INSTALLATION INSTRUCTIONS

SINGLE PACKAGE AIR CONDITIONERS

MODELS

P1124A3
P1130A2
P1136A2
P1142A3
P1148A2
P1060A1
P1224A2
P1230A1
P1236A1
P1242A1
P1248A2

CLIMATE CONTROL SOLUTIONS

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506

Since 1914 . . . Moving ahead just as planned

Manual : 2100-353F
Supersedes: 2100-353E
File: Volume II Tab 10
Date: 12-20-06

CONTENTS

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 Selection

FOR MORE INFORMATION, CONTACT THESE PUBLISHERS:

ACCA **Air Conditioning Contractors of America**
1712 New Hampshire Ave. N.W.
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, Inc.**
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

GENERAL INSTRUCTIONS

IMPORTANT

The equipment covered in this manual is to be installed by trained, experienced service and installation technicians. All duct work, supply and return ducts, must be properly sized for the design airflow requirement of the equipment. 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.

SHIPPING DAMAGE

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

GENERAL

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

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 heat pump 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.

FIELD INSTALLED HEATER PACKAGES (OPTIONAL)

These packaged air conditions are manufactured without supplementary electric heaters. Supplementary heaters are available for simple, fast field installation.

A separate power circuit is required for the supplementary heaters.

***IMPORTANT**: Refer to Table 1 when designing duct work for maximum available static pressure with heater installed.*

Refer to data shown in Tables 3 and 4 for proper application information on all available heater combinations and what units they can be used with. It also shows the applicable circuit ampacities, fuse size, and wire size for each heater combination.

TABLE 1
RATED CFM AND EXTERNAL STATIC PRESSURE (ESP)

Model No.	Rated CFM	Recommended Airflow Range	Rated ESP	Max. ESP
P1124A3	800	720 - 880	0.20	0.50
P1224A2	800	*Note 1*	0.10	0.50
P1130A2	1125	1020 - 1275	0.20	0.50
P1230A1	1000	*Note 1*	0.15	0.50
P1136A2	1250	1150 - 1400	0.30	0.50
P1236A1	1100	*Note 1*	0.15	0.50
P1142A3	1400	1260 - 1540	0.20	0.40
P1242A1	1400	*Note 1*	0.20	0.50
P1148A2	1550	1400 - 1700	0.40	0.50
P1248A2	1550	*Note 1*	0.20	0.50
P1060A1	1700	1530 - 1870	0.20	0.50

NOTE: ECM motors provide rated CFM up to 0.50 ESP

TABLE 2
ELECTRICAL SPECIFICATIONS

Model	P1124A3	P1130A2	P1136A2	P1136A1-B	P1136A1-C	P1142A3
Electric Rating – 60 Hz – Circuit A	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-3	460-60-3	230/208-60-1
Operating Voltage Range	197 - 253	197 - 253	197 - 253	187 - 253	414 - 506	197 - 253
Minimum Circuit Ampacity	16	21	25	18	12	29
BCSC	10.3	13.6	16	11	6	18.5
Field Wire Size *	12	10	8	10	14	8
Ground Wire Size	12	10	10	10	14	10
Delay Fuse – Max. **	25	30	40	25	15	45
Total unit Amps – 230/208	11.8/12.3	15.4/16.9	17.1/18.7	12.3/12.9	7.3	23.1/24.2
Compressor – Circuit A						
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Volts	230/208	230/208	230/208	230/208	460	230/208
Rated Load Amps	8.5/9.0	12.1/13.6	13.8/15.4	9.0/9.6	4.9	17.0/18.5
Lock Roter Amps	54/54	72.5/72.5	88/88	77/77	39	104/104
Fan Motor and Condenser						
Fan Motor – HP/RPM	1/5 - 1090	1/5 - 1075	1/5 - 1075	1/5 - 1075	1/5 - 1075	1/2 - 1075
Fan Motor Amps	1.2	1.6	1.6	1.6	1.0	2.5
Fan – Dia./CFM	20"/1942	20"/2400	20"/2100	20"/2000	20"/2000	24"/2850
Motor and Evaporator						
Blower Motor – HP/RPM	1/3 - 1075	1/5 - 1075	1/5 - 1075	1/5 - 1075	1/5 - 1075	1/2 - 1075
Blower Motor – Amps	2.1	2.6	2.6	2.6	1.4	3.7
CFM Cooling & ESP	800 @ 0.20	1125 @ 0.20	1250 @ 0.30	1275 @ 0.30	1275 @ 0.30	1400 @ 0.20
Charge (R-22 oz.)	52	64	93	93	93	89
Shipping Weight (pounds)	300	310	330	330	330	390

TABLE 2A
ELECTRICAL SPECIFICATIONS

Model	P1148A2	P1148A2-B	P1148A2-C	P1060A1	P1060A1-B	P1060A1-C
Electric Rating – 60 Hz – Circuit A	230/208-60-1	230/208-60-3	460-60-3	230/208-60-1	230/208-60-3	460-60-3
Operating Voltage Range	197 - 253	187 - 253	414 - 506	197 - 253	187 - 253	414 - 506
Minimum Circuit Ampacity	32	25	12	43	29	14
BCSC	20.5	14.7	7	29	12	9
Field Wire Size *	8	10	12	8	8	12
Ground Wire Size	10	10	12	10	10	12
Delay Fuse – Max. **	50	35	15	60	45	20
Tota unit Amps – 230/208	24.2/26.2	17.9/19.1	8.8	30.9/33.7	21.7/23.7	11.2
Compressor – Circuit A						
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Volts	230/208	230/208	460	230/208	230/208	460
Rated Load Amps	18.5/20.5	12.2/13.4	6	25.2/28.2	16/18	8.4
Lock Roter Amps	137/137	91/91	50	169/169	123/123	62
Fan Motor and Condenser						
Fan Motor – HP/RPM	1/3 - 850	1/3 - 850	1/3 - 850	1/3 - 850	1/3 - 850	1/3 - 850
Fan Motor Amps	2.5	2.5	1.2	2.5	2.5	1.2
Fan – Dia./CFM	24"/3100	24"/3100	24"/3100	24"/3100	24"/3100	24"/3100
Motor and Evaporator						
Blower Motor – HP/RPM	1/2 - 1075	1/2 - 1075	1/2 - 1075	1/2 - 1075	1/2 - 1075	1/2 - 1075
Blower Motor – Amps	3.7	3.7	1.8	3.7	3.7	1.8
CFM Cooling & ESP	1550 @ 0.40	1550 @ 0.40	1550 @ 0.40	1700 @ 0.20	1700 @ 0.20	1700 @ 0.20
Charge (R-22 oz.)				120	120	120
Shipping Weight (pounds)	430	430	430	425	425	425

TABLE 2B
ELECTRICAL SPECIFICATIONS

Model	P1224A2	P1230A1	P1236A1	P1236A1-B	P1242A1	P1248A2	P1248A2-B
Electric Rating – 60 Hz – Circuit A	230/208-60-1	230/208-60-1	230/208-60-1	230/208-60-3	230/208-60-1	230/208-60-1	230/208-60-3
Operating Voltage Range	197 - 253	197 - 253	197 - 253	187 - 253	197 - 253	197 - 253	187 - 253
Minimum Circuit Ampacity	15	21	25	19	30	34	23
BCSC	10.3	13.5	16.2	10.9	18	21	12.8
Field Wire Size *	12	10	8	10	8	6	8
Ground Wire Size	12	10	10	10	10	10	10
Delay Fuse – Max. **	20	30	40	25	45	50	35
Tota unit Amps – 230/208	11.7/12.4	15.7/17.1	19.2/21.1	14.9/15.8	23.2/24.1	25.5/27	19.4/19.7
Compressor – Circuit A							
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Volts	230/208	230/208	230/208	230/208	230/208	230/208	230/208
Rated Load Amps	8.5/9.0	11.4/12.8	14.3/16.2	10/10.9	16.4/17.3	18.5/20	12.4/12.7
Lock Roter Amps	54/54	76/76	90.5/90.5	77/77	104/104	137/137	91/91
Fan Motor and Condenser							
Fan Motor – HP/RPM	1/5 - 1090	1/5 - 1075	1/5 - 1075	1/5 - 1075	1/3 - 825	1/3 - 825	1/3 - 825
Fan Motor Amps	1.2	1.6	1.6	1.6	2.5	2.5	2.5
Fan – Dia./CFM	20"/1975	20"/2400	20"/2100	20"/2100	24"/2900	24"/2350	24"/2350
Motor and Evaporator							
Blower Motor – HP/RPM	1/3 Variable	1/2 Variable	1/2 Variable	1/2 Variable	1/2 Variable	1/2 Variable	1/2 Variable
Blower Motor – Amps	2.2	2.7	3.3	3.3	4.3	4.5	4.5
CFM Cooling & ESP	800 @ 0.10	1000 @ 0.15	1100 @ 0.15	1100 @ 0.15	1400 @ 0.20	1550 @ 0.20	1550 @ 0.20
Charge (R-22 oz.)	53	88	102	102	118	151	151
Shipping Weight (pounds)	300	330	340	340	410	430	430

