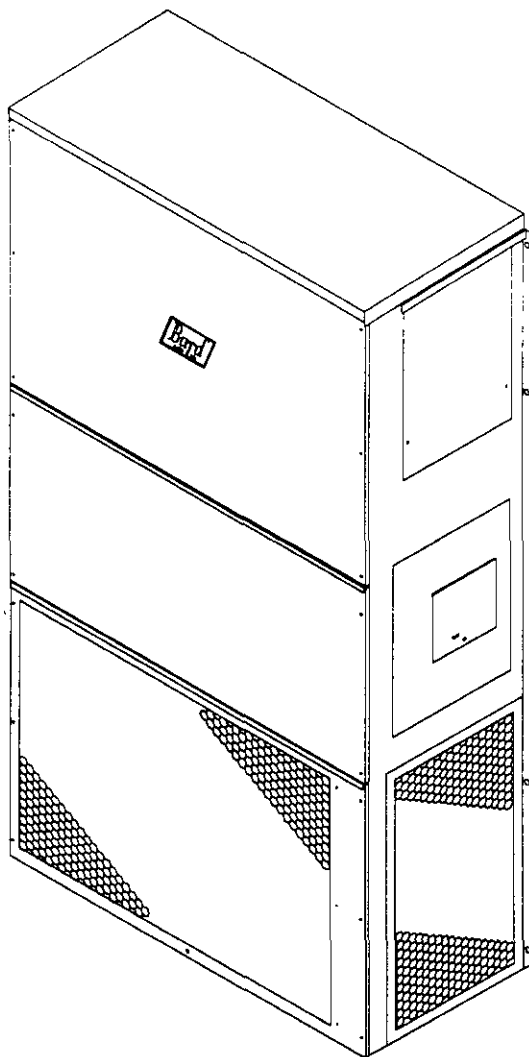

Installation Instructions

Wall Mounted Packaged Air Conditioner

Model: WA351



MIS-801



Bard Manufacturing Company
Bryan, Ohio 43506

*Since 1914...Moving ahead, just as
planned.*

Manual No.: 2100-300
File: Volume III, Tab 16
Date: 07-10-97

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Contents

Getting Other Information and Publications 1
 For more information,
 contact these publishers 1

Wall Mount General Information 2
 Air Conditioner Wall Mount Model Nomenclature 2
 Shipping Damage 4
 General 4
 Duct Work 4
 Filters 4
 Fresh Air Intake 4
 Condensate Drain 4

Installation Instructions 5
 Wall Mounting Information 5
 Mounting the Unit 5
 Wiring — Main Power 5
 Wiring — Low Voltage Wiring 5

Start Up 11
 Important Installer Note 11
 Service Hints 11
 Sequence of Operation 11
 Pressure Service Ports 11
 Three Phase Scroll Compressor 11

Troubleshooting 12
 Fan Blade Setting Dimensions 12
 Removal of Fan Shroud 12
 Refrigerant Charge 12

Figures

Figure 1 Unit Dimensions 3
 Figure 2 Fresh Air Damper Assembly 3
 Figure 3 Mounting Instructions 6
 Figure 4 Electric Heat Clearances 7
 Figure 5 Wall-Mounting Instructions 8
 Figure 6 Wall-Mounting Instructions 8
 Figure 7 Common Wall-Mounting Installations 9
 Figure 8 Low Voltage Wiring 10
 Figure 9 Fan Blade Setting 12

Tables

Table 1 Electrical Specifications 2
 Table 2 Dimensions of Basic Unit 3
 Table 3 Operating Voltage Range 5
 Table 4 Thermostat Wire Size 6
 Table 5 Wall Thermostat and
 Subbase Combinations 6
 Table 6 Fan Blade Dimensions 12
 Table 7 Suction Line Temperatures 12
 Table 8 Indoor Blower Performance 12
 Table 9 CFM and ESP 12
 Table 10 Cooling Pressure 13
 Table 11 Maximum ESP of Operation
 Electric Heat Only 13

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 ANSI/NFPA 90A
of Air Conditioning and
Ventilating Systems

Standard for Warm Air ANSI/NFPA 90B
Heating and Air
Conditioning Systems

Load Calculation for ACCA Manual J
Residential Winter and
Summer Air Conditioning

Duct Design for Residential ACCA Manual D
Winter and Summer Air
Conditioning and Equipment
Installation

For more information, contact these publishers:

ACCA — Air Conditioning Contractors of America
1712 New Hampshire Avenue NW
Washington, DC 20009
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

Manufactured under the following U.S. patent numbers:
5,301,744; 5,002,116; 4,924,934; 4,875,520; 4,825,936; 4,432,409
Other patents pending.

