

# **INSTALLATION INSTRUCTIONS**

## **WALL MOUNTED PACKAGE AIR CONDITIONERS**

### **MODELS**

**WA421**

**WA481**

**WA601**

**PATENT PENDING**

**DATE: 03-15-93**

**MANUAL 2100-218 REV. A  
SUPERSEDES REV.  
FILE VOL. III, TAB 16**

## 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<br>Air Conditioning and Ventilating Systems              | -ANSI/NFPA 90A |
| Standard For Warm Air Heating<br>and Air Conditioning Systems                             | -ANSI/NFPA 90B |
| Load Calculation For Residential<br>Winter and Summer Air Conditioning                    | -ACCA Manual J |
| Duct Design For Residential Winter and Summer<br>Air Conditioning and Equipment Selection | -ACCA Manual D |

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### FOR MORE INFORMATION, CONTACT THESE PUBLISHERS

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

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# PART 1 -- WALL MOUNT GENERAL INFORMATION

## AIR CONDITIONER WALL MOUNT MODEL NOMENCLATURE

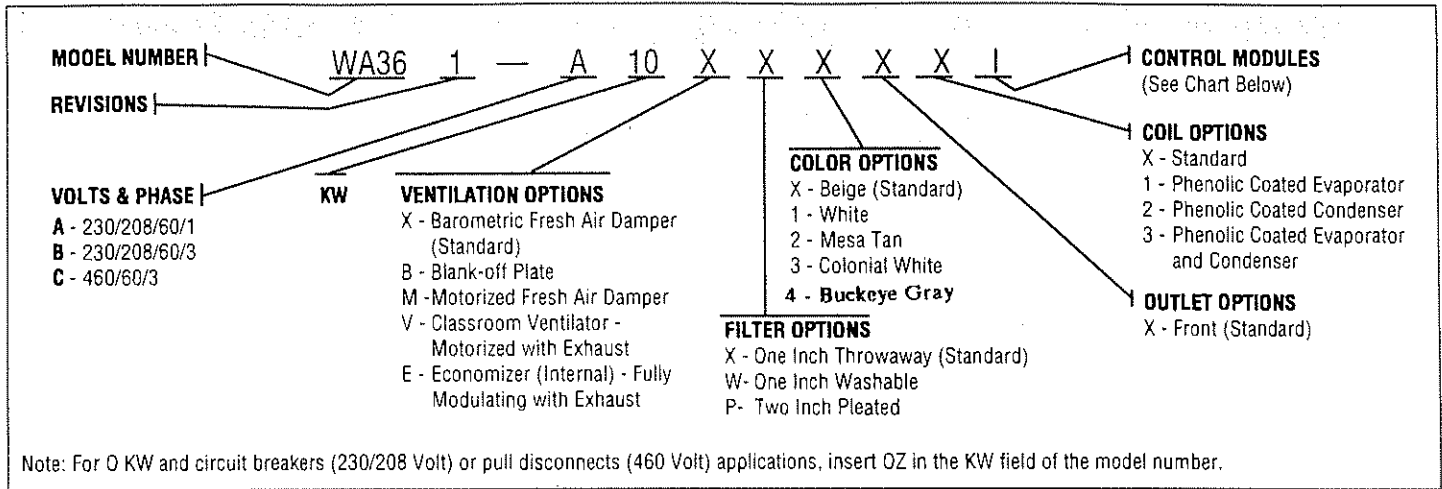


TABLE 1 ELECTRIC HEAT TABLE

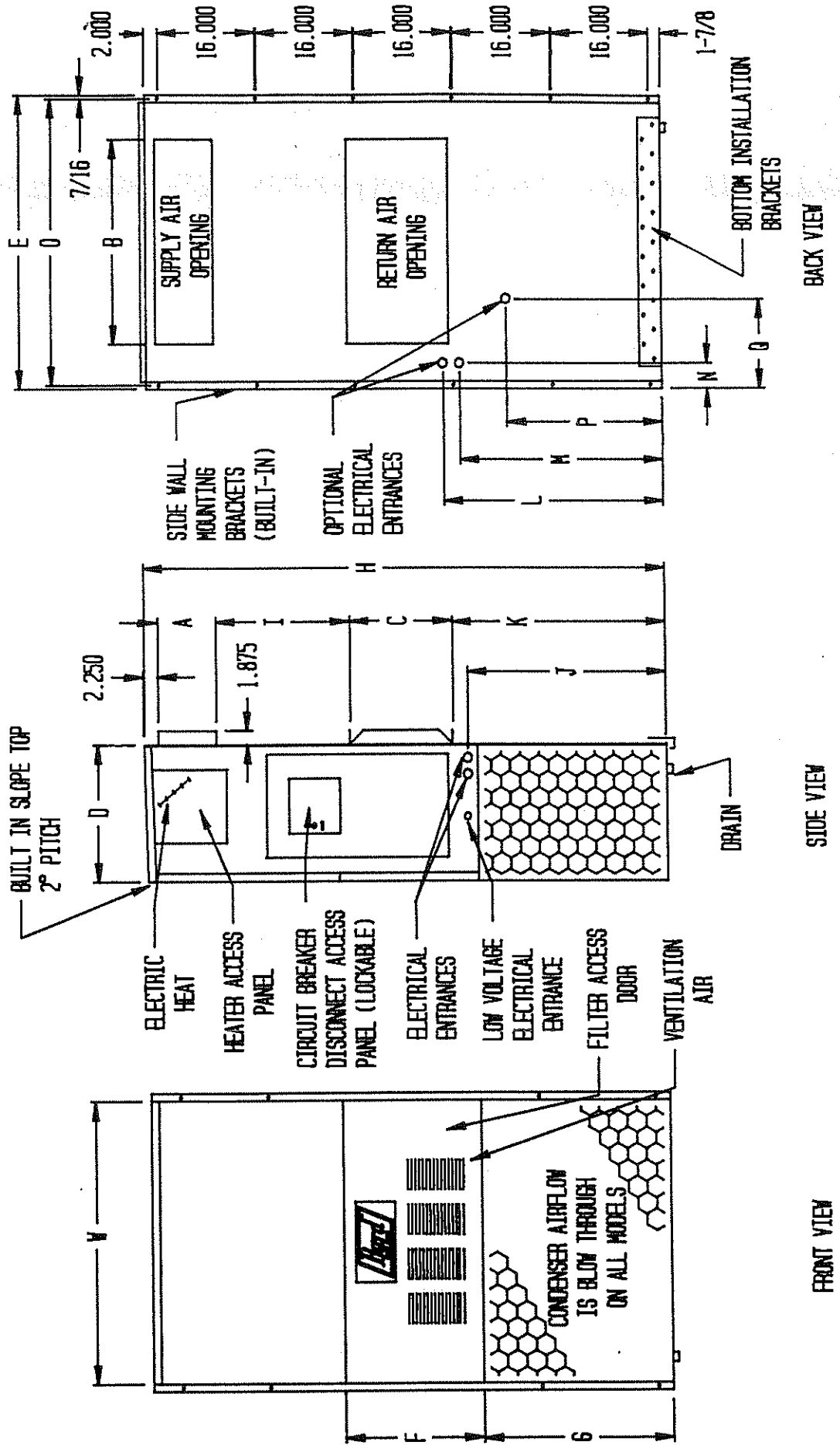
| Models | WA421-A |       | WA421-B |       | WA421-C |       |       |       |       |       |
|--------|---------|-------|---------|-------|---------|-------|-------|-------|-------|-------|
|        | WA481-A |       | WA481-B |       | WA481-C |       |       |       |       |       |
|        | WA601-A |       | WA601-B |       | WA601-C |       |       |       |       |       |
| KW     | 240-1   |       | 208-1   |       | 240-3   |       | 208-3 |       | 460-3 |       |
|        | A       | BTU   | A       | BTU   | A       | BTU   | A     | BTU   | A     | BTU   |
| 5      | 20.8    | 17050 | 18.1    | 12800 |         |       |       |       |       |       |
| 9      |         |       |         |       | 21.7    | 30600 | 18.7  | 23030 | 10.8  | 30700 |
| 10     | 41.6    | 34130 | 36.2    | 25600 |         |       |       |       |       |       |
| 15     | 62.5    | 51200 | 54.1    | 38400 | 36.2    | 51200 | 31.2  | 38400 | 17.3  | 47000 |
| 18     |         |       |         |       | 43.3    | 61430 | 37.5  | 46100 |       |       |
| 20     | 83.2    | 68260 | 72.1    | 51200 |         |       |       |       |       |       |