TABLE 3
OPTIONAL FIELD INSTALLED HEATER PACKAGES
ONLY TO BE USED WITH THE MODELS INDICATED

Heater Package Model	Volts & Phase	P1124A3	P1124A2	P1130A2	P1230A1	P1236A2	P1136A1-C	P1136A1-C	P1236A1	P1236A1-B	
EH3PB-A05	240/208-1	S	NA	S	NA	S	A	A	NA	NA	
EH3PB-A08	240/208-1	S	NA	S	NA	S	A	A	NA	NA	
EH3PB-A10	240/208-1	S	NA	S	S	S	A	A	S	NA	
EH3PB-A15	240/208-1	NA	NA	S	NA	S	A	A	NA	NA	
EH3PC-A05	240/208-1	NA	S	NA	S	NA	NA	NA	S	NA	This column is left blank intentionally.
EH3PC-A10	240/208-1	NA	S	NA	NA	NA	NA	NA	NA	NA	
EH3PC-A15	240/208-1	NA	NA	NA	S	NA	NA	NA	S	NA	
EH3PB-B09	240/208-3	A	NA	A	NA	A	S	A	NA	S	
EH3PB-B15	240/208-3	NA	NA	A	NA	A	S	A	NA	S	
EHPB-C09	480-3	NA	NA	A	NA	A	A	S	NA	NA	
EHPB-C15	480-3	NA	NA	A	NA	A	A	S	NA	NA	

Heater Package Model	Volts & Phase	P1142A3	P1242A1	P1148A2	P1148A2-B	P1148A2-C	P1248A2	P1248A2-B	P1060A1	P1060A1-B	P1060A1-C
EH5PB-A05	240/208-1	S	S	S	A	A	S	A	S	A	A
EH5PB-A10	240/208-1	S	S	S	A	A	S	A	S	A	A
EH5PB-A15	240/208-1	S	S	S	A	A	S	A	S	A	A
EH5PB-A20	240/208-1	S	NA	S	A	A	NA	NA	S	A	A
EH5PB-B09	240/208-3	A	A	A	S	A	A	S	A	S	A
EH5PB-B15	240/208-3	A	A	A	S	A	A	S	A	S	A
EH5PB-B18	240/208-3	A	NA	A	S	A	NA	NA	A	S	A
EH5PC-C09	480-3	A	NA	A	A	S	NA	NA	A	A	S
EH5PC-C15	480-3	A	NA	A	A	S	NA	NA	A	A	S
EH5PC-C18	480-3	A	NA	A	A	S	NA	NA	A	A	S

S = Standard Application – Heater volts and phase same as basic unit
A = Alternate Application – Heater volts and phase different from basic unit.
N = Not Approved

TABLE 4
OPTIONAL FIELD INSTALLED ELECTRIC HEATER TABLE

Heater Pkg. Model No.	Unit Volts Phases	Htr. KW & Capacity @ 240 Volts		Htr. KW & Capacity @ 208 Volts		240/208V Htr. Amps	Heater Internal Fuses	Circuit B				
		KW	BTUH	KW	BTUH			No. Field Circuits	Min. Circuit Ampacity	① Max. Over Current Protection	② Field Power Wiring	③ Ground Wire Size
EH3PB-A05	240/208-1	5	17,100	3.75	12,800	20.8/18.1		1	26/23	30/25	10/10	10
EH3PB-A08		8	27,300	6.00	20,500	33.3/28.8		1	42/36	45/40	10/10	10
EH3PB-A10		10	34,100	7.50	26,000	41.6/36.2		1	53/46	60/50	6/8	10
EH3PB-A15		15	51,200	11.25	38,400	62.5/54.1	30/60	1	79/68	80/70	4/4	8
EH3PC-A05		5	17,100	3.75	12,800	20.8/18.1		1	26/23	30/25	10/10	10
EH3PC-A10		10	34,100	7.50	26,000	41.6/36.2		1	53/46	60/50	6/8	10
EH3PC-A15		15	51,200	11.25	38,400	62.5/54.1	30/60	1	79/68	80/70	4/4	8
EH5PB-A05	240/208-1	5	17,100	3.75	12,800	20.8/18.1		1	26/23	30/25	10/10	10
EH5PB-A10		10	34,100	7.50	26,000	41.6/36.2		1	53/46	60/50	6/8	10
EH5PB-A15		15	51,200	11.25	38,400	62.5/54.1	30/60	1	79/68	80/70	4/4	8
EH5PB-A20		20	68,200	15.00	51,200	83.2/72.1	60/60	1	104/91	110/100	2/3	6
EH3PB-B09	240/208-3	9	30,700	6.75	23,000	21.7/18.7		1	28/24	30/25	10/10	10
EH3PB-B15		15	51,200	11.25	38,400	36.2/31.2		1	46/39	50/40	8/8	10
EH5PB-B09	240/208-3	9	30,700	6.75	23,000	21.7/18.7		1	28/24	30/25	10/10	10
EH5PB-B15		15	51,200	11.25	38,400	36.2/31.2		1	46/39	50/40	8/8	10
EH5PB-B18		18	61,400	13.50	46,100	43.4/37.5		1	55/47	60/50	6/8	10
EH3PB-C09	480-3	9	30,700	8.26	28,200	10.8		1	15	15	14	14
EH3PB-C15		15	51,200	13.77	47,000	18.0		1	23	25	10	10
EH5PB-C09	480-3	9	30,700	8.26	28,200	10.8		1	15	15	14	14
EH5PB-C15		15	51,200	13.77	47,000	18.0		1	23	25	10	10
EH5PB-C18		18	61,400	16.53	56,400	21.7		1	28	30	10	10

① Time Delay fuses of "HACR" type circuit breakers must be used for 60 and smaller sizes. Standard fuses or circuit breakers are suitable for sizes 70 and larger. 480V circuit breakers are not "HACR" type.

② Based on wire suitable for 75 degree C. Other wiring materials must be rated for marked "Minimum Circuit Ampacity" or greater.

③ Based upon Table 250-95 of N.E.C. 1993. See electric data for basic heat pump for Circuit A wiring specification requirements.

IMPORTANT: While this electrical data is presented as a guide, it is important to electrically connect properly sized fuses and conductor wires in accordance with the National Electrical Code and all existing local codes.