Wall Mount General Information

Air Conditioner Wall Mount Model Nomenclature

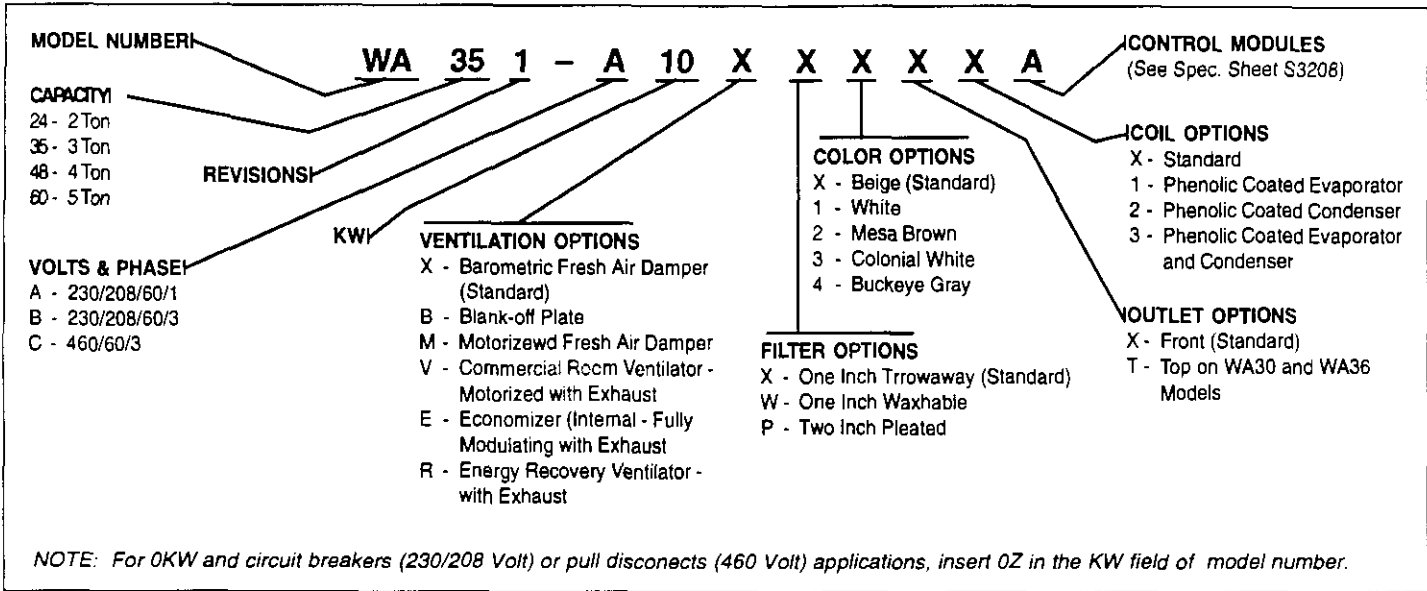


Table 1 - Electrical Specifications

Models	Rated Volts/Phase	No. Field Power Circuits	③ Minimum Circuit Ampacity	① Maximum External Fuse or Ckt. 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
WA351-B0Z	230/208-3	1	20	25	10	10	---	---	---	---	---	---	---	---
WA351-F0Z	415/380-3	1	10	15	14	14	---	---	---	---	---	---	---	---
WA351-F07	415/380-3	1	15	15	14	14	---	---	---	---	---	---	---	---
WA351-F12	415/380-3	1	23	25	10	10	---	---	---	---	---	---	---	---

- 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 the National Electrical Code 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 through one conduit, the conductors must be derated. Pay special attention to Note 8 of Table 310 regarding Ampacity Adjustment Factors when more than three conductors are in a raceway.

TABLE 2 – DIMENSIONS OF BASIC UNIT FOR ARCHITECTURAL AND INSTALLATION REQUIREMENTS (NOMINAL)

NIT	WIDTH (W)	DEPTH (D)	HEIGHT (H)	SUPPLY		RETURN		E	F	G	I	J	K	L	M	N	O	P	Q
				A	B	C	B												
WA351	37-7/8	16-7/8	70-1/2	7-7/8	27-7/8	13-7/8	27-7/8	39-7/8	18-1/4	25-3/4	18	26-3/4	28-3/4	29-1/4	27	2-9/16	39	22-3/4	9

All dimensions are in inches.

