | Description | W | W | W | W |
|------------|-----------------------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | H 1 8 1 - | H 2 4 1 - | H 2 4 1 - | H 2 4 1 - |
| | | A | A | B | C |
| EHWH02-A05 | Heater Packages | X | X | | |
| EHWH02-A10 | Heater Packages | X | X | | |
| EHWH24-B06 | Heater Packages | | | X | |
| EHWH24-C06 | Heater Packages | | | | X |
| BOP-2 | Blank Off Plate | X | X | X | X |
| BFAD-2 | Barometric Fresh Air Damper | X | X | X | X |
| MFAD-2 | Motorized Fresh Air Damper | X | X | X | X |
| CRV-2 | Classroom Ventilator With Exhaust | X | X | X | X |
| EIEM-2 | Economizer With Exhaust | X | X | X | X |
| CMH-3 | Low Pressure Control (LPC) | X | X | X | X |
| CMH-7 | Low Ambient Control (LAC) | X | X | X | |
| CMH-9 | LAC + LPC | X | X | X | |
| CMH-14 | Outdoor Thermostat (ODT) | X | X | | |
| CMC-15 | Start Skit (SK) | X | X | | |
| WMCB-02A | Circuit Breaker Kit | X | | | |
| WMCB-03A | Circuit Breaker Kit | | X | | |
| WMCB-02B | Circuit Breaker Kit | | | X | |
| WMPD-01C | Pull Disconnect Kit | | | | X |



| COMPONENT CODE | INDOOR BLOWER RELAY | LOW AMBIENT BYPASS CONTROL | LOW AMBIENT CONTROL | LOW PRESSURE BYPASS | LOW PRESSURE CONTROL | LIMIT SWITCH | OUTDOOR FAN MOTOR | PLUG #1 | REV. VALVE SOLINOID | START KIT | TOP CAP THERMOSTAT | TRANSFORMER | TERMINAL BLOCK | LOW VOLTAGE TERMINAL BLOCK | TERMINAL OUTLET |
|----------------|---------------------|----------------------------|---------------------|---------------------|----------------------|--------------|-------------------|---------|---------------------|-----------|--------------------|-------------|----------------|----------------------------|-----------------|
| CB1 | IBR | LAB | LAC | LPC | LS | DPH | PL1 | RV | SK | TCT | TB | FEL | TCD | | |
| CB2 | | | | | | | | | | | | | | | |
| CC | | | | | | | | | | | | | | | |
| CDP | | | | | | | | | | | | | | | |
| DR1 | | | | | | | | | | | | | | | |
| DEC | | | | | | | | | | | | | | | |
| DFC | | | | | | | | | | | | | | | |
| DRH | | | | | | | | | | | | | | | |
| END | | | | | | | | | | | | | | | |
| H1 | | | | | | | | | | | | | | | |
| H2 | | | | | | | | | | | | | | | |
| H3 | | | | | | | | | | | | | | | |
| HPC | | | | | | | | | | | | | | | |
| IBC | | | | | | | | | | | | | | | |
| IBR | | | | | | | | | | | | | | | |

USE COPPER CONDUCTORS

230/208-50-1

230/208-50-1

MOVE RED WIRE TO 208V TAP FOR 208V OPERATION

LABELED WIRES CONNECT IF NO OPTIONS USED

OPTIONAL

FACTORY STD. FIELD

HIGH VOLTAGE ACCESSORY

LOW VOLTAGE ACCESSORY

RED (LOW) BLACK (HIGH)

| BLACK | BROWN | RED | ORANGE | YELLOW | GREEN | BLUE | WHITE | VIOLET | PURPLE | SLATE |
|-------|-------|-----|--------|--------|-------|------|-------|--------|--------|-------|
| BK | BR | R | O | Y | G | B | W | V | P | S |