FIGURE 1
DIMENSIONS OF UNITS

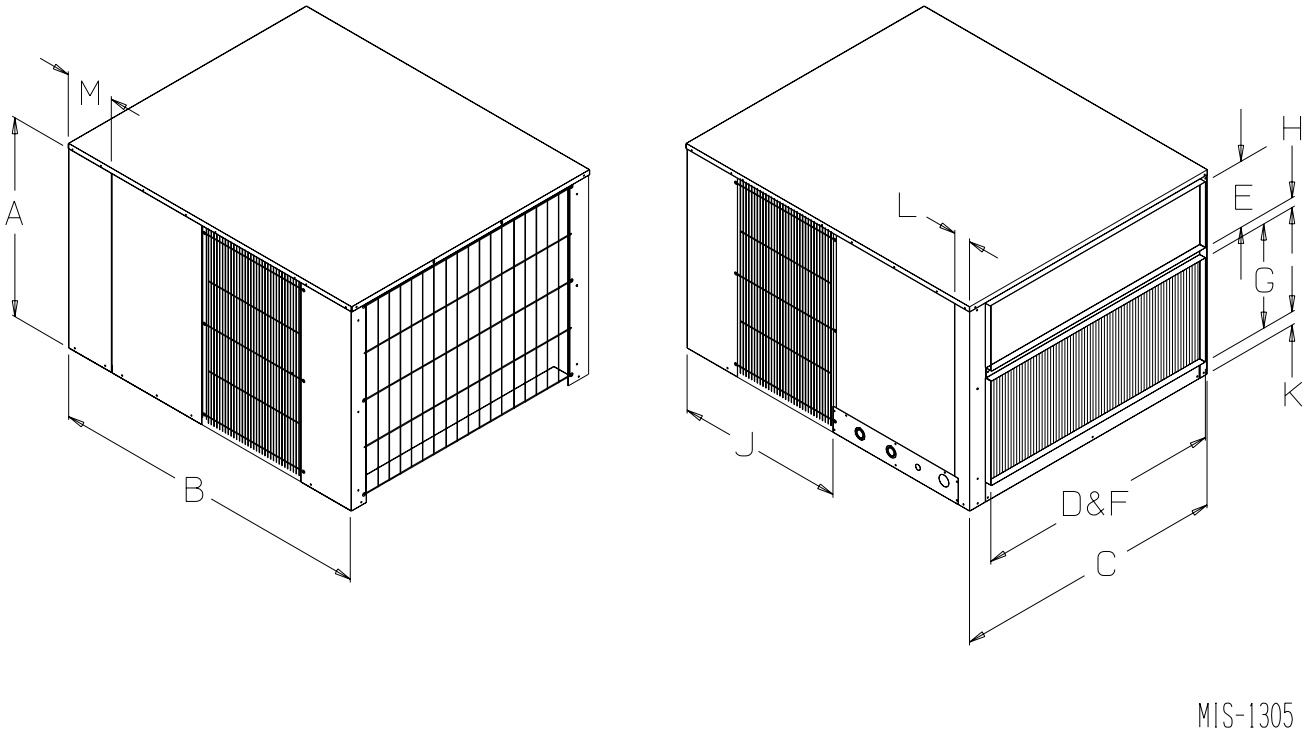

TABLE 5
DIMENSIONS OF UNITS

Model No.	Nominal Cabinet Dimensions (Inches)							Duct Opening (Inches)				H
								Discharge		Return Air		
	A	B	C	J	K	L	M	D	E	F	G	
P1124A3 P1224A2 P1130A2 P1230A1 P1136A2 P1236A1	24-1/4	48-3/16	38-1/8	26-1/8	2-1/8	9/16	9/16	33	6	33	14	7/8
P1142A3 P1242A1 P1148A2 P1248A2 P1060A1	31-1/4	50	42	26	3	2-3/4	7-9/16	38	10	38	16	1-3/8

LOCATION

GENERAL

The unit must be located outside, or in a well ventilated area. It must not be in the space being heated or cooled. A sound absorbing material should be considered if the unit is to be installed in such a position or location that might cause transmission of sound or vibration to the living area or adjacent buildings.

SLAB MOUNTING

In areas where winter temperatures *DO NOT* go below 32° F for periods over twelve hours, the unit may be slab mounted at grade level. When installing unit at grade level, install on a concrete slab at least four inches above finished grade level. Slab should have a slope tolerance away from the building structure of at least ¼ inch per foot, while being level from side to side. Place slab in a location where runoff water from higher ground will not collect around unit. See Figure 2.

A minimum of 18 inches should be provided between the coil inlet and any building surfaces. Provide at least four feet between coil outlet and any building wall, fences or other vertical structures. Provide a minimum of three feet clearance on the service access side of the unit. See Figure 3.

ROOF MOUNTING

When a unit is installed in areas where low ambient temperatures or strong winter winds exist, it should be placed for prevailing winter winds are not in direct line with the outdoor coil. If this is not possible, a wind barrier should be constructed. Place barrier 24 inches from the coil inlet side of the unit and in the direction of prevailing winds. Size barrier at least the same height and width as the unit. This may be necessary on ground level installations also. See Figure 4.

WINTER INSTALLATION BELOW 32°F

In areas where winter conditions go below 32°F for extended periods, the unit must be elevated above the mounting surface to prevent snowfall or ice accumulation from interfering with the operation of the unit. A minimum of twelve inch elevation is recommended, while greater elevation may be required for areas of high snow accumulation. Poured concrete, steel framework, brick, cement block, etc., can be utilized to construct a suitable raised mounting platform. See Figure 5.

TYPICAL INSTALLATIONS

1. **ROOF MOUNTED** – The unit is mounted on a sturdy base on the roof of the building. Return air to the unit is brought through a single return grille (grilles with built-in filters are best since they enable easy access for filter changing). Return air ducts are attached to the lower section of the front panel. Supply air is brought from the unit to attic duct work or to a furred down hall. Supply air duct is attached to the top of the front panel.

   CAUTION: All outdoor duct work must be thoroughly insulated and weatherproofed. All attic duct work must be thoroughly insulated. 2-inch thick insulation with suitable vapor barrier is recommended for both outdoor and attic runs.

   In roof top installation, as in all installations, the air conditioner must be level from side to side. However, the unit should have a pitch along the length to assure complete external drainage of precipitation and of defrost condensate. See Figures 6 and 7, and Tables 6 and 7.

2. **CRAWL SPACE** – Duct work installed in crawl space must be well insulated and provided with a vapor barrier. In addition, the crawl space must be thoroughly ventilated and provided with a good vapor barrier as a ground cover. It is most desirable to install the unit will be outdoors rather than inside the crawl space, so that it will be readily accessible for service.

3. **SLAB MOUNTED AT GROUND LEVEL** – This type installation is ideal for homes with a slab floor construction where a roof mounted unit is not desired. The supply and return duct work can be run through a furred closet space.

4. **THROUGH THE WALL** – This type installation requires a suitable framework to be fabricated capable of withstanding the unit weight. Normally the unit will be insulated so as to minimize supply and return duct work.

FIGURE 2
SLAB MOUNTING AT GROUND LEVEL
(Above 32°F Outside Temperature)