Figure 1 — Unit Dimensions

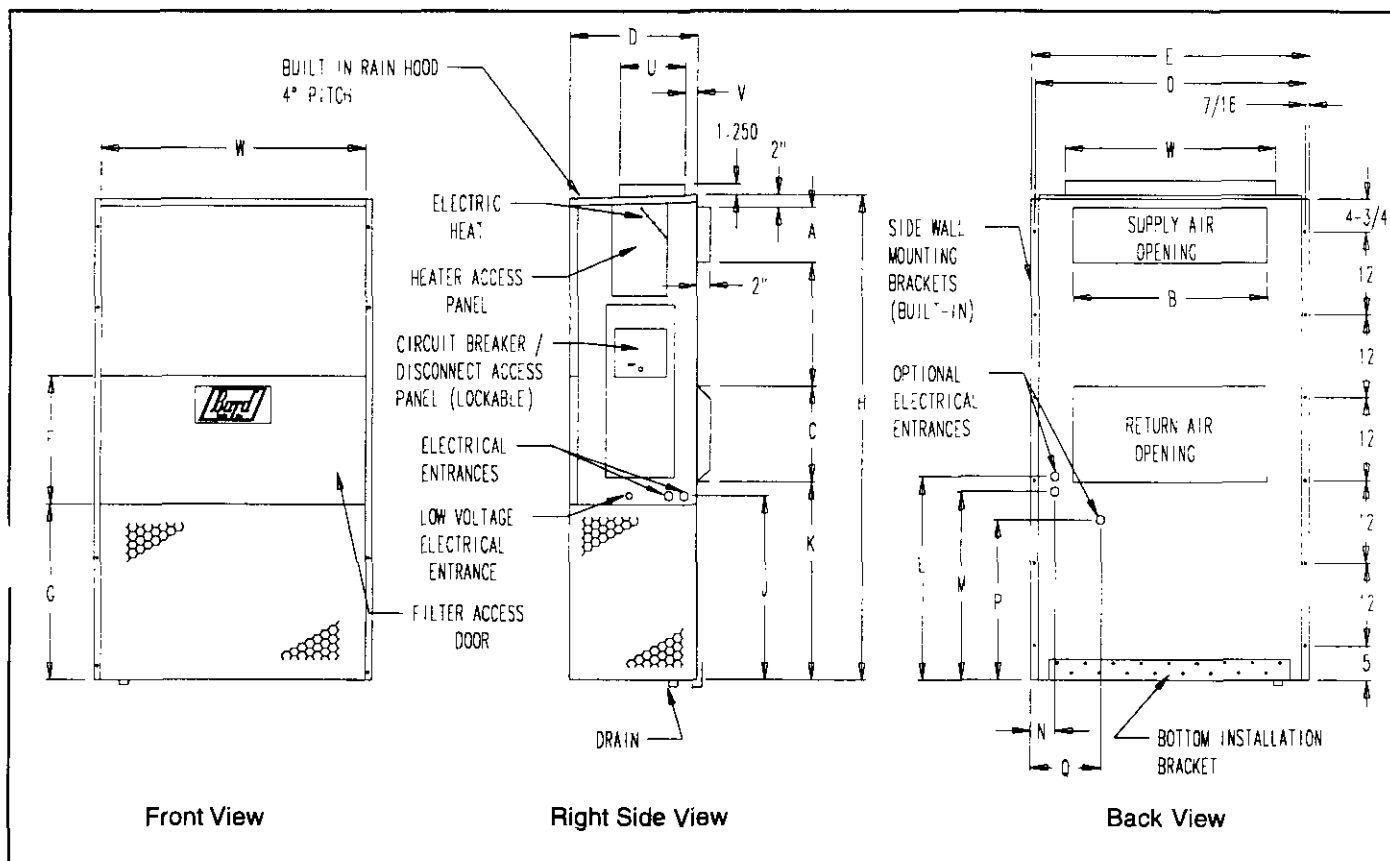
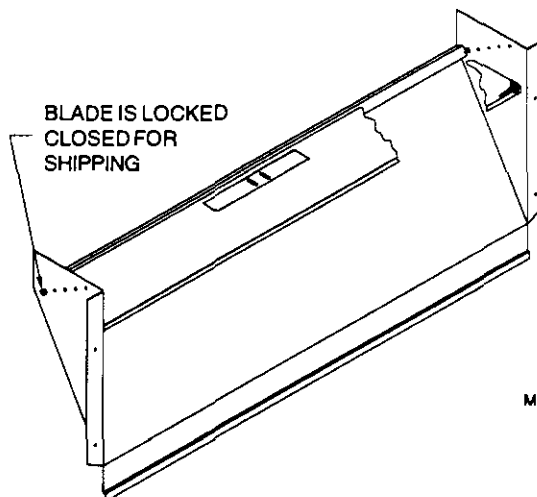


Figure 2 – Fresh Air Damper Assembly



MIS-938

Shipping Damage

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

General

The 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 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 1 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 3 feet of duct attached to the outlet air frame is required. See Wall Mounting Instructions and Figures 4 and 5 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.

CAUTION

Some installations may not require any return air duct. A metallic return air grille is required with installations not requiring a return air duct. The spacing between louvers on the grille shall not be larger than 5/8 inches.

Any grille that meets the 5/8 inch louver criteria may be used. It is recommended that Bard Return Air Grille Kit RG-2 through RG-5 or RFG-2 through RFG-5 be installed when no return duct is used. Contact distributor or factory for ordering information. If using a return air filter grille, filters must be of sufficient size to allow a maximum velocity of 400 fpm.

Filters

A 2-inch pleated filter is supplied with each unit.

Fresh Air Intake

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

If the unit is equipped with the fresh air damper assembly, the assembly is shipped already attached to the unit. The damper blade is locked in the closed position. To allow the damper to operate, the maximum and minimum blade position stops must be installed. See Figure 2 on Page 3.

All capacity, efficiency and cost of operation information as required for Department of Energy "Energyguide" fact sheet 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.

Installation Instructions

All Mounting Information

1. Two holes, for the supply and return air openings, must be cut through the wall as shown in Figure 5.
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 4.

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, but is not required.
2. The unit itself is suitable for "0" inch clearance, but the supply air duct flange and the first 3 feet of supply air duct require a minimum of 1/4-inch clearance to combustible material. If a combustible wall, use a minimum of 28-1/2" x 8-1/2" dimensions for sizing. However, it is generally recommended that a 1-inch clearance is used for ease of installation and maintaining the required clearance to combustible material. The supply air opening would then be 30" x 10". See Figures 3 and 4 for details.