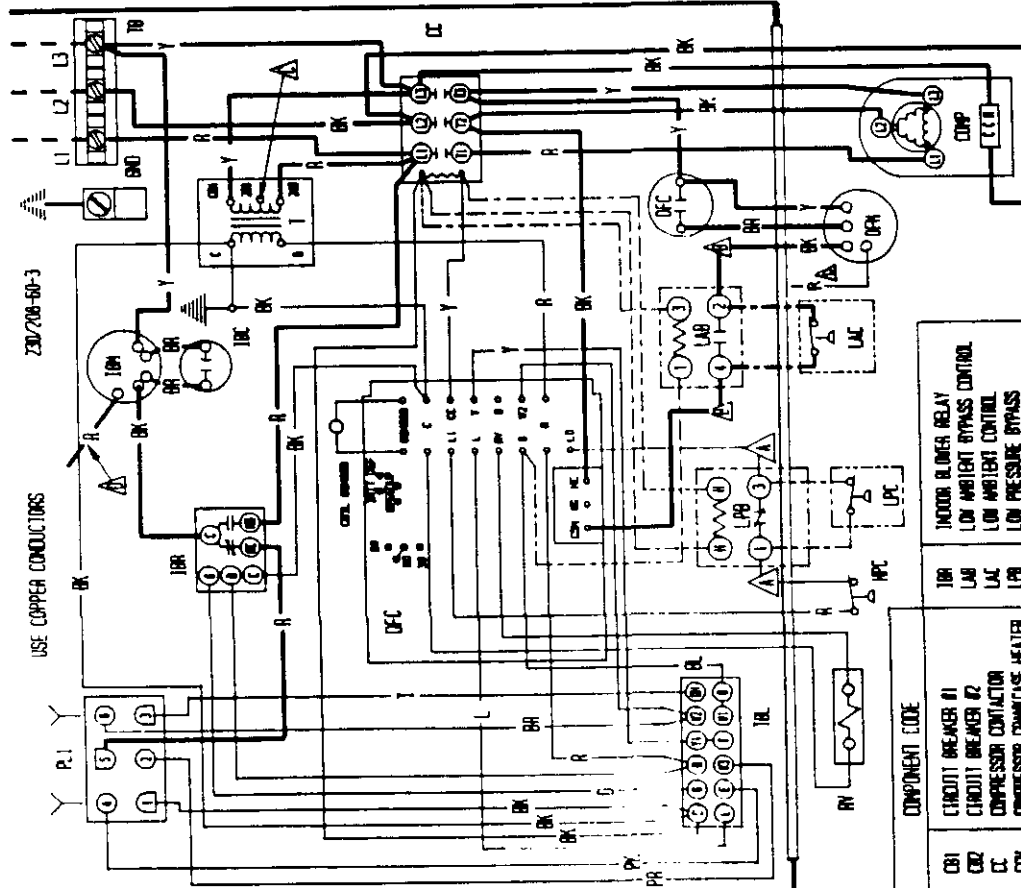
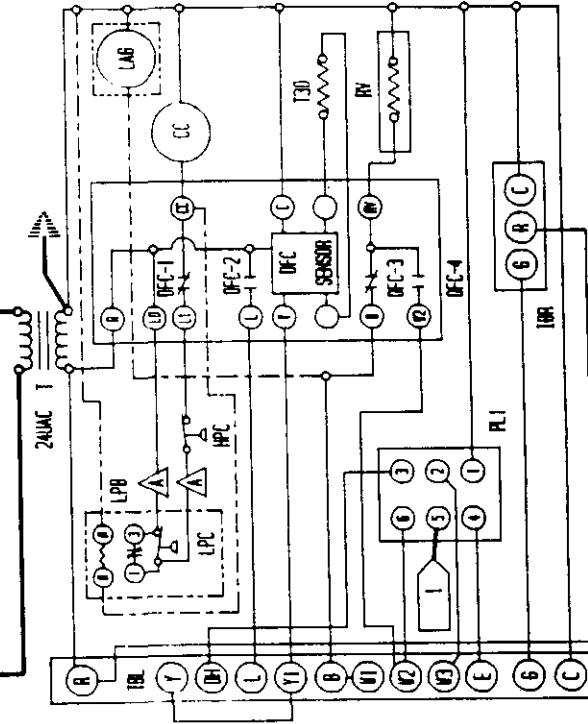
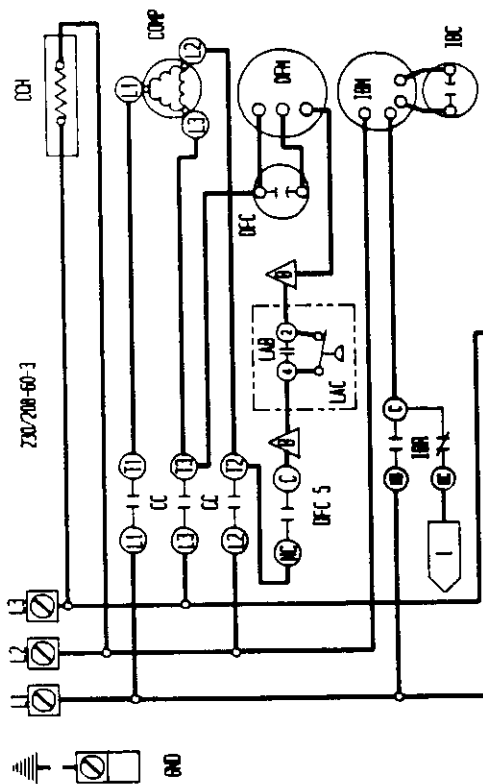
| TAN | PINK | LAURENCE |
|-----|------|----------|
| T | P | L |

BARB MFG. CO.