### 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 MTS-411

| 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      | C      |        |    |          |    |        |        |       |    |        |    |   |   |   |
| 42 & 60 | 42        | 22-1/4    | 84-7/8     | 9-7/8  | 29-7/8 | 15-7/8 | 29-7/8 | 43-7/8 | 31-5/8 | 30 | 32-11/16 | 27 | 34-3/4 | 32-1/2 | 3-1/4 | 43 | 23-7/8 | 10 |   |   |   |



ELECTRICAL SPECIFICATIONS

TABLE 2

| SINGLE CIRCUIT |                       |                       |                              |  |                           |                      | DUAL CIRCUIT                 |       |   |       |                           |       |                      |       |
|----------------|-----------------------|-----------------------|------------------------------|--|---------------------------|----------------------|------------------------------|-------|---|-------|---------------------------|-------|----------------------|-------|
| Model          | Rated Volts and Phase | No. Field Power Ckts. | (3) Minimum Circuit Ampacity | (1) Maximum External Fuse Or Circuit Breaker | (2) Field Power Wire Size | (2) Ground Wire Size | (3) Minimum Circuit Ampacity |       | (1) Maximum External Fuse Or Ckt. Breaker |       | (2) Field Power Wire Size |       | (2) Ground Wire Size |       |
|                |                       |                       |                              |  |                           |                      | Ckt A                        | Ckt B | Ckt A                                     | Ckt B | Ckt A                     | Ckt B | Ckt A                | Ckt B |
|                |                       |                       |                              |  |                           |                      |                              |       |   |       |                           |       |                      |       |
| WA421-A00,A0Z  | 230/208-1             | 1                     | 32                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A05            |                       | 1                     | 31                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A10            |                       | 1                     | 56                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A15            |                       | 1 or 2                | 83                           | 90   | 4                         | 8                    | 56                           | 26    | 60  | 30    | 6                         | 10    | 10                   | 10    |
| A20            |                       | 1 or 2                | 108                          | 110  | 2                         | 6                    | 56                           | 52    | 60  | 60    | 6                         | 6     | 10                   | 10    |
| WA421-B00,BOZ  | 230/208-3             | 1                     | 22                           | 35   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B09            |                       | 1                     | 32                           | 35   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B15            |                       | 1                     | 50                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B18            |                       | 1                     | 59                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| WA421-C00,COZ  | 460-3                 | 1                     | 11                           | 15   | 14                        | 14                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C09            |                       | 1                     | 16                           | 20   | 12                        | 12                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C15            |                       | 1                     | 25                           | 25   | 10                        | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| WA481-A00,A0Z  | 230/208-1             | 1                     | 36                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A05            |                       | 1                     | 36                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A10            |                       | 1                     | 56                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A15            |                       | 1 or 2                | 83                           | 90   | 4                         | 8                    | 56                           | 26    | 60  | 30    | 6                         | 10    | 10                   | 10    |
| A20            |                       | 1 or 2                | 108                          | 110  | 2                         | 6                    | 56                           | 52    | 60  | 60    | 6                         | 6     | 10                   | 10    |
| WA481-B00,BOZ  | 230/208-3             | 1                     | 24                           | 35   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B09            |                       | 1                     | 32                           | 35   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B15            |                       | 1                     | 50                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B18            |                       | 1                     | 59                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| WA481-C00,COZ  | 460-3                 | 1                     | 12                           | 15   | 14                        | 14                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C09            |                       | 1                     | 16                           | 20   | 12                        | 12                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C15            |                       | 1                     | 25                           | 25   | 10                        | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| WA601-A00,A0Z  | 230/208-1             | 1                     | 42                           | 60   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A05            |                       | 1                     | 42                           | 60   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A10            |                       | 1                     | 56                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| A15            |                       | 1 or 2                | 83                           | 90   | 4                         | 8                    | 56                           | 26    | 60  | 30    | 6                         | 10    | 10                   | 10    |
| A20            |                       | 1 or 2                | 108                          | 110  | 2                         | 6                    | 56                           | 52    | 60  | 60    | 6                         | 6     | 10                   | 10    |
| WA601-B00,BOZ  | 230/208-3             | 1                     | 30                           | 45   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B09            |                       | 1                     | 32                           | 45   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B15            |                       | 1                     | 50                           | 50   | 8                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| B18            |                       | 1                     | 59                           | 60   | 6                         | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| WA601-C00,COZ  | 460-3                 | 1                     | 15                           | 20   | 12                        | 12                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C09            |                       | 1                     | 16                           | 20   | 12                        | 12                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |
| C15            |                       | 1                     | 25                           | 25   | 10                        | 10                   | N/A                          | N/A   | N/A                                       | N/A   | N/A                       | N/A   | N/A                  | N/A   |

- (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) 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 conductors 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

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 8 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.

A 1/4-inch clearance to combustible material for the first three feet of duct attached to the outlet air frame is required. See Pages 5, 6 and 7 Wall Mounting Instructions and Figures 2 and 2A for further details.

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. Two holes, for the supply and return air openings, must be cut through the wall as shown in Figure 2.
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. **WARNING:** Fire hazard can result if 1/4-inch clearance to combustible materials for supply air duct is not maintained. See Figure 2.
3. Concrete block walls must be thoroughly inspected to insure that they are capable of carrying the weight of the installing unit.