WARNING

Failure to provide the 1/4-inch clearance between the supply duct and a combustible surface for the first 3 feet of duct can result in fire.

3. Locate and mark lag bolt locations and bottom mounting bracket location. See Figure 5.
4. Mount bottom mounting bracket, if used.
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 3.
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. Additional clearance may be required to meet local or national codes.

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:

Table 3 – Operating Voltage Range

TAP	RANGE
240V	253-216
208V	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 8.

Table 4 – Thermostat Wire Size

TRANSFORMER VA	FLA	WIRE GAUGE	MAXIMUM DISTANCE IN FEET
40	1.7	20 gauge	45
		18 gauge	60
		16 gauge	100
		14 gauge	160
		12 gauge	250

Table 5 – Wall Thermostat and Subbase Combination

FEATURES	THERMOSTAT	SUBBASE PREDOMINANT
8403-002 T87F3111	8404-003 Q539A1220	1 stage cool, 1 stage heat System: heat-off-cool Fan: auto-on
8403-009 1F56-318	-----	1 stage heat, 1 stage cool
8403-019 T874C1760	8404-012 Q674A1001	1 stage heat, 2 stage cool System: heat-auto-cool Fan: auto-on
8403-021 T874D1934	8404-012 Q674A1001	2 stage cool, 2 stage heat System: heat-auto-cool Fan: auto-on
8403-035 1F95-80		2 stage cool, 2 stage heat, electronic 7 day programming

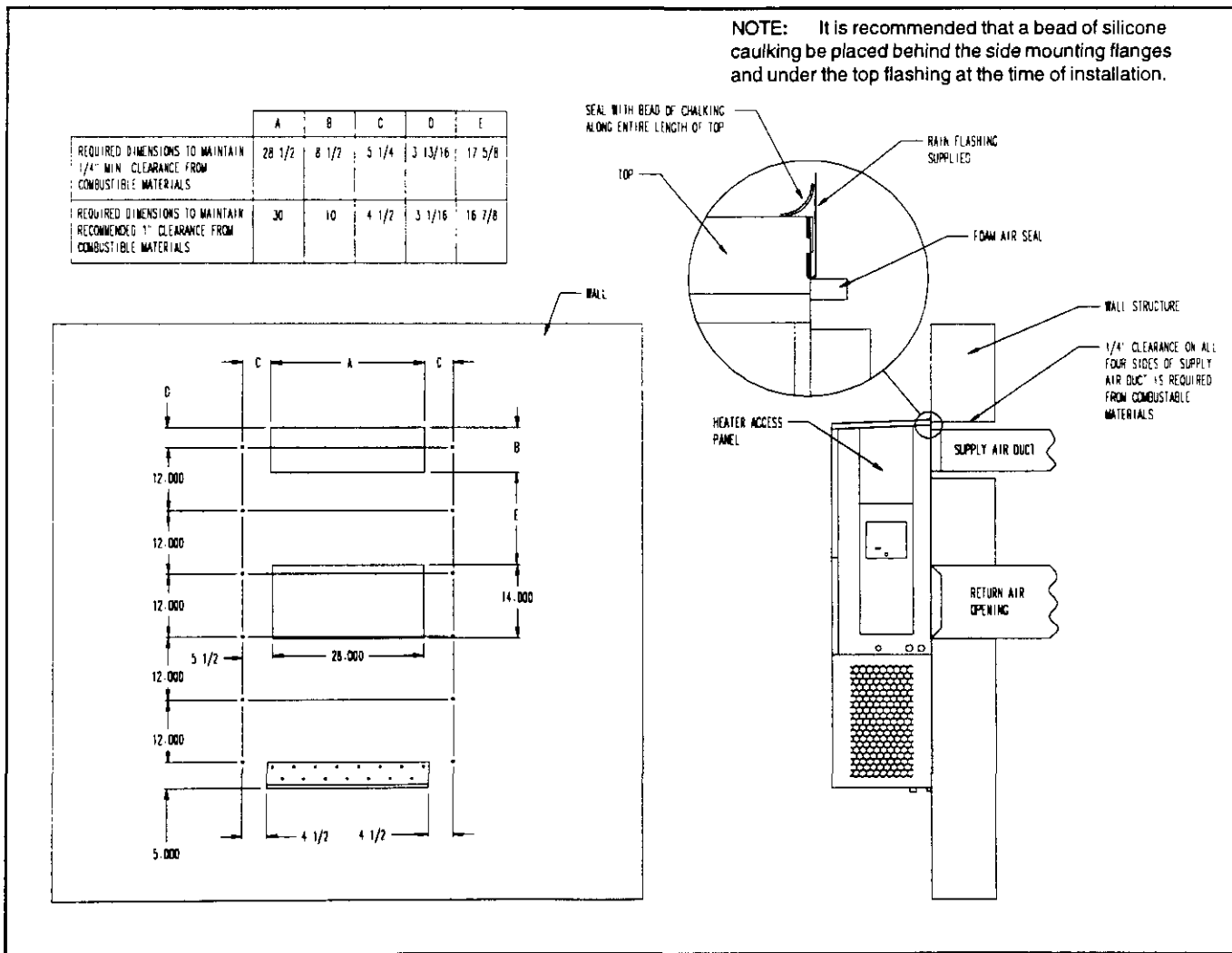
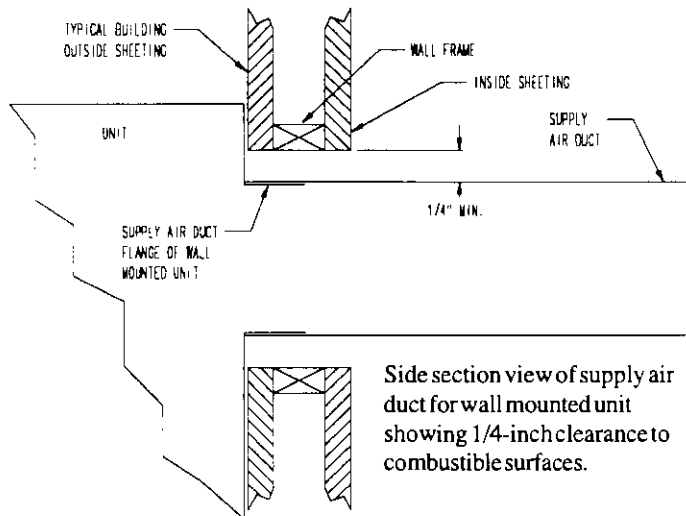