DWG 4056-1111A

DATE 5-11-92

CHK APPR



USE COPPER CONDUCTORS

230/210-60-3

COMPONENT CODE

| | |
|------|----------------------------|
| IR | INDOOR BLOWER RELAY |
| LAB | LOW AMBIENT BYPASS CONTROL |
| LAC | LOW AMBIENT CONTROL |
| LPC | LOW PRESSURE BYPASS |
| LPC | LOW PRESSURE CONTROL |
| LS | LIMIT SWITCH |
| DPF | OUTDOOR FAN CAPACTOR |
| DPH | OUTDOOR FAN MOTOR |
| IR-1 | OUTDOOR FAN RELAY |
| IR-2 | PLUS #1 |
| IR-3 | REV. VALVE SOLINOID |
| IR-4 | TRANSFORMER |
| IR-5 | TERMINAL BLOCK |
| IR-6 | LOW VOLTAGE TERMINAL BLOCK |
| IR-7 | INDOOR BLOWER MOTOR |
| IR-8 | THERMAL OUTLET |

COMPONENT CODE

| | |
|-----|------------------------|
| CB1 | CIRCUIT BREAKER #1 |
| CB2 | CIRCUIT BREAKER #2 |
| CC | COMPRESSOR CONTACTOR |
| CC | COMPRESSOR |
| CC | COMPRESSOR |
| DFC | DEFROST CONTROL |
| DFC | EMERGENCY HEAT RELAY |
| DFC | EMERGENCY SHUTDOWN |
| DFC | HEAT STRIP #1 |
| DFC | HEAT STRIP #2 |
| DFC | HEATER CONTACTOR #1 |
| DFC | HEATER CONTACTOR #2 |
| DFC | HIGH PRESSURE CONTROL |
| DFC | INDOOR BLOWER CAPACTOR |
| DFC | INDOOR BLOWER MOTOR |

RED (OLD) BLACK (NEW) WERE APPLICABLE

MOVE RED WIRE TO 200V TAP FOR 200V OPERATION

LABELED WIRES CORRECT IF NO OPTIONS USED.

LABELLED WIRES CORRECT IF NO OPTIONS USED.

COLOR CODE

| | |
|----|----------|
| Y | YELLOW |
| G | GREEN |
| B | BLUE |
| W | WHITE |
| V | VIOLET |
| PR | PURPLE |
| SL | SLATE |
| P | PINK |
| L | LAVENDER |
| T | TAN |