### MOUNTING THE UNIT

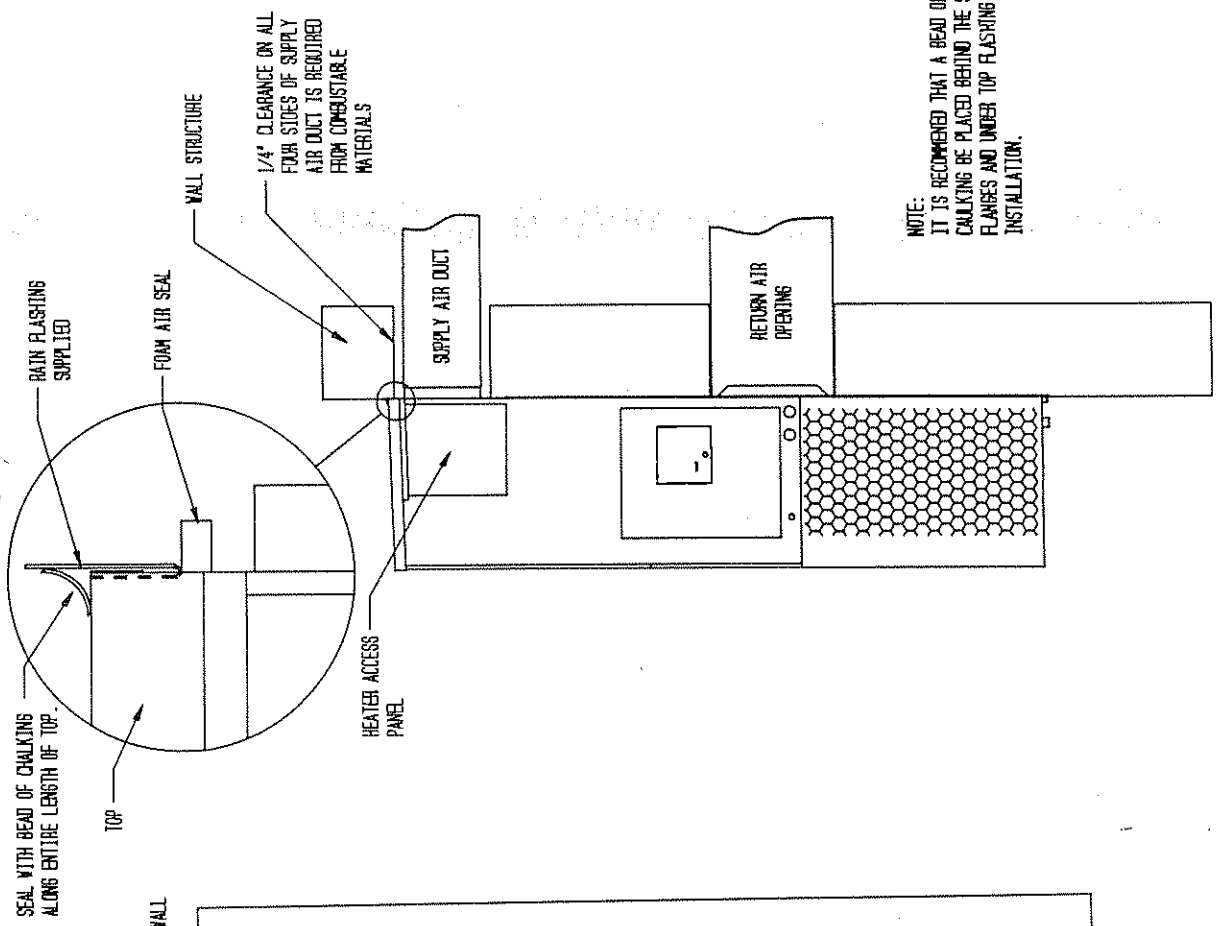
1. These units are secured by wall mounting brackets which secure the unit to the outside wall surface at both sides. A bottom mounting bracket is provided for ease of installation.
2. The unit itself is suitable for "0" inch clearance, but the supply air duct flange and the first three feet of supply air duct require a minimum of 1/4-inch clearance to combustible material. If a combustible wall, use a minimum of 30-1/2" x 10-1/2" dimensions for sizing. However, it is generally recommended that a 1" clearance is used for ease of installation and maintaining the required clearance to combustible material. The supply air opening would then be 32" x 12". See Figures 2 and 2A for details.

\*\*\*\*\*  
**WARNING:** Failure to provide the 1/4-inch clearance between the supply duct and a combustible surface for the first three feet of duct can result in fire.  
\*\*\*\*\*

3. Locate and mark lag bolt locations and bottom mounting bracket location. See Figure 2.
4. Mount bottom mounting bracket.
5. Hook top rain flashing under back bend of top. Top rain flashing is shipped secured to the right side of the back.
6. Position unit in opening and secure with 5/16 lag bolts; use 7/8 inch diameter flat washers on the lag bolts.
7. Secure rain flashing to wall and caulk across entire length of top. See Figure 2.
8. 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.
9. On side by side installations, maintain a minimum of 20 inches clearance on right side to allow access to heat strips and control panel and to 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.

|   | A      | B      | C     | D      | E      |
|---|--------|--------|-------|--------|--------|
| REQUIRED DIMENSIONS TO MAINTAIN 1/4" MIN. CLEARANCE FROM COMBUSTIBLE MATERIALS      | 30 1/2 | 10 1/2 | 6 1/4 | 1 5/16 | 29 1/2 |
| REQUIRED DIMENSIONS TO MAINTAIN RECOMMENDED 1" CLEARANCE FROM COMBUSTIBLE MATERIALS | 32     | 12     | 5 1/2 | 9/16   | 28     |