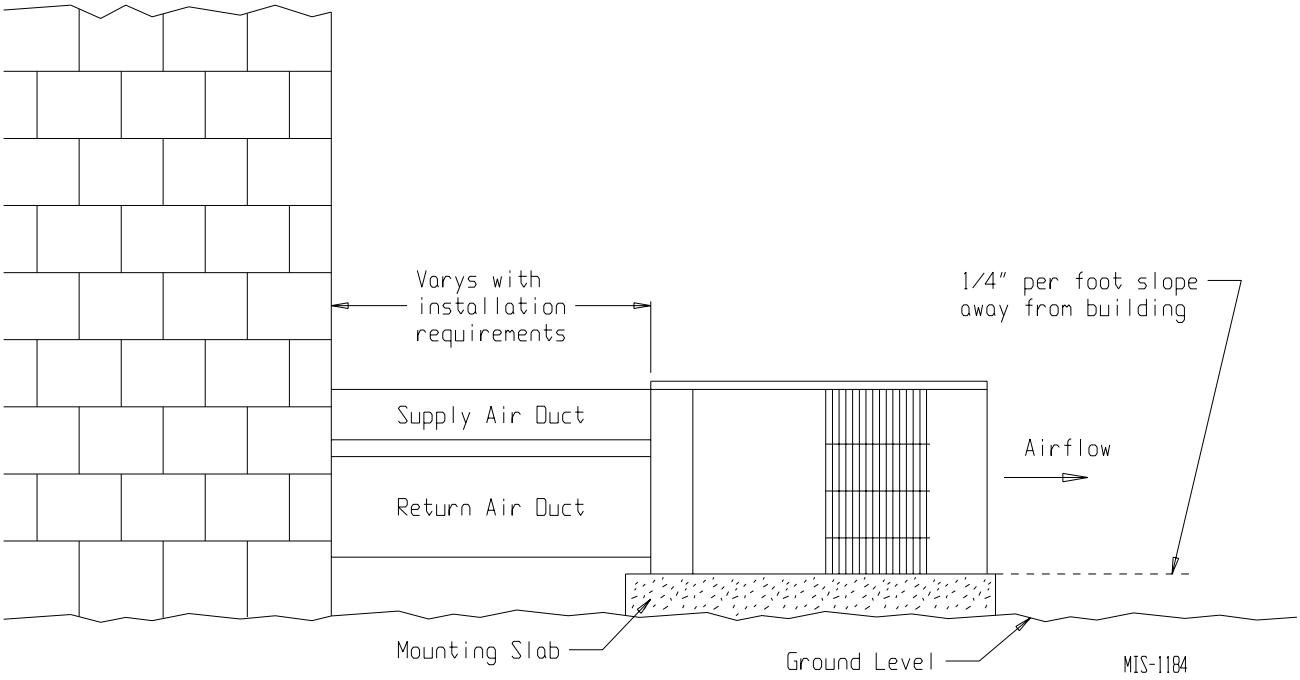

FIGURE 3
AIRFLOW AND SERVICE ACCESS CLEARANCES

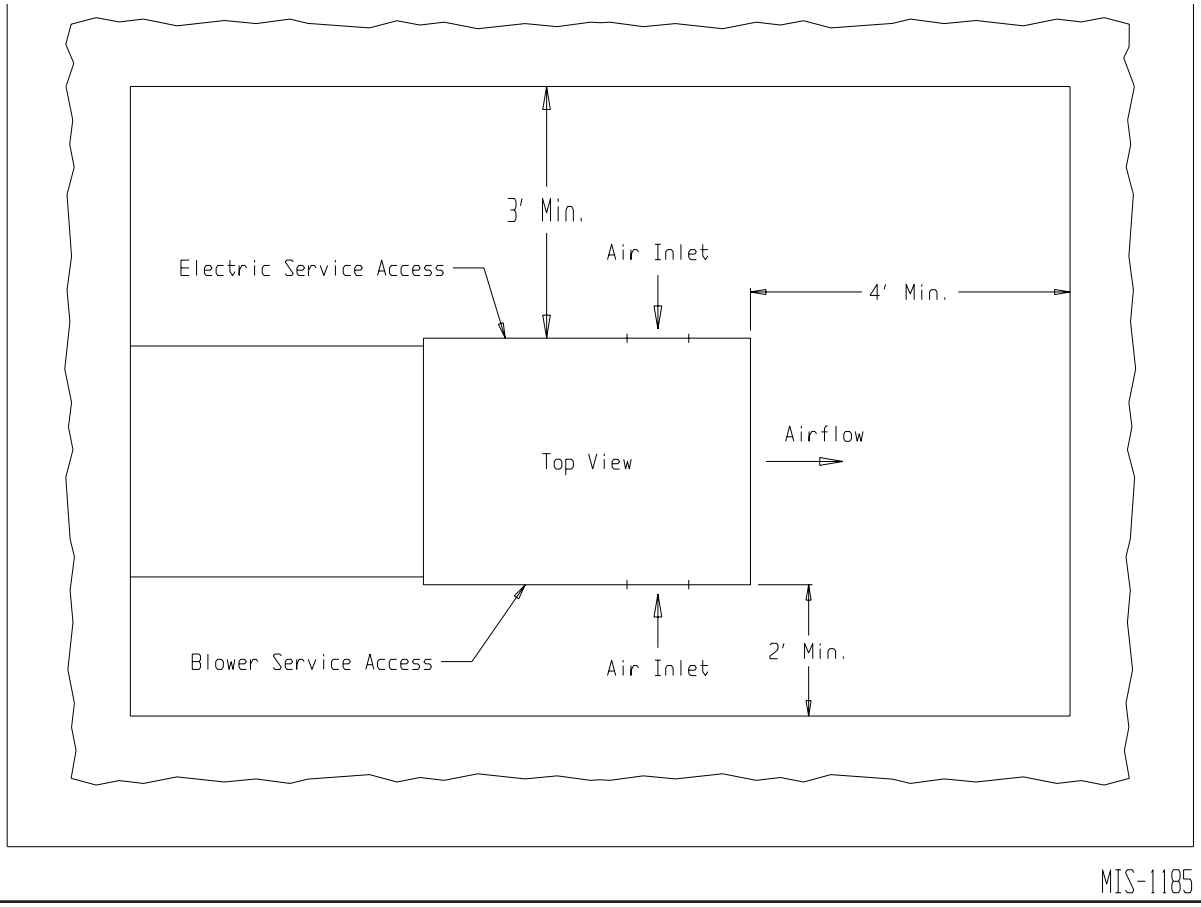

FIGURE 4
ROOF TOP APPLICATION
(May also be required for ground level installations)

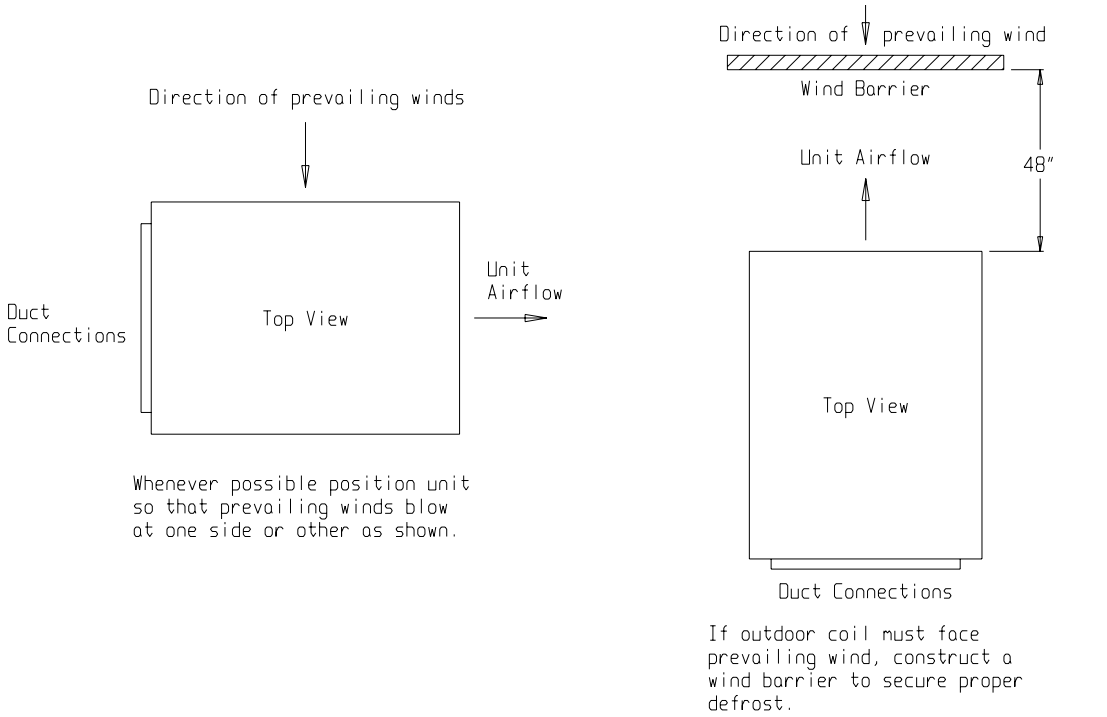

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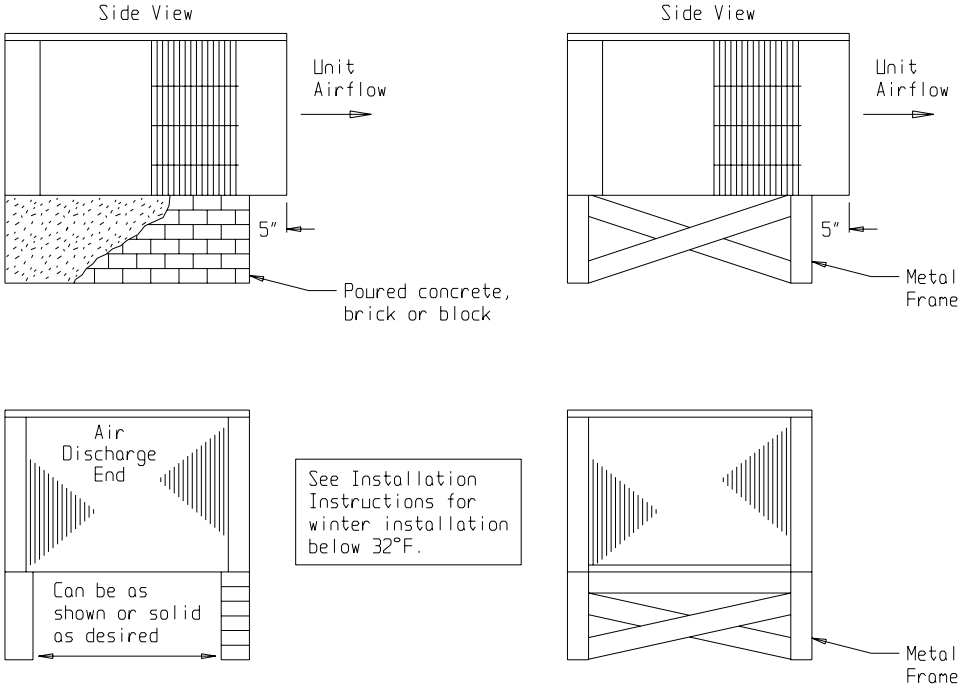
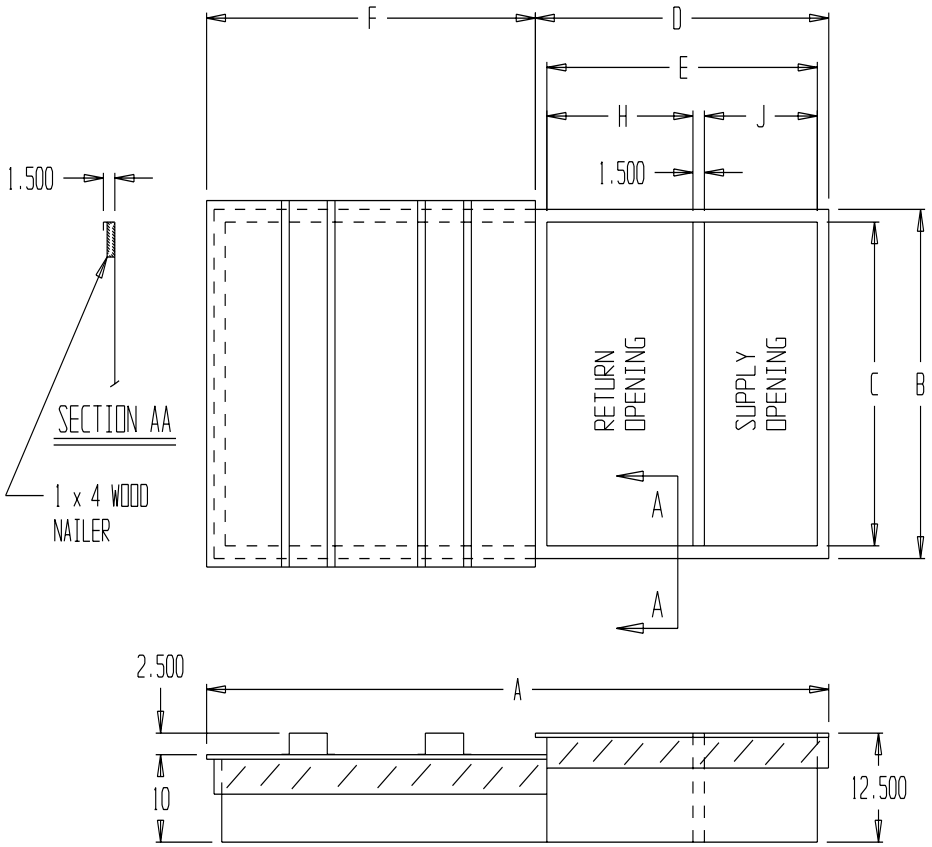
FIGURE 5
ELEVATED MOUNTING PLATFORMS