FACTORY STD. FIELD OPTIONAL

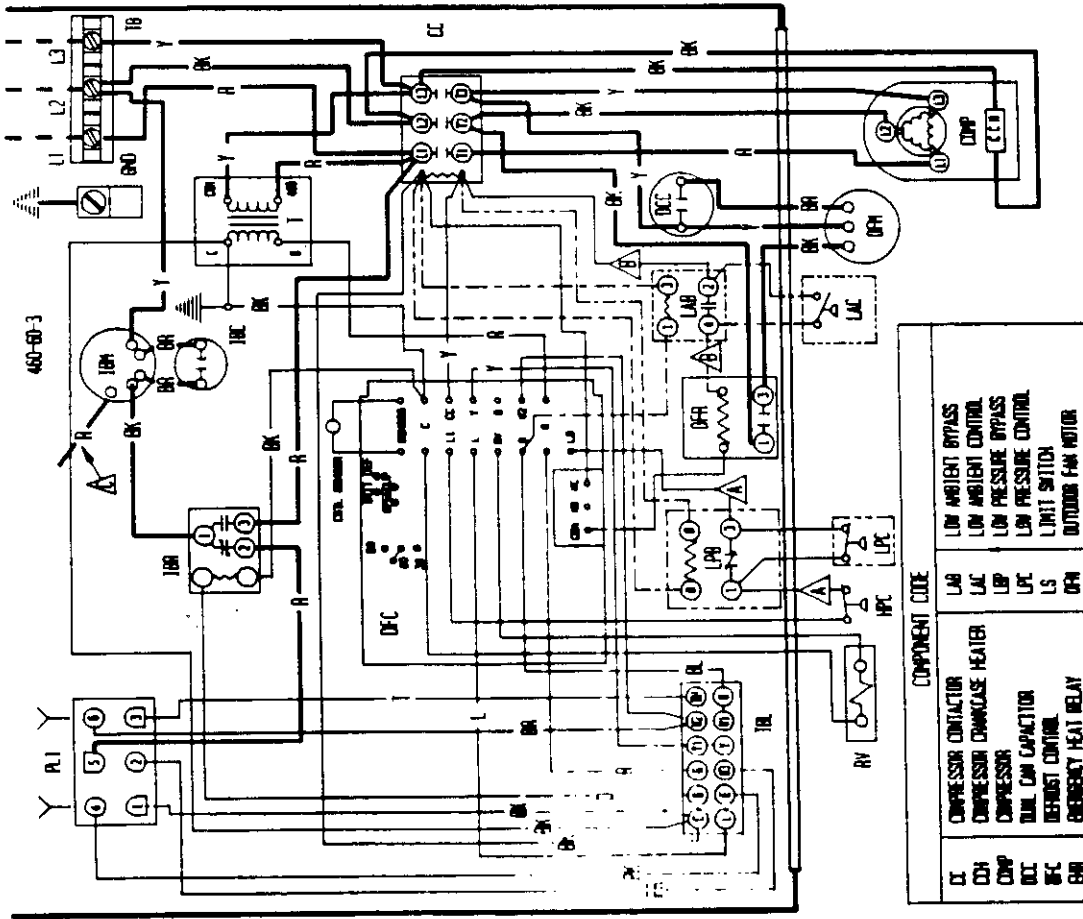
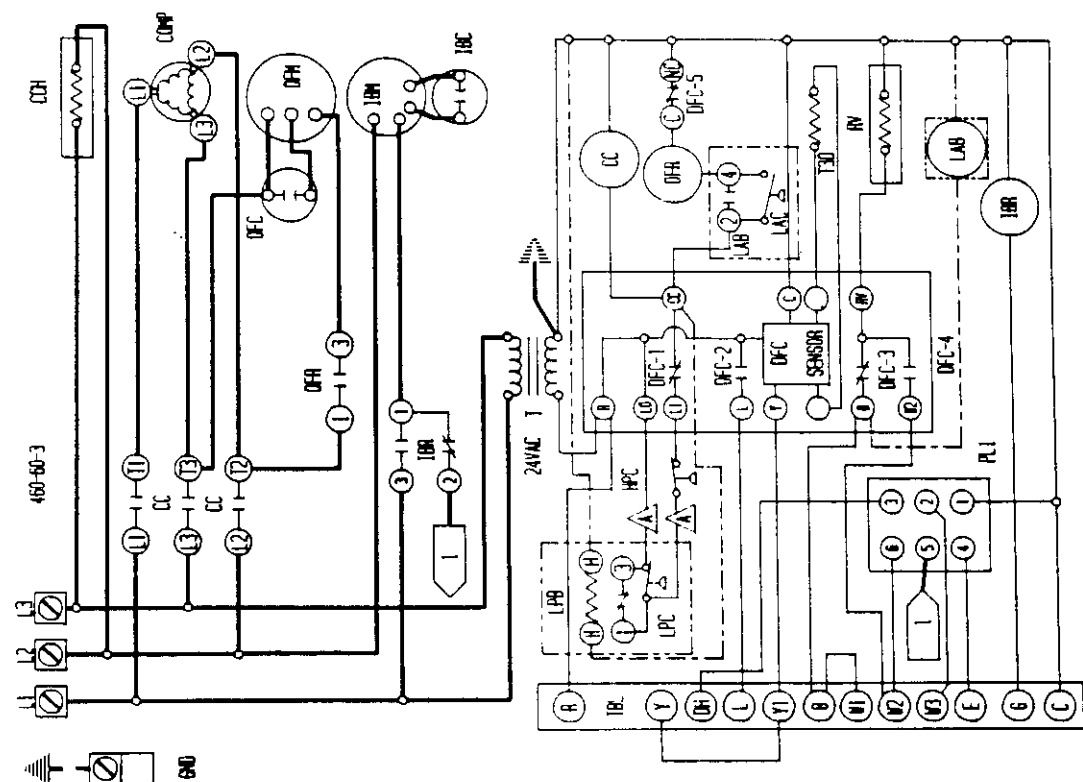
| | | |
|----------------------------|-----|-----|
| HIGH VOLTAGE ACCESSORY | --- | --- |
| LOW VOLTAGE ACCESSORY | --- | --- |
| TERMINAL BLOCK | --- | --- |
| LOW VOLTAGE TERMINAL BLOCK | --- | --- |
| INDOOR BLOWER MOTOR | --- | --- |
| INDOOR BLOWER CAPACTOR | --- | --- |
| HEATER CONTACTOR #1 | --- | --- |
| HEATER CONTACTOR #2 | --- | --- |
| EMERGENCY SHUTDOWN | --- | --- |
| EMERGENCY HEAT RELAY | --- | --- |
| DEFROST CONTROL | --- | --- |
| COMPRESSOR | --- | --- |
| COMPRESSOR CONTACTOR | --- | --- |
| CIRCUIT BREAKER #1 | --- | --- |
| CIRCUIT BREAKER #2 | --- | --- |
| INDOOR BLOWER MOTOR | --- | --- |
| INDOOR BLOWER CAPACTOR | --- | --- |
| LOW VOLTAGE TERMINAL BLOCK | --- | --- |
| TERMINAL BLOCK | --- | --- |
| TRANSFORMER | --- | --- |
| PLUS #1 | --- | --- |
| OUTDOOR FAN RELAY | --- | --- |
| OUTDOOR FAN MOTOR | --- | --- |
| OUTDOOR FAN CAPACTOR | --- | --- |
| LIMIT SWITCH | --- | --- |
| LOW PRESSURE CONTROL | --- | --- |
| LOW PRESSURE BYPASS | --- | --- |
| LOW AMBIENT CONTROL | --- | --- |
| LOW AMBIENT BYPASS CONTROL | --- | --- |
| INDOOR BLOWER RELAY | --- | --- |