Figure 3 – Mounting Instructions

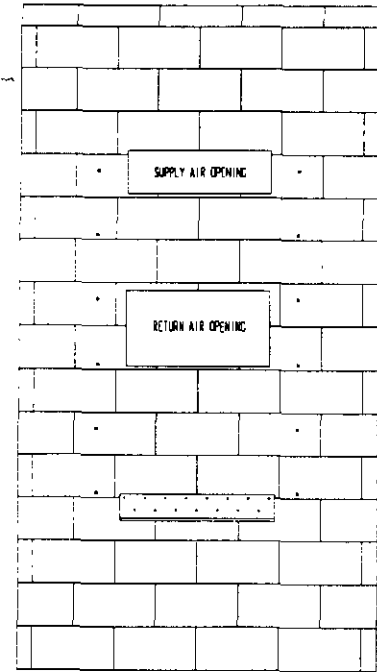


WARNING

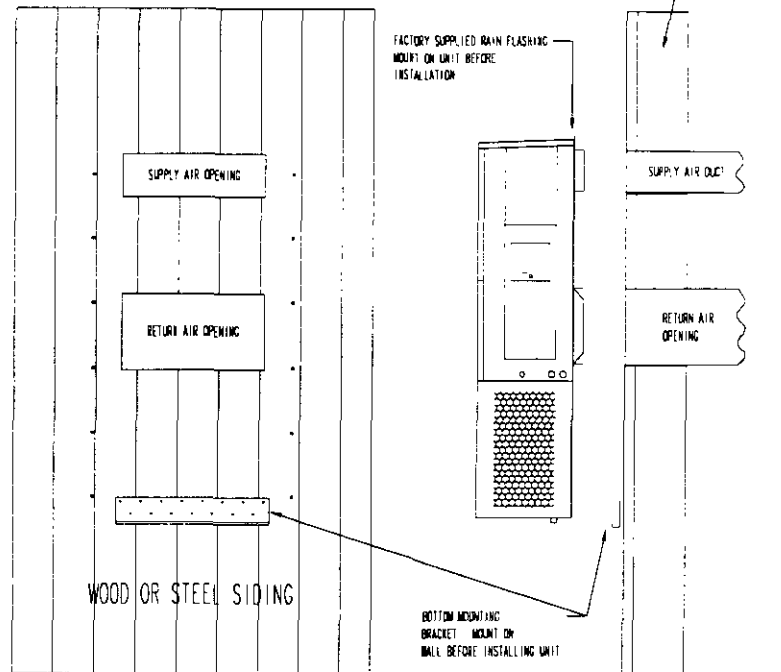
- A minimum of 1/4-inch clearance must be maintained between the supply air duct and combustible materials. This is required for the first 3 feet of ducting.
- It is important to insure that the 1/4-inch minimum spacing is maintained at all points.
- Failure to do this could result in overheating the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