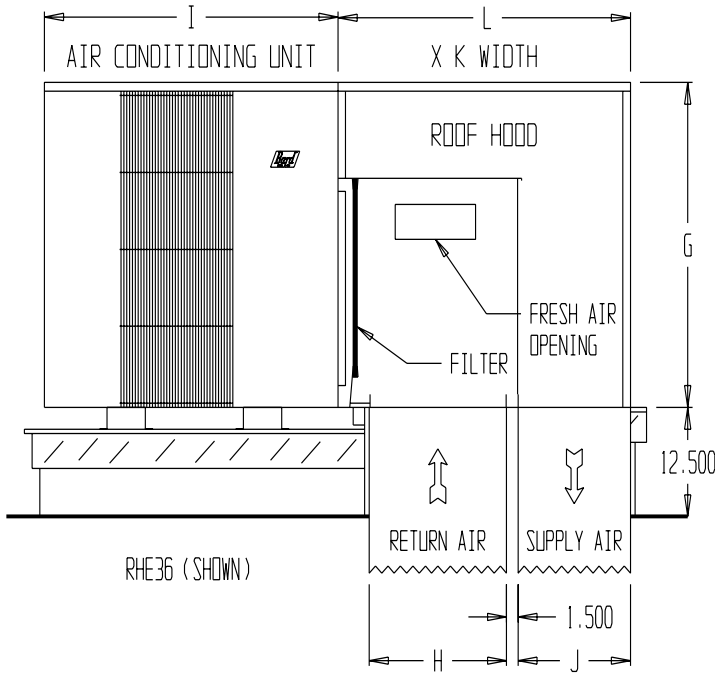


MIS-1183

FIGURE 6
PREFABRICATED ROOF CURB SPECIFICATIONS
HEAVY GAUGE GALVANIZED WITH WOOD NAILING STRIP, WELDED/LEAKPROOF
ONCE PIECE CONSTRUCTION – READY TO INSTALL

FIGURE 1





MIS-1177 C

FOR SIZES SEE ROOF CURB SPECIFICATIONS
SIDE VIEW

TABLE 6
ROOF CURB DETAILS
(Refer to Figure 7)

Unit Model	Roof Hood Model	Roof Curb Model	Roof Curb Details											
			A	B	C	D	E	F	G	H	I	J	K	L
P1124A3 P1224A2 P1130A2 P1230A1 P1136A2 P1236A1	RHE-36	9042-003	80.375	40.25	37.25	38.375	35.375	42	24.25	19.125	48.188	14.75	38.125	38.25
P1142A3 P1242A1 P1148A2 P1248A2 P1060A1	RHE-60	9042-004	82.375	44.125	41.125	38.375	35.375	44	31.25	19.125	50	14.75	42	38.25

FIGURE 7
FIELD FABRICATED CURBING

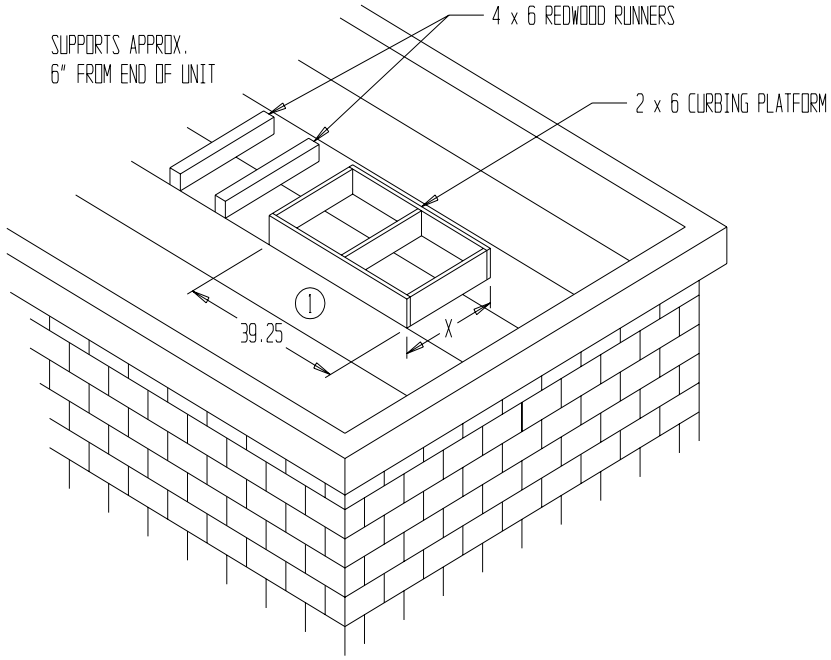


TABLE 7
DIMENSION FOR X IN FIG. 7

Unit Model	Roof Hood Model	Dimension X
P1124A3 P1224A2 P1130A2 P1230A1 P1136A2 P1236A1	RHE-36	41
P1142A3 P1242A1 P1148A2 P1248A2 P1060A1	RHE60	44-7/8

(1) A SEPARATE METAL FLASHING SHOULD BE INSTALLED AROUND WOOD CURBING. CAULK & SEAL ALL JOINTS & WEATHERPROOF.

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5. **OTHER INSTALLATIONS** – Many other installations are possible with the packaged air conditioner. No matter what the installation, always consider the following facts:

   A. Insure that the discharge air is not obstructed in any way so as to cause operation difficulties.

   B. The indoor coil drain pan is equipped with a coupling that must be piped through a condensate drain trap to a suitable drain.

   C. Always mount the unit in such a position that it may be easily reached for servicing and maintenance.

   D. Insure that the unit is clear so that proper airflow over the outdoor coil will be maintained.

If this unit is operated in cooling below a 65° outdoor ambient temperature, the installation of low ambient controls (CMA-6) to unit is required.

CONDENSATE DRAIN TRAP

It is very important to provide a trap in the condensate drain line to allow a positive liquid seal in the line and assure correct drainage from the coil condensate pan.

Install condensate drain trap shown in Figure 8. Use drain connection size or larger. Do not operate unit without trap. Unit must be level or slightly inclined toward drain. With a trap installed on a unit located in an unconditioned area, water in the trap may freeze. It is recommended that the trap material be of a type that will allow for expansion of water when it freezes.

AIR FILTERS

Air filters for the return air side of the system are not provided as part of these models, and must be field supplied and installed as part of the final installation.

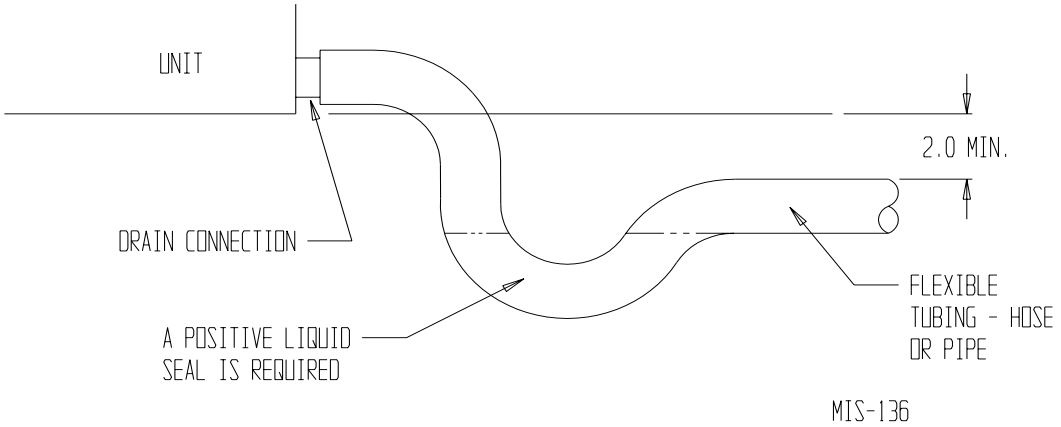
Prior thought should be given to return air location and placement of the air filter(s). The air filter(s) must be of adequate size and readily accessible to the operator of the equipment. Filters must be adequate in size and properly maintained for proper operation. If this is not done, excessive energy use, poor performance, and multiple service problems will result. *It is impossible to oversize air filters.* Generous sizing will result in cleaner air and coils as well as lower operating costs and extend the time between required changes. Table 8 shows minimum filter areas and recommended filter sizes. Actual filter sizes can vary with the installation due to single or multiple returns utilizing a filter/grille arrangement or being placed immediately ahead of the indoor coil face in the return air duct.