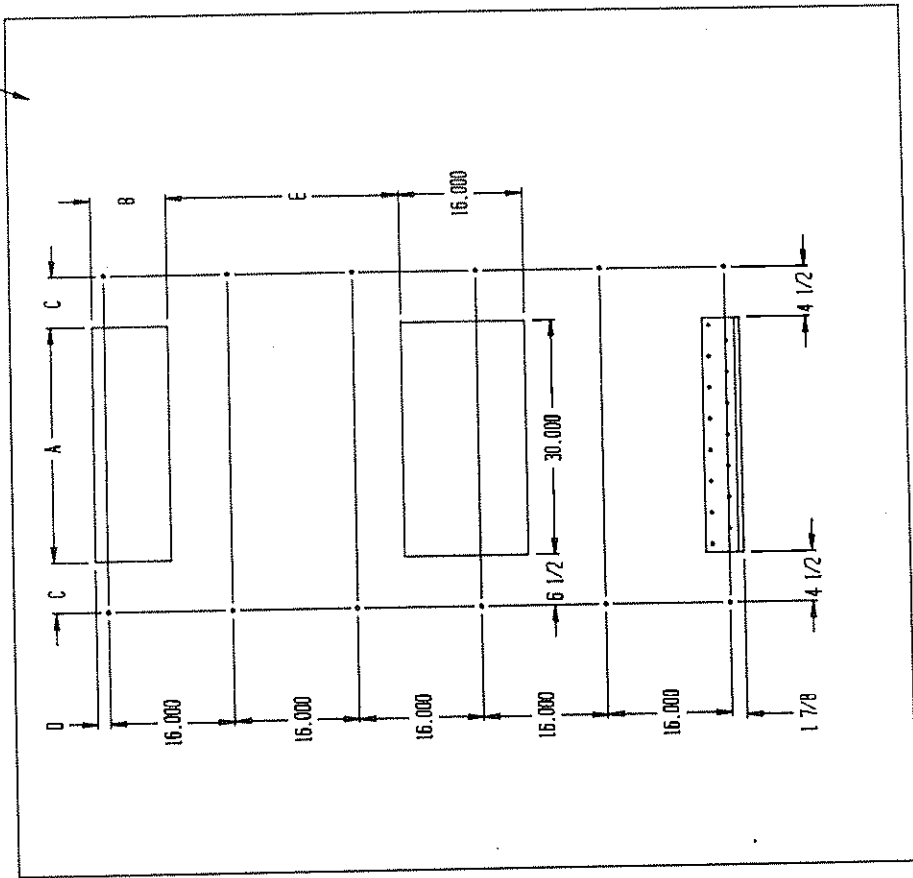
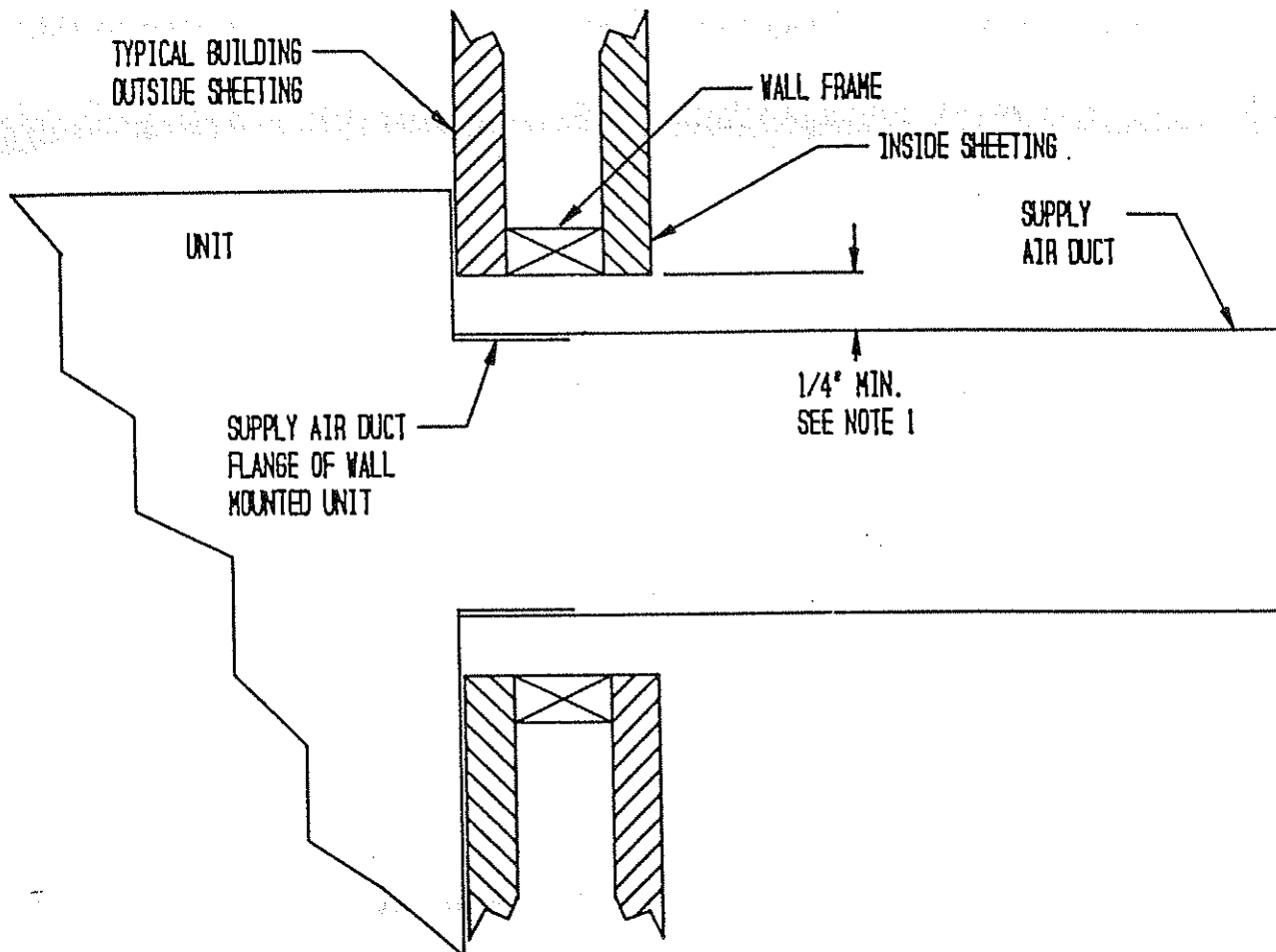


FIGURE 2A  
ELECTRIC HEAT CLEARANCE



Side section view of supply air duct for wall mounted unit showing 1/4" clearance to combustible surfaces.

NOTE 1:

| WARNING  |
|--|
| A <u>minimum</u> of 1/4" clearance must be maintained between the supply air duct and combustible materials. This is required for the first 3 feet of ducting. |
| It is important to insure that the 1/4" minimum spacing is maintained at all points.   |
| Failure to do this could result in overheating the combustible material and may result in a fire.  |

**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).

Five (5) wires should be run from thermostat subbase to the 24V terminal board in the unit. A five conductor, 18 gauge copper, color-coded thermostat cable is recommended. The connection points are shown in Figure 3.

TABLE 3 THERMOSTAT WIRE SIZE

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

TABLE 3A WALL THERMOSTAT AND SUBBASE COMBINATIONS

| Thermostat | Subbase   | Predominate Features                |
|------------|-----------|-------------------------------------|
| 8403-019   | 8404-012  | 1 stage cool, 2 stage heat          |
| T874C1760  | Q674A1001 | System: heat-auto-cool Fan: on-auto |
| 8403-002   | 8404-003  | 1 stage heat, 1 stage cool          |
| T87F3111   | Q539A1220 | System: heat-off-cool Fan: on-auto  |
| 8403-009   | ----      | 1 stage heat, 1 stage cool          |
| 1F56-318   |           |                                     |

FIGURE 3

LOW VOLTAGE WIRING

T87F OR 1F56  
THERMOSTAT



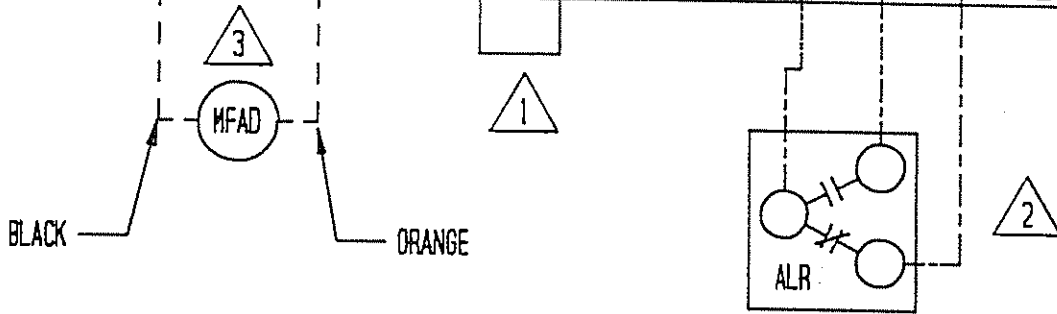
1 STAGE COOL  
1 STAGE HEAT  
THERMOSTAT

T874C1760  
Q674A1001  
THERMOSTAT



1 STAGE COOL  
2 STAGE HEAT  
THERMOSTAT

UNIT 24V  
TERMINAL BLOCK



REMOVE JUMPER FOR 2 STAGE ELECTRIC HEAT ON UNITS WITH 15 OR MORE KW



OPTIONAL ALARM RELAY PROVIDED ON UNITS WITH CONTROL MODULE "M" OR "J" INSTALLED. CONTACT RATING 24VAC @ 125VA



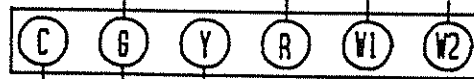
OPTIONAL MOTORIZED FRESH AIR DAMPER SUGGESTED HOOK UP

OPTIONAL ECONOMIZER LOW VOLTAGE WIRING

T874D1934  
Q674A1001  
THERMOSTAT



UNIT 24V  
TERMINAL STRIP



ECONOMIZER WIRING  
HARNES



## PART 3 -- START-UP

### **IMPORTANT INSTALLER NOTE**

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

### **CRANKCASE HEATERS**

WA421 units are provided with compressor crankcase heat. WA601 and WA481 units are not provided with crankcase heat. These units utilize scroll compressors which do not require crankcase in this application.