Figure 4 – Electric Heat Clearance

SEE FIGURE 2 — MOUNTING INSTRUCTIONS



CONCRETE BLOCK WALL INSTALLATION



WOOD FRAME WALL INSTALLATION

Figure 5 — Wall-Mounting Instructions

SEE UNIT DIMENSIONS, FIGURE 1, FOR ACTUAL DIMENSIONS

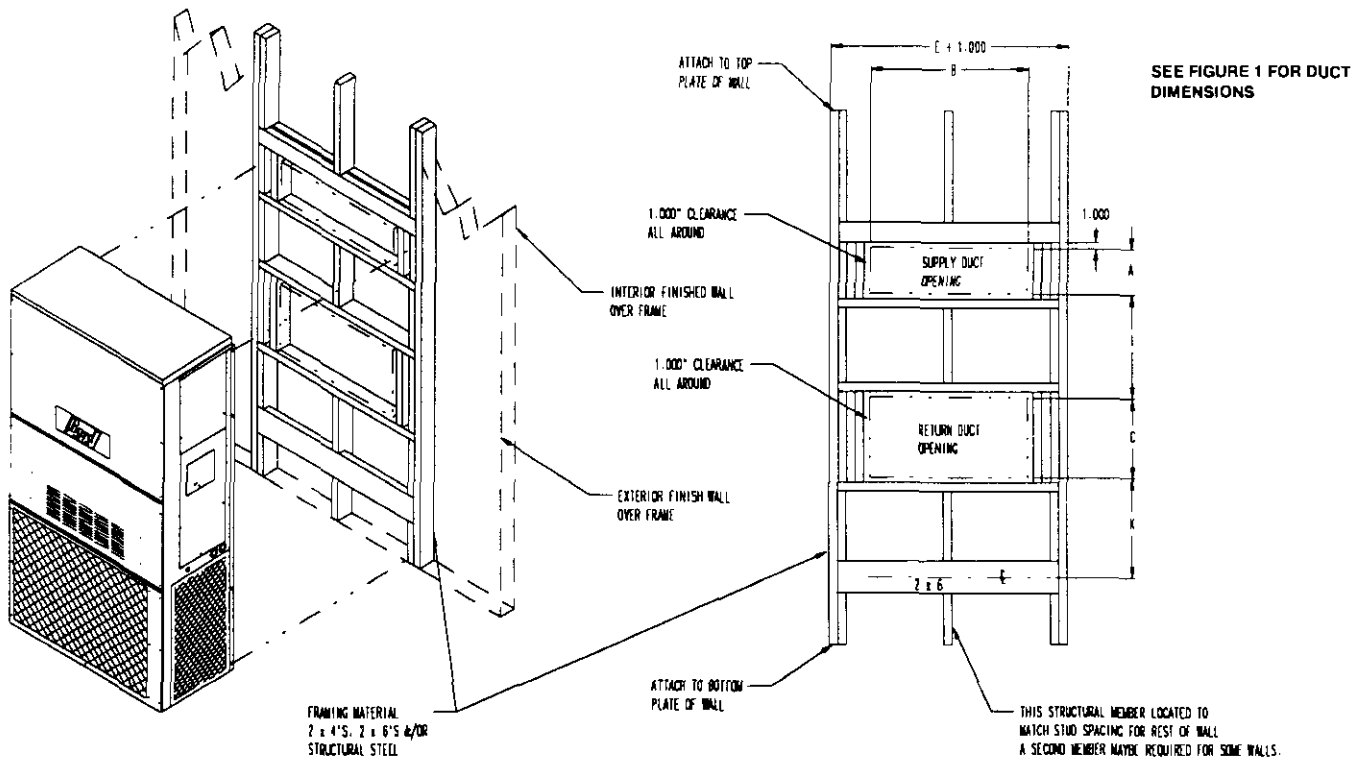
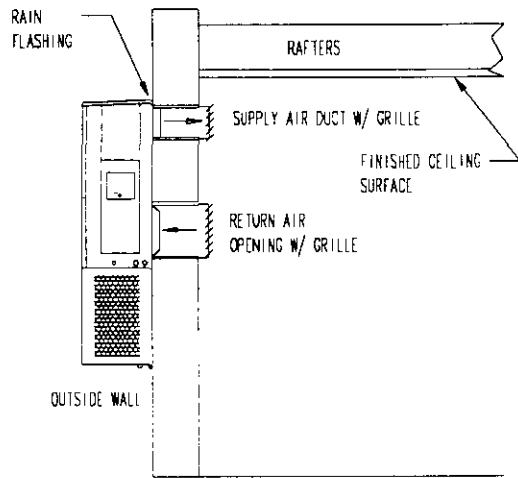
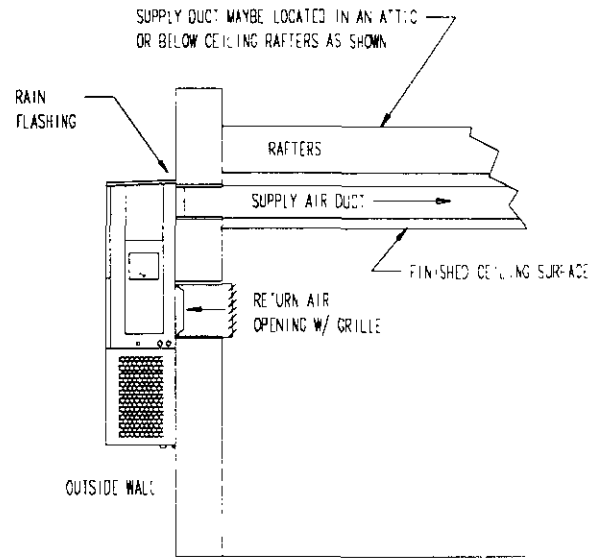