TABLE 8
FILTER REQUIREMENTS & SIZES

Model No.	Minimum Filter Area	Recommended Size
P1124A3 P1224A2 P1130A2 P1230A1 P1136A2 P1236A1	462 Square Inches (3.21 Square Feet)	15x30-5/8x1
P1142A3 P1242A1 P1148A2 P1248A2 P1060A1	608 Square Inches (4.62 Square Feet)	(2) 16x20x1

NOTE: If roof hood accessory is to be used, information on air filters may be found under that heading in this manual. Air filters are supplied as part of that package.

FIGURE 8
CONDENSATE DRAIN TRAP



WIRING – MAIN POWER

Refer to the unit rating plate for wire sizing information and maximum fuse size. Each outdoor unit is marked with a "Minimum Circuit Ampacity". This means that the field wiring used must be sized to carry that amount of current. If field installed heaters are added to the basic unit, a second separate power supply circuit will be required. The heater rating plate located adjacent to the basic unit rating plate will show the appropriate circuit ampacity fuse size, etc. (Also see "Electrical Specifications" on pages 5, 6 and 7.) *All models are suitable for connection with copper wire only.* These instructions ***must*** be adhered to. Refer to the National Electrical Code for complete current carrying capacity data on the various insulation grades of wiring material.

The electrical specifications list fuse and wire sizes (75°F copper) for all models including the most commonly used heater sizes.

The unit rating plate lists a "Maximum Time Delay 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.

WIRING – 24V LOW VOLTAGE CONTROL CIRCUIT

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 9.

TABLE 9
THERMOSTAT WIRE SIZE

Transformer VA	FLA	Wire Gauge	Maximum Distance In Feet
55	2.3	20	45
		18	60
		16	100
		14	160
		12	250

TRANSFORMER TAPS

230/208V, 1 phase and 3 phase equipment employ 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).

THERMOSTATS

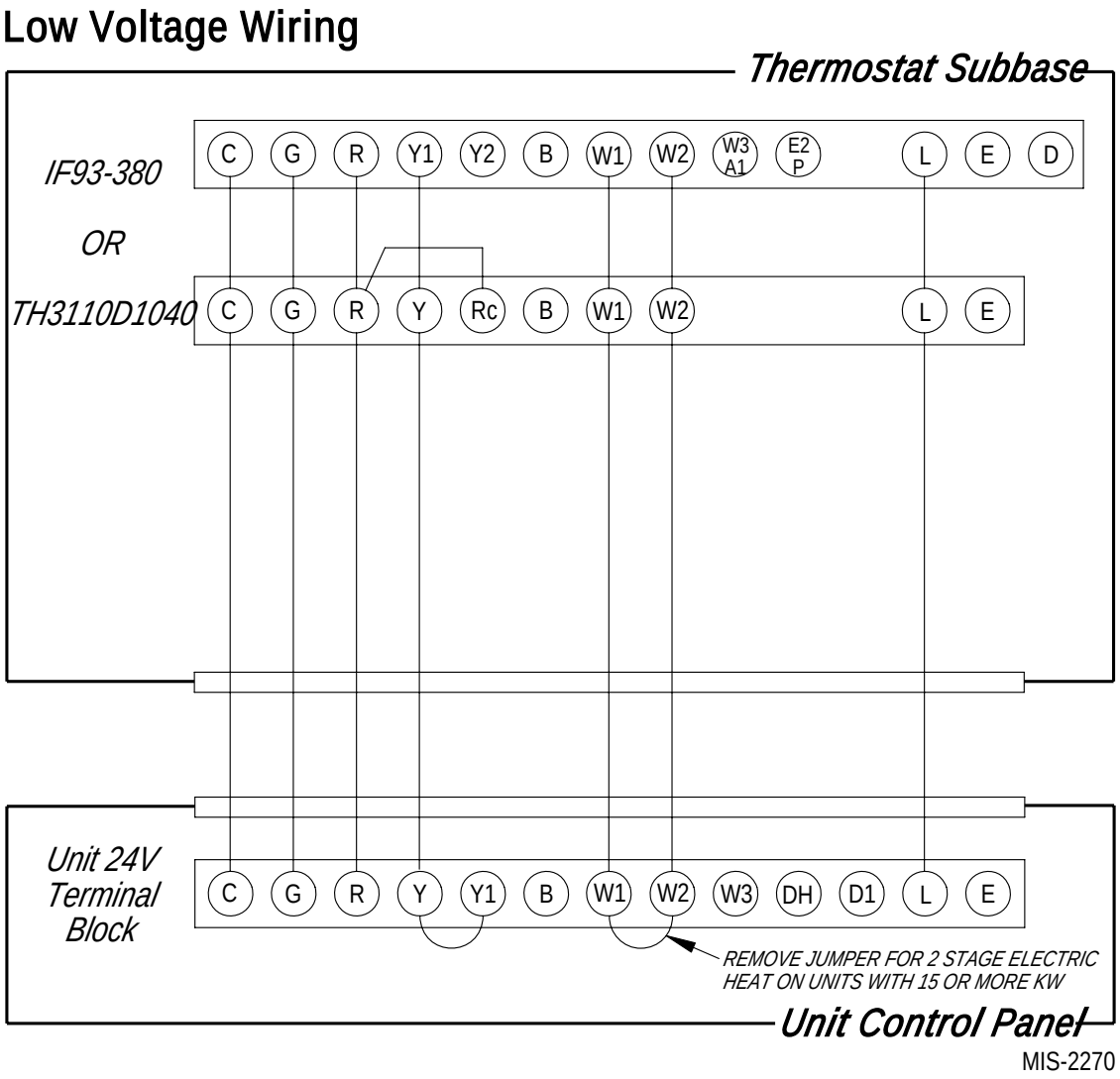
See specific wiring information for the different models, heater KWs, and voltages on unit and heating wiring diagrams.

TABLE 10
WALL THERMOSTAT

Thermostat	Predominant Features
8403-049 (1F93-380)	2 stage Cool; 2 stage Heat Programmable Electronic Auto or Manual changeover
8403-057 (TH3110D1040)	1 stage Cool; 1 stage Heat Electronic Non-Programmable Manual changeover

IMPORTANT NOTE: Only the thermostats shown above are recommended for use with this equipment.

FIGURE 9
LOW VOLTAGE WIRING



THREE PHASE SCROLL COMPRESSOR START UP INFORMATION

Scroll compressors, like several other types of compressors, will only compress in one rotational 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 be no negative impact on the durability of the compressor. However, reverse operation for over one hour may have a negative impact on the bearing 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 ZR*3 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 Fusite terminals should maintain proper rotation direction.

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

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 circuit R-W1 is completed on each heating cycle energizing electric heat if so equipped.

START UP NOTES

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

INDOOR BLOWER MOTOR

Some models feature a variable speed (ECM) motor providing high efficiency, low sound levels and soft start capabilities. The motor is self-adjusting to provide the proper airflow rate at duct static pressures up to 0.50" WC without user adjustment or wiring changes.

On command from the wall thermostat, the motor will start slowly and ramp up to full speed over a period of 10-15 seconds.

When the thermostat is satisfied, the blower will operate for approximately 1 minute, and then slow down and stop.

COMPRESSOR CONTROL MODULE

The compressor control is an anti-short cycle/lockout timer with high and low pressure switch monitoring and alarm output.

ADJUSTABLE DELAY-ON-MAKE AND BREAK TIMER

On a call for compressor operation, the *delay-on-make* period begins which will be 10% of the *delay-on-break* setting. When the delay-on-make is complete and the high pressure switch (and low pressure switch if employed) is closed, the compressor contactor is energized. Upon shutdown, the delay-on-break timer starts and prevents restart until the delay-on-break and delay-on-make periods have expired.

HIGH PRESSURE SWITCH AND LOCKOUT SEQUENCE (Standard Feature)

If the high pressure switch opens, the compressor contactor will de-energize immediately. The lockout timer will go into a *soft lockout* and stay in soft lockout until the high pressure switch closes **and** the delay-on-make time has expired. If the high pressure switch opens again in this same operating cycle the unit will go into *manual lockout* condition and the alarm circuit will energize. Recycling the wall thermostat resets the manual lockout.

LOW PRESSURE SWITCH, BYPASS, AND LOCKOUT SEQUENCE

NOTE: The low pressure switch is an optional control and the bypass and lockout sequence are part of the standard compressor control module.