The WA421 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 on these units.

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 4 is affixed to all WA421 units detailing start-up procedure. This is very important. Please read carefully.

### **HIGH PRESSURE SWITCH**

The WA481 and WA601 models are supplied with a remote reset high pressure switch. If tripped, this pressure switch may be reset by turning the thermostat off then back on again.

### **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. Check all power fuses or circuit breakers to be sure they are the correct rating.
4. 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. On a call for heating, circuit R-W1 make at the thermostat pulling in heat contact for the strip heat and blower operation. On a call for second stage heat, R-W2 makes bringing on second heat contactor, if so equipped.

FIGURE 4

## **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

## 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. It is imperative to match the correct pressure curve to the unit by model number.

## PART 4 -- TROUBLESHOOTING

### 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 5

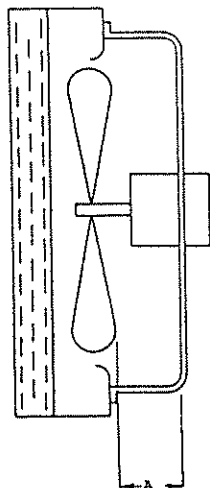


TABLE 4

| Model                   | Dimension A |
|-------------------------|-------------|
| WA421<br>WA481<br>WA601 | 1.75        |

### 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 5

| Model | Rated Airflow | 95° F OD Temperature | 82° F OD Temperature |
|-------|---------------|----------------------|----------------------|
| WA421 | 1400          | 52 - 54              | 64 - 66              |
| WA481 | 1550          | 54 - 56              | 65 - 67              |
| WA601 | 1700          | 53 - 55              | 60 - 62              |

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

TABLE 6 INDOOR BLOWER PERFORMANCE--CFM @ 230V

| E.S.P.<br>In H2O | WA421, WA481 |              | WA601        |              |
|------------------|--------------|--------------|--------------|--------------|
|                  | Lo 230V      | Hi 230V      | Lo 230V      | Hi 230V      |
|                  | Dry/Wet Coil | Dry/Wet Coil | Dry/Wet Coil | Dry/Wet Coil |
| .0               | 1650 / 1600  | 1885 / 1800  | 1600 / 1450  | 2200 / 2000  |
| .1               | 1550 / 1500  | 1770 / 1665  | 1525 / 1375  | 2100 / 1900  |
| .2               | 1450 / 1400  | 1635 / 1540  |              | 2000 / 1800  |
| .3               | 1350 / 1300  | 1500 / 1400  |              | 1875 / 1700  |
| .4               | 1300 / 1175  | 1370 / 1285  |              | 1775 / 1600  |
| .5               | ---          | 1250 / 1150  |              | 1650 / 1475  |

TABLE 7

| Model | Rated CFM* | Rated ESP* | Recommended Airflow Range |
|-------|------------|------------|---------------------------|
| WA421 | 1400       | .30        | 1600 - 1150               |
| WA481 | 1550       | .20        | 1750 - 1285               |
| WA601 | 1700       | .30        | 1950 - 1375               |

\*Rated CFM and ESP on high speed tap.

## MAXIMUM ESP OF OPERATION

TABLE 8

### ELECTRIC HEAT ONLY

| Model | WA421      |           | WA481      |           | WA601      |           |
|-------|------------|-----------|------------|-----------|------------|-----------|
|       | High Speed | Low Speed | High Speed | Low Speed | High Speed | Low Speed |
| -A05  | .50        | .50       | .50        | .50       | .50        | .50       |
| -A10  | .50        | .50       | .50        | .50       | .50        | .50       |
| -A15  | .50        | .50       | .50        | .50       | .50        | .50       |
| -A20  | .50        | .45       | .50        | .45       | .50        | .40       |
| -B00  | .50        | .50       | .50        | .50       | .50        | .50       |
| -B09  | .50        | .50       | .50        | .50       | .50        | .50       |
| -B15  | .50        | .50       | .50        | .50       | .50        | .50       |
| -B18  | .50        | .50       | .50        | .50       | .50        | .50       |
| -C09  | .50        | .50       | .50        | .50       | .50        | .50       |
| -C15  | .50        | .50       | .50        | .50       | .50        | .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 9

## COOLING

Air Temperature Entering Outdoor Coil °F

| Model | Return Air Temperature | Pressure  | °   | °   | °   | °   | °   | °   | °   | °   | °   |
|-------|------------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|       |                        |           | 75  | 80  | 85  | 90  | 95  | 100 | 105 | 110 | 115 |
| WA421 | 75 deg. DB             | Low Side  | 68  | 71  | 74  | 76  | 78  | 80  | 81  | 83  | 84  |
|       | 62 deg. WB             | High Side | 213 | 228 | 243 | 259 | 274 | 290 | 305 | 321 | 337 |
|       | 80 deg. DB             | Low Side  | 72  | 76  | 79  | 82  | 84  | 86  | 88  | 89  | 90  |
|       | 67 deg. WB             | High Side | 218 | 234 | 249 | 265 | 281 | 297 | 313 | 330 | 346 |
|       | 85 deg. DB             | Low Side  | 78  | 82  | 85  | 88  | 90  | 92  | 94  | 96  | 97  |
|       | 72 deg. WB             | High Side | 226 | 242 | 258 | 274 | 290 | 307 | 323 | 341 | 358 |
| WA481 | 75 deg. DB             | Low Side  | 73  | 74  | 76  | 78  | 79  | 80  | 82  | 83  | 84  |
|       | 62 deg. WB             | High Side | 204 | 217 | 232 | 248 | 265 | 284 | 304 | 325 | 348 |
|       | 80 deg. DB             | Low Side  | 78  | 79  | 81  | 82  | 84  | 86  | 87  | 89  | 90  |
|       | 67 deg. WB             | High Side | 210 | 223 | 238 | 254 | 272 | 291 | 312 | 334 | 357 |
|       | 85 deg. DB             | Low Side  | 84  | 85  | 87  | 88  | 90  | 92  | 93  | 95  | 97  |
|       | 72 deg. WB             | High Side | 217 | 231 | 247 | 264 | 282 | 302 | 323 | 345 | 369 |
| WA601 | 75 deg. DB             | Low Side  | 71  | 72  | 74  | 75  | 76  | 77  | 78  | 78  | 79  |
|       | 62 deg. WB             | High Side | 233 | 247 | 262 | 278 | 295 | 313 | 331 | 351 | 371 |
|       | 80 deg. DB             | Low Side  | 76  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  |
|       | 67 deg. WB             | High Side | 237 | 253 | 269 | 285 | 303 | 321 | 340 | 360 | 381 |
|       | 85 deg. DB             | Low Side  | 84  | 85  | 85  | 86  | 87  | 88  | 89  | 90  | 91  |
|       | 72 deg. WB             | High Side | 245 | 261 | 278 | 296 | 314 | 333 | 353 | 373 | 394 |