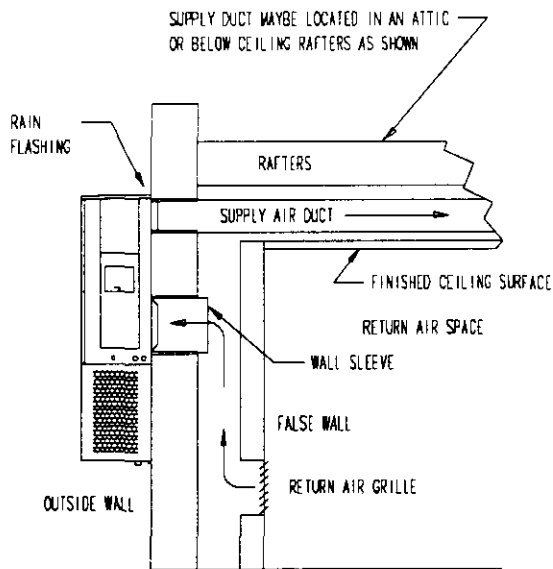
Figure 6 — Wall-Mounting Instructions



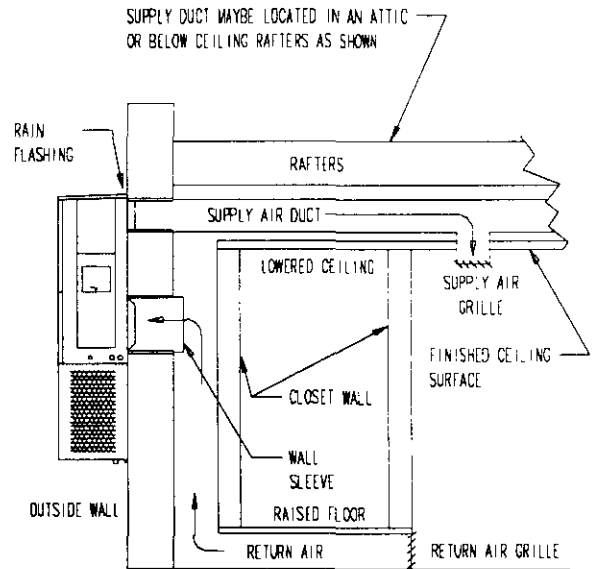
FREE AIR FLOW
NO DUCT



DUCTED SUPPLY
RETURN AT UNIT



FALSE WALL INSTALLATION



CLOSET INSTALLATION

Figure 7 – Common Wall-Mounting Installations

Start Up

Important Installer Note

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

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. Check all power fuses or circuit breakers to be sure they are the correct rating.
3. 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.

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.

Three Phase Scroll Compressor Start-Up Information

Scroll compressors, unlike several other type of compressors, will only compress when rotating in the proper direction. Direction of rotation is not an issue with single phase compressors since they will always start and run in the proper direction.

However, three phase compressors will rotate in either direction depending upon phasing of the power. Since there is a 50-50 chance of connecting power in such a way as to cause rotation in the reverse direction, verification of proper rotation must be made. Verification of proper rotation direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level over that with correct rotation, as well as, substantially reduced current draw compared to tabulated values.

Verification of proper rotation must be made at the time the equipment is put into service. If improper rotation is corrected at this time there will not be negative impact on the durability of the compressor. However, reverse operation for over one hour may have a negative impact on the bearings due to oil pump out.

NOTE: If compressor is allowed to run in reverse rotation for several minutes the compressor's internal protector will trip.

All three phase ZR3 compressors are wired identically internally. As a result, once the correct phasing is determined for a specific system or installation, connecting properly phased power leads to the same Fustite terminal should maintain proper rotation direction.

The direction of the rotation of the motor may be changed by reversing any two line connections to the unit.

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.

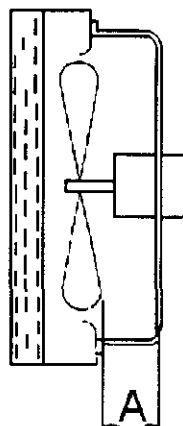


Figure 9 — Fan Blade Setting

Table 6 — Fan Blade Dimensions

Model	Dimension A
WA351	1.25

Removal of 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-inches from compressor) as shown in Table 7.

Table 7 — Suction Line Temperatures

Models	Rated Airflow	95 F OD Temp.	82 F OD Temp.
WA351	1,100	57-59	62-64

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 8 — Indoor Blower Performance — CFM at 230 Volts

E.S.P. In H ₂ O	WA351	
	High Speed Dry / Wet Coil	Low Speed Dry / Wet Coil
.0	1,395 / 1,315	950 / 935
.1	1,340 / 1,270	930 / 915
.2	1,285 / 1,190	910 / 885
.3	1,205 / 1,100	855 / 830
.4	1,100 / 1,000	800 / 755
.5	1,005 / 870	

Table 9 — CFM and ESP

Model	Rated CFM ①	Rated ESP ①	Recommended Airflow Range
WA351	1,100	.30	930 - 1,350

① Rated CFM and ESP on high speed tap.