If the low pressure switch opens for more that 120 seconds, the compressor contactor will de-energize and go into a soft lockout. Regardless the state of the low pressure switch, the contactor will reenergize after the delay-on-make time delay has expired. If the low pressure switch remains open or opens again for longer than 120 seconds the unit will go into manual lockout condition and the alarm circuit will energize. Recycling the wall thermostat resets the manual lockout.

ALARM OUTPUT

Alarm terminal is output connection for applications where alarm signal is desired. This terminal is powered whenever compressor is locked out due to HPC or LPC sequences as described.

NOTE: Both high and low pressure switch controls are inherently automatic reset devices. The high pressure switch and low pressure switch cut out and cut in settings are fixed by specific air conditioner or heat pump unit model. The lockout features, both soft and manual, are a function of the Compressor Control Module.

ADJUSTMENTS

ADJUSTABLE DELAY-ON-MAKE AND DELAY-ON-BREAK TIMER

The potentiometer is used to select Delay-on-Break time from 30 seconds to 5 minutes. Delay-on-Make (DOM) timing on power-up and after power interruptions is equal to 2 minutes plus 10% of Delay-on-Break (DOB) setting:

0.5 minute	(30 seconds)	DOB	=	123 second DOM
1.0 minute	(60 seconds)	DOB	=	126 second DOM
2.0 minute	(120 seconds)	DOB	=	132 second DOM
3.0 minute	(160 seconds)	DOB	=	138 second DOM
4.0 minute	(240 seconds)	DOB	=	144 second DOM
5.0 minute	(300 seconds)	DOB	=	150 second DOM

SERVICE HINTS

1. Caution homeowner to maintain clean air filters at all times. Also, not to needlessly close off supply and return air registers. This reduces airflow through the system, which shortens equipment service life as well as increasing operating costs.
2. Check all power fuses or circuit breakers to be sure that they are the correct rating.
3. Periodic cleaning of the outdoor coil to permit full and unrestricted airflow circulation is essential.

PRESSURE SERVICE PORTS

High and low pressure service ports are installed on all units so that the system operating pressures can be observed. Pressure tables can be found later in this manual covering all models on cooling cycle. It is imperative to match the correct pressure table to the unit by model number.

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 Table 11.

TABLE 11
SUCTION LINE TEMPERATURES

Model	Rated Airflow	95° OD Temperature	82° OD Temperature
P1124A3	800	54 - 56	60 - 62
P1224A2	800	55 - 58	61 - 63
P1130A2	1125	56 - 58	63 - 65
P1230A1	1000	56 - 58	63 - 65
P1136A2	1250	57 - 59	58 - 60
P1236A1	1100	57 - 59	58 - 60
P1142A3	1400	57 - 59	58 - 60
P1242A1	1400	57 - 59	58 - 60
P1148A2	1550	54 - 57	58 - 60
P1248A2	1550	53 - 55	56 - 58
P1060A1	1700	47 - 49	54 - 56

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

FAN BLADE SETTINGS

Shown in Figure 10 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 10
FAN BLADE SETTING

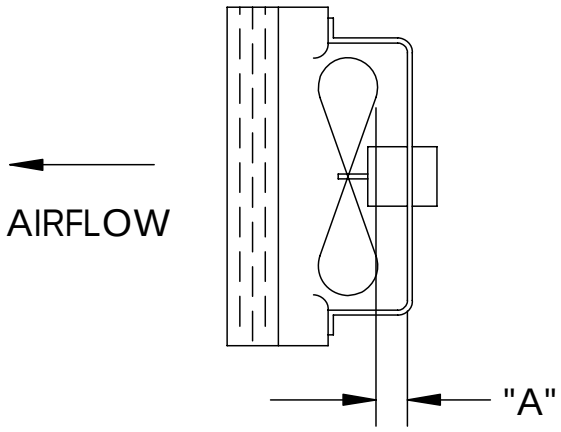


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TABLE 12
FAN BLADE SETTING DIMENSIONS

Model	Dimension "A"
P1124A3	1.00"
P1224A2	1.00"
P1130A2	.75"
P1230A1	1.00"
P1136A2	1.00"
P1236A1	1.00"
P1142A3	1.75"
P1242A1	1.75"
P1148A2	1.75"
P1248A2	1.75"
P1060A1	1.75"

SUCTION AND DISCHARGE TUBE BRAZING

Compliant Scroll compressors have copper plated steel suction and discharge tubes. These tubes are far more rugged and less prone to leaks than copper tubes used on other compressors. Due to different thermal properties of steel and copper, brazing procedures may have to be changed from those commonly used.

- To disconnect: heat joint Areas 2 and 3 slowly and uniformly until braze material softens and the tube can be pulled out of suction fitting. (See Figure 11.)
- To connect:
  - Recommended brazing materials: silfos with minimum 5% silver or silver braze material with flux.
  - Reinsert tube into fitting.
  - Heat tube uniformly in Area 1 moving slowly to Area 2. When joint reaches brazing temperature, apply brazing material. (See Figure 11)
  - Heat joint uniformly around the circumference to flow braze material completely around the joint.
  - Slowly move torch into Area 3 to draw braze material into joint. (See Figure 11.)
  - ***Do not*** overheat joint.

FIGURE 11
BRAZING DIAGRAM

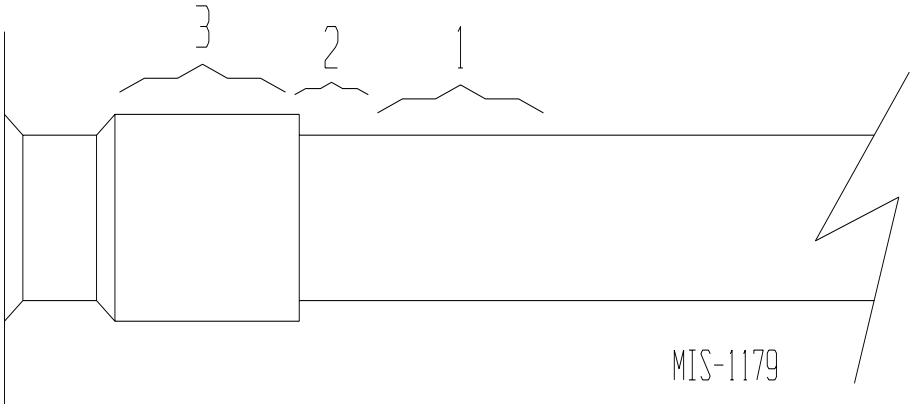

TABLE 13
INDOOR BLOWER PERFORMANCE

ESP In H_2O	P1124A3	P1130A2	P1136A2	P1142A3	P1148A2	P1060A1
	Dry / Wet	Dry / Wet	Dry / Wet	Dry / Wet	Dry / Wet	Dry / Wet
0.0	1025 / 960	1350 / 1210	1465 / 1375	1650 / 1625	1950 / 1920	1850 / 1850
0.1	935 / 870	1300 / 1160	1430 / 1340	1550 / 1525	1860 / 1830	1800 / 1780
0.2	865 / 800	1240 / 1100	1385 / 1295	1435 / 1400	1780 / 1750	1725 / 1700
0.3	835 / 770	1175 / 1035	1340 / 1250	1340 / 1310	1680 / 1660	1660 / 1625
0.4	800 / 735	1120 / 980	1275 / 1185	1230 / 1210	1580 / 1550	1580 / 1540
0.5	750 / 685	1050 / 910	1190 / 1100	1120 / 1100	1500 / 1480	1500 / 1475