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

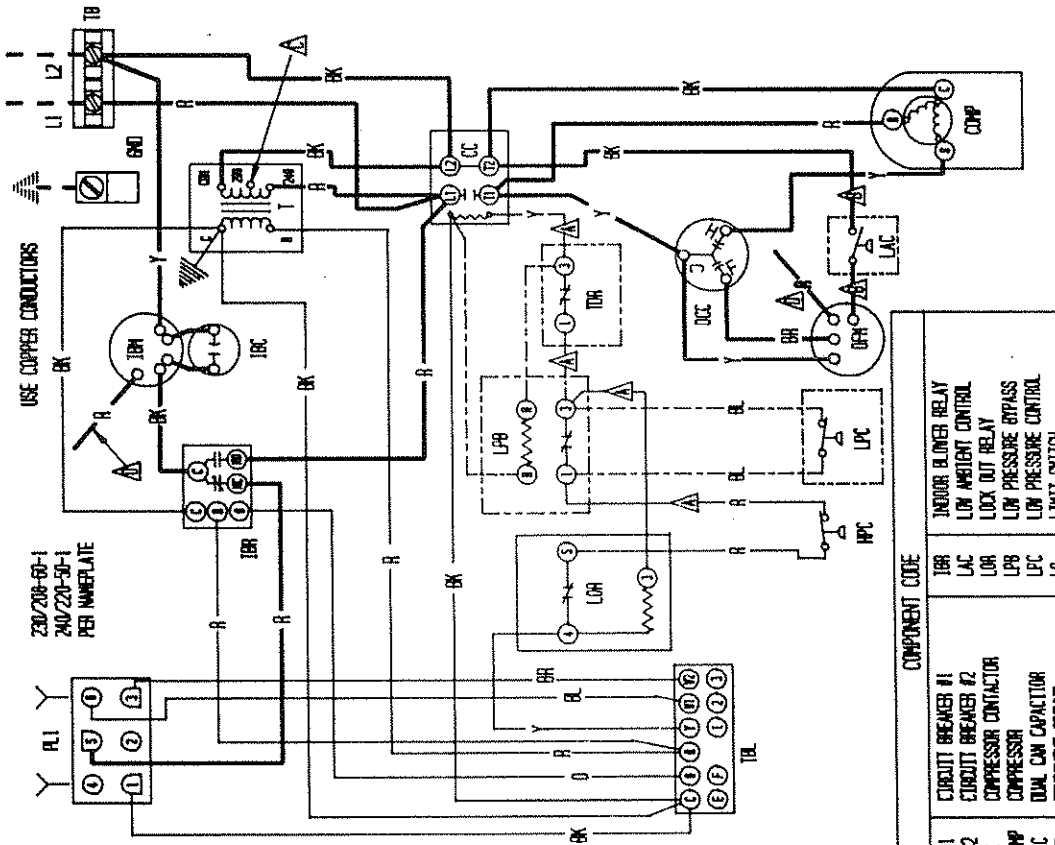
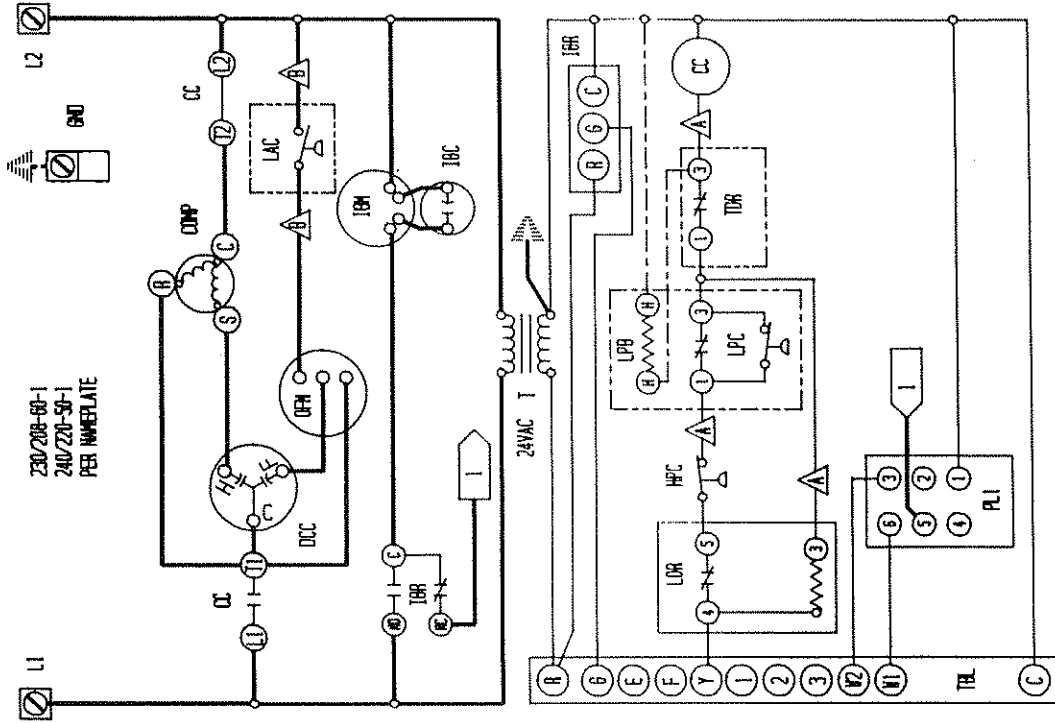
Tables are based upon rated CFM (airflow) across the evaporator coil and should be found under section titled "Refrigerant Charge" elsewhere in manual. If there is any doubt as to correct operating charge being in the system, the charge should be removed, system evacuated, and recharged to serial plate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