Table 10 – Cooling Pressure – Outdoor Temperature °F

Model	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115	120	125
WA351	75 DB 62 WB	Low Side	70	72	74	76	78	79	80	81	82	83	84
		High Side	208	226	243	259	274	288	300	312	323	335	347
	80 DB 67 WB	Low Side	75	77	79	81	83	85	86	87	88	89	90
		High Side	213	232	249	256	281	295	309	321	332	344	357
	85 DB 72 WB	Low Side	80	83	85	87	89	91	92	94	95	96	98
		High Side	222	241	259	276	291	306	320	333	344	357	370

Low side pressure ± 2 psig

High side pressure ± 5 psig

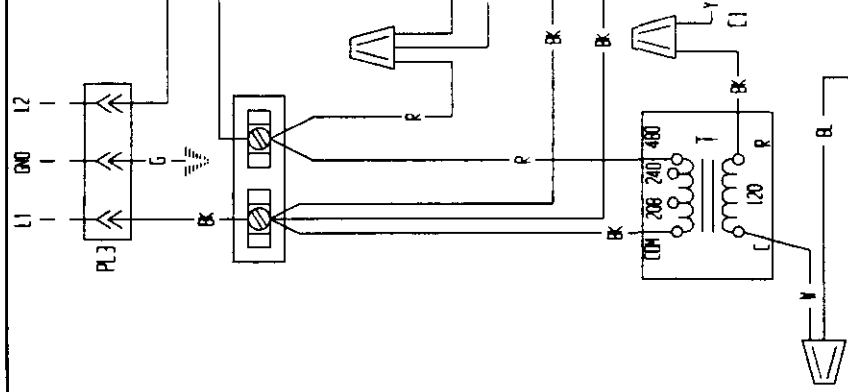
Tables are based upon rated CFM (airflow) across the evaporator coil and should be found under section titled "refrigerant charge" elsewhere in manual. If there is any doubt as to correct charge being in the system, the charge should be removed, system evacuated and recharged to serial plate instructions.

NOTE: The high pressure tap is located in the liquid line.

Table 11 – Maximum ESP of Operation – Electric Heat Only

MODEL KW	FRONT OUTLET	
	Low Speed	High Speed
F07	.40	.50
F12	.35	.45

TO UNIT HIGH VOLTAGE
460 - 60 - 1



SEE CONTROL WIRING SECTION
OF INSTALLATION INSTRUCTIONS

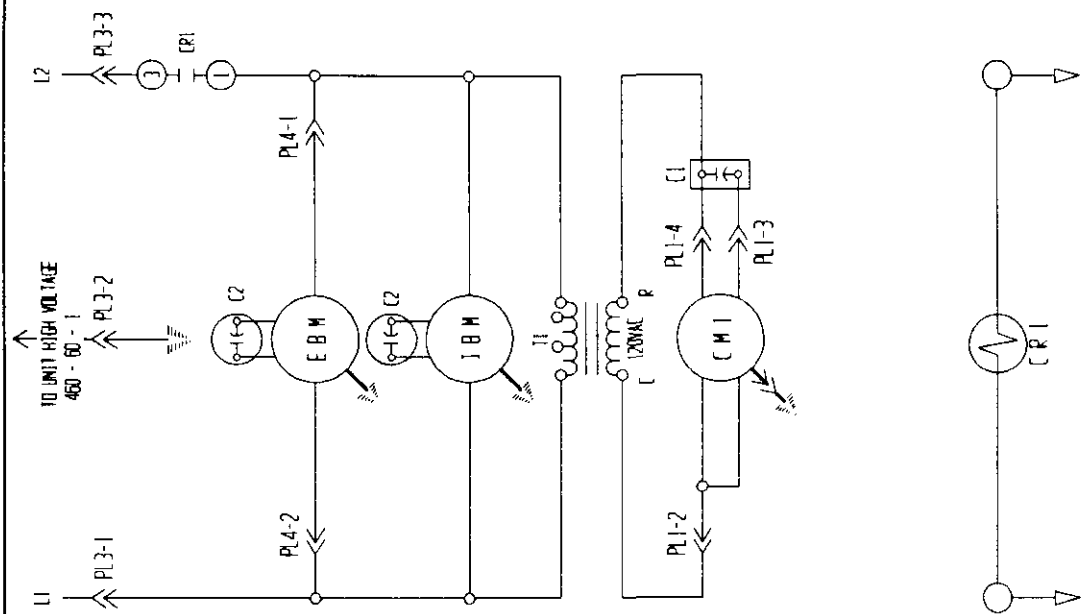
YELLOW - HIGH SPEED
RED - LOW SPEED
BLUE - MED SPEED

USED ON MERV-ASA ONLY

WIRE COLOR	ABBREVIATION	COLOR CODE
BLACK	BK	BK
BROWN	BR	BR
RED	R	R
ORANGE	O	O
YELLOW	Y	Y
GREEN	G	G
BLUE	B	B
VIOLET (PURPLE)	V (PR)	V (PR)
GRAY (SLATE)	G (S)	G (S)
WHITE	W	W
TAN	T	T
PINK	PK	PK
LAVENDER	L	L

COMPONENT CODE

- C1 CAPACITOR #1 34FD
- C2 CAPACITOR #2 4FD
- CM1 CASSETTE MOTOR #1
- EBM EXHAUST BLOWER MOTOR
- IBM INTAKE BLOWER MOTOR
- T TRANSFORMER
- CR1 CONTROL RELAY
- PL1 TERMINAL BLOCK
- PL3 CONNECTOR PLUG #3
- PL4 CONNECTOR PLUG #4



SEE CONTROL WIRING SECTION
OF INSTALLATION INSTRUCTIONS