BAIRD MFG. CO.

DWG. 4856-210 B

DATE 9-16-92

DRK./APP.



BARD MFG. CO.
 DWG. 408F-310 B
 DATE 9-16-50
 DR./APPR.

| | | | | |
|-----|--------|-------|--------|------|
| T | PK | L | S | DATE |
| TAM | PINK | LAYER | | |
| Y | VIOLET | (PH) | CT | (S) |
| 6 | GREEN | BL | WHITE | |
| BL | BLUE | GR | ORANGE | |
| GR | RED | OR | BLACK | |
| OR | BLACK | Y | YELLOW | |
| BLK | BLACK | 6 | GREEN | |
| | | BL | BLUE | |
| | | GR | ORANGE | |
| | | OR | RED | |
| | | Y | VIOLET | |
| | | PK | PINK | |
| | | L | LAYER | |

▲ Labeled wires connect if no options used.
 ▲ RED (LOW) BLACK (HIGH)
 FACTORY SD. FIELD OPTIONAL
 HIGH VOLTAGE LOW VOLTAGE ACCESSORY

| | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|-------------------|----------------------|---------------------|---------------------|---------------------|---------------------|---------------------|----------------|----------------------------|----------------------------|
| DC | COMP | CC | DFC | EN | EM | HI | W2 | W1 | WPC | WIC | WIR | WBR |
| LOW AMBIENT BYPASS | COMPRESSOR CAPACITOR | DEFROST CONTROL | OUTDOOR FAN MOTOR | EMERGENCY HEAT RELAY | GROUND | HEAT STRIP #1 | HEAT STRIP #2 | HEATER CONTACTOR #1 | HEATER CONTACTOR #2 | WINDMOTOR | WINDMOTOR CAPACITOR | WINDMOTOR RELAY |
| LAB | LAC | LPC | LS | OPH | PLI | PO | PK | SK | T | TR | TIL | TOD |
| LOW AMBIENT BYPASS | LOW PRESSURE BYPASS | LOW PRESSURE CONTROL | LIMIT SWITCH | OUTDOOR FAN MOTOR | OUTDOOR FAN RELAY | PLUS #1 | REV. VALVE SOLINOID | FULL DISCONNECT | KEY VALVE SOLINOID | START KIT | TRANSFORMER | TERMINAL BLOCK |
| LOW PRESSURE BYPASS | LOW PRESSURE CONTROL | LIMIT SWITCH | OUTDOOR FAN MOTOR | OUTDOOR FAN RELAY | PLUS #1 | REV. VALVE SOLINOID | FULL DISCONNECT | KEY VALVE SOLINOID | START KIT | TRANSFORMER | TERMINAL BLOCK | LOW VOLTAGE TERMINAL BLOCK |
| LOW PRESSURE CONTROL | LIMIT SWITCH | OUTDOOR FAN MOTOR | OUTDOOR FAN RELAY | PLUS #1 | REV. VALVE SOLINOID | FULL DISCONNECT | KEY VALVE SOLINOID | START KIT | TRANSFORMER | TERMINAL BLOCK | LOW VOLTAGE TERMINAL BLOCK | THEORETICAL OUTLET |