TABLE 10

## OPTIONAL ACCESSORIES

| Model      | Description                         | W | W | W | W | W | W | W | W | W |
|------------|-------------------------------------|---|---|---|---|---|---|---|---|---|
|            |                                     | A | A | A | A | A | A | A | A | A |
|            |                                     | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 6 | 6 |
|            |                                     | 2 | 2 | 2 | 8 | 8 | 8 | 1 | 0 | 0 |
|            |                                     | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
|            |                                     | - | - | - | - | - | - | - | - | - |
|            |                                     | A | B | C | A | B | C | A | B | C |
| EHWA05-A05 | Heater Packages                     | X |   |   | X |   |   | X |   |   |
| EHWA05-A08 | Heater Packages                     | X |   |   | X |   |   | X |   |   |
| EHWA05-A10 | Heater Packages                     | X |   |   | X |   |   | X |   |   |
| EHWA05-A15 | Heater Packages                     | X |   |   | X |   |   | X |   |   |
| EHWA05-B09 | Heater Packages                     |   | X |   |   | X |   |   | X |   |
| EHWA05-B15 | Heater Packages                     |   | X |   |   | X |   |   | X |   |
| EHWA05-B18 | Heater Packages                     |   | X |   |   | X |   |   | X |   |
| EHWC05-C05 | Heater Packages                     |   |   | X |   |   | X |   |   | X |
| EHWA05-C15 | Heater Packages                     |   |   | X |   |   | X |   |   | X |
| BOP-5      | Blank Off Plate                     | X | X | X | X | X | X | X | X | X |
| BFAD-5     | Barometric Fresh Air Damper         | X | X | X | X | X | X | X | X | X |
| MFAD-5     | Motorized Fresh Air Damper          | X | X | X | X | X | X | X | X | X |
| CRV-5      | Classroom Ventilator With Exhaust   | X | X | X | X | X | X | X | X | X |
| EIFM-5     | Economizer With Exhaust             | X | X | X | X | X | X | X | X | X |
| CMA-1      | High Pressure Control (HPC)         | X | X | X |   |   |   |   |   |   |
| CMA-2      | Low Pressure Control (LPC)          | X | X | X |   |   |   |   |   |   |
| CMA-4      | Low and High Pressure Control       | X | X | X |   |   |   |   |   |   |
| CMA-5      | Time Delay Relay (TDR)              | X | X | X | X | X | X | X | X | X |
| CMA-6      | Low Ambient Control (LAC)           | X | X |   | X | X |   | X | X |   |
| CMA-8      | TDR + HPC                           | X | X | X |   |   |   |   |   |   |
| CMA-10     | LPC + HPC + TDR                     | X | X | X |   |   |   |   |   |   |
| CMA-11     | LPC + HPC + LAC                     | X | X |   |   |   |   |   |   |   |
| CMA-12     | LAC + TDR                           | X | X |   |   |   |   |   |   |   |
| CMA-13     | LPC + HPC + TDR + LAC + Alarm Relay | X | X |   |   |   |   |   |   |   |
| CMC-15     | Start Kit                           | X |   |   |   |   |   |   |   |   |
| CMA-16     | Low Pressure Control                |   |   |   | X | X | X | X | X | X |
| CMA-17     | LPC & TDR                           |   |   |   | X | X | X | X | X | X |
| CMA-18     | LPC & LAC                           |   |   |   | X | X |   | X | X |   |
| CMA-19     | LAC & TDR                           |   |   |   | X | X |   | X | X |   |
| CMC-20     | LAC & TDR & LPC                     |   |   |   | X | X |   | X | X |   |
| WMCB-05B   | Circuit Breaker Kit                 |   | X |   |   | X |   |   |   |   |
| WMPD-01C   | Pull Disconnect Kit                 |   |   | X |   |   | X |   |   | X |
| WMCB-08A   | Circuit Breaker Kit                 | X |   |   | X |   |   |   |   |   |
| WMCB-09A   | Circuit Breaker Kit                 |   |   |   |   |   |   | X |   |   |
| WMCB-07B   | Circuit Breaker Kit                 |   |   |   |   |   |   |   | X |   |





230/208-60-1  
240/220-50-1  
PER NAMEPLATE

230/208-60-1  
240/220-50-1  
PER NAMEPLATE

USE COPPER CONDUCTORS

| COMPONENT CODE |                            |
|----------------|----------------------------|
| CB1            | CIRCUIT BREAKER #1         |
| CB2            | CIRCUIT BREAKER #2         |
| CC             | COMPRESSOR CONTACTOR       |
| COMP           | COMPRESSOR                 |
| DUAL           | DUAL CAPACITOR             |
| EQUIP          | EQUIPMENT GROUND           |
| H1             | HEAT STRIP #1              |
| H2             | HEAT STRIP #2              |
| HC1            | HEATER CONTACTOR #1        |
| HC2            | HEATER CONTACTOR #2        |
| HPC            | HIGH PRESSURE CONTROL      |
| IBC            | INDOOR BLOWER CONTACTOR    |
| IBN            | INDOOR BLOWER MOTOR        |
| IBR            | INDOOR BLOWER RELAY        |
| LAC            | LOW AMBIENT CONTROL        |
| LOR            | LOCK OUT RELAY             |
| LPS            | LOW PRESSURE BYPASS        |
| LPC            | LOW PRESSURE CONTROL       |
| LS             | LIMIT SWITCH               |
| OFN            | OUTDOOR FAN MOTOR          |
| PL1            | PLUG #1                    |
| SK             | START KIT                  |
| T              | TRANSFORMER                |
| TB             | TERMINAL BLOCK             |
| TL             | TERMINAL BLOCK             |
| TCD            | LOW VOLTAGE TERMINAL BLOCK |
| TDO            | THERMAL OFF                |
| TDR            | TIME DELAY RELAY           |

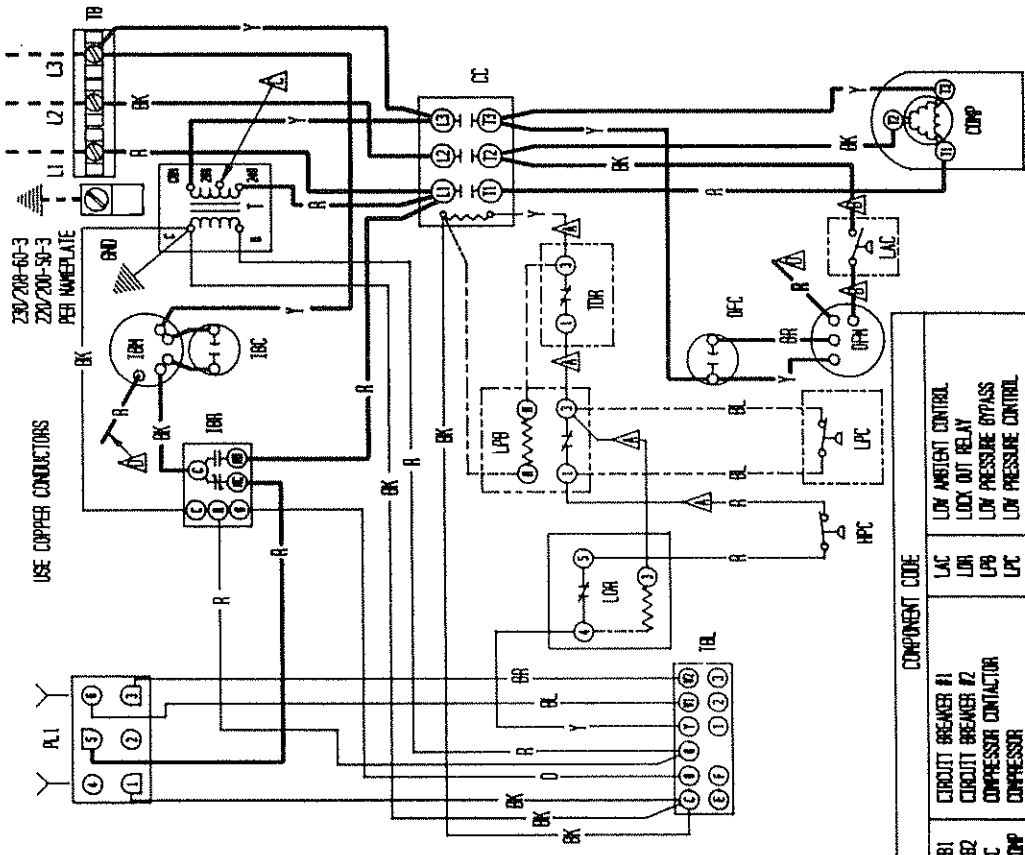
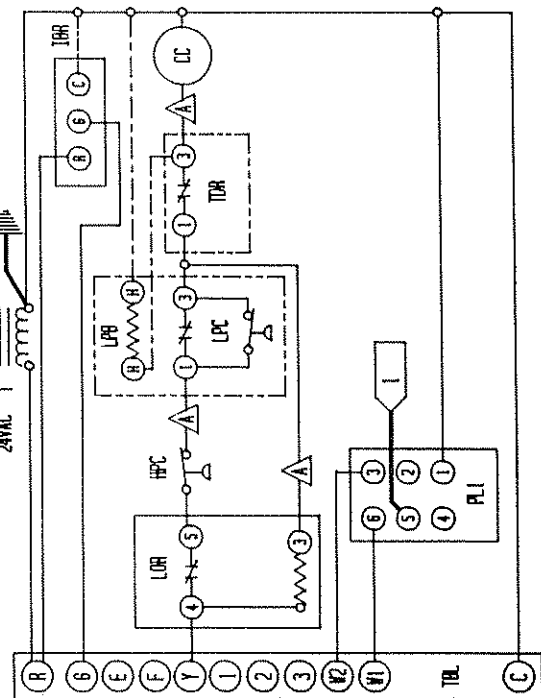
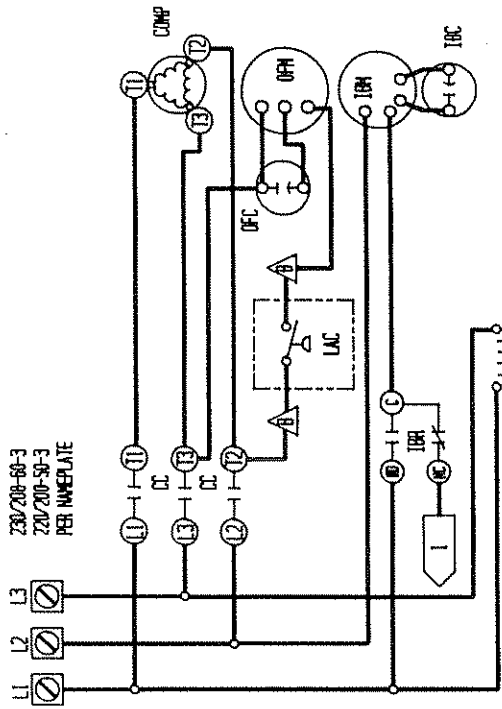
▲, ▲ Labeled wires connect if no options used. ▲ Move red wire to 208V tap for 208V operation ▲ Red (low) Black (high)

| FACTORY STD. |             | OPTIONAL  |     |
|--------------|-------------|-----------|-----|
| HIGH VOLTAGE | LOW VOLTAGE | ACCESSORY |     |
| ---          | ---         | ---       | --- |
| ---          | ---         | ---       | --- |
| ---          | ---         | ---       | --- |
| ---          | ---         | ---       | --- |

| COLOR CODE |        |    |          |
|------------|--------|----|----------|
| BK         | BLACK  | Y  | YELLOW   |
| BR         | BROWN  | G  | GREEN    |
| H          | RED    | BL | BLUE     |
| O          | ORANGE | W  | WHITE    |
|            |        | S  | SLATE    |
|            |        | VI | VIOLET   |
|            |        | PK | PINK     |
|            |        | L  | LAVENDER |

| BARD MFG. CO. |          |
|---------------|----------|
| IMG           | 4055-112 |
| DRN           | CSB      |
| CHK           | APPR.    |





|   |                                      |                      |                               |
|---|--------------------------------------|----------------------|-------------------------------|
| <p>▲ ▲ LABELLED WIRES CONNECT IF NO OPTIONS USED. ▲ MOVE RED WIRE TO 200V TAP FOR 200V OPERATION ▲ RED (LOW) BLACK (HIGH)</p> |                                      | <p>▲ ▲</p>           |                               |
| <p>COMPONENT CODE</p>   | <p>LOW AMBIENT CONTROL</p>           | <p>COLOR CODE</p>    | <p>RED (LOW) BLACK (HIGH)</p> |
| <p>CB1 CIRCUIT BREAKER #1</p>   | <p>LAC LOCK OUT RELAY</p>            | <p>Y YELLOW</p>      | <p>T TAN</p>                  |
| <p>CB2 CIRCUIT BREAKER #2</p>   | <p>LOR LOW PRESSURE BYPASS</p>       | <p>G GREEN</p>       | <p>PK PINK</p>                |
| <p>CC COMPRESSOR CONTACTOR</p>  | <p>LPC LOW PRESSURE CONTROL</p>      | <p>B BLUE</p>        | <p>L LAVENDER</p>             |
| <p>COMP COMPRESSOR</p>  | <p>LS LIMIT SWITCH</p>               | <p>PR PURPLE</p>     | <p>W WHITE</p>                |
| <p>END EQUIPMENT GROUND</p>   | <p>OPR OUTDOOR FAN CAPACITOR</p>     | <p>BT BRAY</p>       | <p>S SLATE</p>                |
| <p>#1 HEAT STRIP #1</p>   | <p>ORR OUTDOOR FAN MOTOR</p>         | <p>BL BLACK</p>      | <p>ORR ORR</p>                |
| <p>#2 HEAT STRIP #2</p>   | <p>PL1 PLUG #1</p>                   | <p>BR BROWN</p>      | <p>ORR ORR</p>                |
| <p>HC1 HEATER CONTACTOR #1</p>  | <p>SK START KIT</p>                  | <p>RED RED</p>       | <p>ORR ORR</p>                |
| <p>HC2 HEATER CONTACTOR #2</p>  | <p>TR TRANSFORMER</p>                | <p>ORR ORR</p>       | <p>ORR ORR</p>                |
| <p>IPC HIGH PRESSURE CONTROL</p>  | <p>TB TERMINAL BLOCK</p>             | <p>ORR ORR</p>       | <p>ORR ORR</p>                |
| <p>IBC INDOOR BLOWER CAPACITOR</p>  | <p>TL LOW VOLTAGE TERMINAL BLOCK</p> | <p>ORR ORR</p>       | <p>ORR ORR</p>                |
| <p>IBR INDOOR BLOWER MOTOR</p>  | <p>TO THERMAL ON/OFF</p>             | <p>ORR ORR</p>       | <p>ORR ORR</p>                |
| <p>IBR INDOOR BLOWER RELAY</p>  | <p>TR TIME DELAY RELAY</p>           | <p>ORR ORR</p>       | <p>ORR ORR</p>                |
| <p>FACTORY STD. FIELD OPTIONAL</p>  |                                      | <p>BARO MFG. CO.</p> |                               |
| <p>DATE: 4/10/55-212</p>  |                                      | <p>DESIGN: CDR</p>   |                               |
| <p>BY: CDR</p>  |                                      | <p>CHECK: /APPR.</p> |                               |

USE COPPER CONDUCTORS