TABLE 14
PRESSURE TABLE

COOLING

Air Temperature Entering Outdoor Coil Degrees F

Model	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
P1124A3	75 deg. DB 62 deg. WB	Low Side High Side	70 219	74 220	77 224	79 234	80 248	82 258	83 276	84 293	85 316
	80 deg. DB 67 deg. WB	Low Side High Side	75 224	79 225	82 230	84 240	86 254	88 265	89 283	90 300	91 324
	85 deg. DB 72 deg. WB	Low Side High Side	81 232	85 233	88 238	90 248	92 263	94 274	96 293	97 311	98 335
P1224A2	75 deg. DB 62 deg. WB	Low Side High Side	74 188	75 203	77 217	79 233	79 249	80 265	81 282	82 299	83 317
	80 deg. DB 67 deg. WB	Low Side High Side	79 193	80 208	82 223	84 239	85 255	86 272	87 289	88 307	89 325
	85 deg. DB 72 deg. WB	Low Side High Side	82 200	83 215	85 231	87 247	88 264	89 282	90 299	91 318	92 336
P1130A2	75 deg. DB 62 deg. WB	Low Side High Side	73 200	75 219	76 234	77 254	79 271	80 288	81 307	82 327	83 342
	80 deg. DB 67 deg. WB	Low Side High Side	75 205	80 225	81 240	82 260	84 278	85 295	86 315	87 335	88 351
	85 deg. DB 72 deg. WB	Low Side High Side	84 212	86 233	87 248	88 269	90 287	91 305	92 326	94 347	95 363
P1230A1	75 deg. DB 62 deg. WB	Low Side High Side	72 199	73 213	74 227	75 243	77 258	78 275	79 293	79 310	80 330
	80 deg. DB 67 deg. WB	Low Side High Side	77 204	78 218	79 233	80 249	82 265	8/3 282	84 300	85 318	86 338
	85 deg. DB 72 deg. WB	Low Side High Side	80 211	81 226	82 241	83 258	85 274	86 292	87 311	88 329	89 350
P1136A2	75 deg. DB 62 deg. WB	Low Side High Side	67 195	71 215	73 229	75 249	77 263	78 282	79 302	80 317	81 336
	80 deg. DB 67 deg. WB	Low Side High Side	72 200	76 220	78 235	80 255	82 270	84 290	85 310	86 325	87 345
	85 deg. DB 72 deg. WB	Low Side High Side	77 207	82 228	84 243	86 264	88 279	90 300	91 321	92 336	94 357
P1236A1	75 deg. DB 62 deg. WB	Low Side High Side	71 209	73 225	75 242	76 258	78 275	79 293	79 310	80 329	81 346
	80 deg. DB 67 deg. WB	Low Side High Side	76 214	78 231	80 248	81 265	83 282	84 300	85 318	86 337	87 355
	85 deg. DB 72 deg. WB	Low Side High Side	79 221	81 239	83 257	84 274	86 292	87 311	88 329	89 349	90 367

(Continued on Page 24 in Table 14A)

TABLE 14A
PRESSURE TABLE

COOLING

Air Temperature Entering Outdoor Coil Degrees F

Model	Return Air Temperature	Pressure	75	80	85	90	95	100	105	110	115
P1142A3	75 deg. DB 62 deg. WB	Low Side High Side	70 208	72 223	75 239	77 254	78 271	79 288	80 305	81 324	82 342
	80 deg. DB 67 deg. WB	Low Side High Side	75 213	77 229	80 245	82 261	84 278	85 295	96 313	87 332	88 351
	85 deg. DB 72 deg. WB	Low Side High Side	81 220	83 237	86 254	88 270	0 288	91 305	92 324	94 344	95 363
P1242A1	75 deg. DB 62 deg. WB	Low Side High Side	70 192	72 206	74 220	76 236	78 252	79 268	80 286	81 304	82 323
	80 deg. DB 67 deg. WB	Low Side High Side	75 197	77 211	79 226	81 242	83 258	85 275	86 293	87 312	88 331
	85 deg. DB 72 deg. WB	Low Side High Side	78 204	80 218	82 234	84 250	86 267	88 285	89 303	90 323	91 343
P1148A2	75 deg. DB 62 deg. WB	Low Side High Side	73 203	74 218	75 231	76 246	78 264	79 278	80 294	81 312	82 330
	80 deg. DB 67 deg. WB	Low Side High Side	78 208	79 222	81 237	82 252	83 268	84 285	86 302	87 320	88 338
	85 deg. DB 72 deg. WB	Low Side High Side	83 215	85 230	87 245	88 261	87 273	91 295	92 313	93 331	94 350
P1248A2	75 deg. DB 62 deg. WB	Low Side High Side	70 200	72 215	73 230	75 247	77 263	79 281	79 298	81 317	83 336
	80 deg. DB 67 deg. WB	Low Side High Side	75 205	77 220	78 236	80 253	82 270	84 288	85 306	87 325	89 345
	85 deg. DB 72 deg. WB	Low Side High Side	78 212	80 228	81 244	83 262	85 279	87 298	88 317	90 336	92 357
P1060A1	75 deg. DB 62 deg. WB	Low Side High Side	65 214	66 230	68 247	69 264	70 284	72 299	74 318	75 336	76 355
	80 deg. DB 67 deg. WB	Low Side High Side	69 219	71 236	72 253	74 271	76 289	77 307	79 326	80 345	82 364
	85 deg. DB 72 deg. WB	Low Side High Side	74 227	76 244	78 262	79 280	81 296	83 318	85 337	86 357	88 377

TROUBLESHOOTING GE ECM BLOWER MOTORS

CAUTION:

Disconnect power from unit before removing or replacing connectors, or servicing motor. To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.

Symptom	Cause/Procedure
Motor rocks slightly when starting	• This is normal start-up for ECM
Motor won't start	
• No movement	• Check blower turns by hand • Check power at motor • Check low voltage (24 Vac R to C) at motor • Check low voltage connections (G, Y, W, R, C) at motor • Check for unseated pins in connectors on motor harness • Test with a temporary jumper between R - G • Check motor for tight shaft • Perform motor/control replacement check • **Perform Moisture Check**
• Motor rocks, but won't start	• Check for loose or compliant motor mount • Make sure blower wheel is tight on shaft • Perform motor/control replacement check
Motor oscillates up & down while being tested off of blower	• It is normal for motor to oscillate with no load on shaft
Motor starts, but runs erratically	
• Varies up and down or intermittent	• Check line voltage for variation or "sag" • Check low voltage connections (G, Y, W, R, C) at motor, unseated pins in motor harness connectors • Check "Bk" for erratic CFM command (in variable-speed applications) • Check out system controls, Thermostat • **Perform Moisture Check**
• "Hunts" or "puffs" at high CFM (speed)	• Does removing panel or filter reduce "puffing"? - Reduce restriction - Reduce max airflow
• Stays at low CFM despite system call for cool or heat CFM	• Check low voltage (Thermostat) wires and connections • Verify fan is not in delay mode; wait until delay complete • "R" missing/not connected at motor • Perform motor/control replacement check
• Stays at high CFM	• "R" missing/not connected at motor • Is fan in delay mode? - wait until delay time complete • Perform motor/control replacement check
• Blower won't shut off	• Current leakage from controls into G, Y or W? Check for Triac switched thermostat or solid-state relay
Excessive noise	• Determine if it's air noise, cabinet, duct or motor noise; interview customer, if necessary
• Air noise	• High static creating high blower speed? - Is airflow set properly? - Does removing filter cause blower to slow down? Check filter - Use low-pressure drop filter - Check/correct duct restrictions
• Noisy blower or cabinet	• Check for loose blower housing, panels, etc. • High static creating high blower speed? - Check for air whistling through seams in ducts, cabinets or panels - Check for cabinet/duct deformation
• "Hunts" or "puffs" at high CFM (speed)	• Does removing panel or filter reduce "puffing"? - Reduce restriction - Reduce max. airflow
Evidence of Moisture	
• Motor failure or malfunction has occurred and moisture is present	• Replace motor and **Perform Moisture Check**
• Evidence of moisture present inside air mover	• **Perform Moisture Check**

Do	Don't
• Check out motor, controls, wiring and connections thoroughly before replacing motor	• Automatically assume the motor is bad.
• Orient connectors down so water can't get in - Install "drip loops"	• Locate connectors above 7 and 4 o'clock positions
• Use authorized motor and model #'s for replacement	• Replace one motor or control model # with another (unless an authorized replacement)
• Keep static pressure to a minimum: - Recommend high efficiency, low static filters - Recommend keeping filters clean. - Design ductwork for min. static, max. comfort - Look for and recommend ductwork improvement, where necessary	• Use high pressure drop filters some have ½" H20 drop! • Use restricted returns
• Size the equipment wisely	• Oversize system, then compensate with low airflow
• Check orientation before inserting motor connectors	• Plug in power connector backwards • Force plugs

Moisture Check

- Connectors are oriented "down" (or as recommended by equipment manufacturer)
- Arrange harness with "drip loop" under motor
- Is condensate drain plugged?
- Check for low airflow (too much latent capacity)
- Check for undercharged condition
- Check and plug leaks in return ducts, cabinet

Comfort Check

- Check proper airflow settings
- Low static pressure for lowest noise
- Set low continuous-fan CFM
- Use humidistat and 2-speed cooling units
- Use zoning controls designed for ECM that regulate CFM
- Thermostat in bad location?

TROUBLESHOOTING GE ECM™ MOTORS CONT'D.

Replacing ECM Control Module

To replace the control module for the GE variable-speed indoor blower motor you need to take the following steps:

1. You MUST have the correct replacement module. The controls are factory programmed for specific operating modes. Even though they look alike, different modules may have completely different functionality.

USING THE WRONG CONTROL MODULE VOIDS ALL PRODUCT WARRANTIES AND MAY PRODUCE UNEXPECTED RESULTS.

2. Begin by removing AC power from the furnace or air handler being serviced. **DO NOT WORK ON THE MOTOR WITH AC POWER APPLIED.** To avoid electric shock from the motor's capacitors, disconnect power and wait at least 5 minutes before opening motor.

3. It is usually not necessary to remove the motor from the blower assembly. However, it is recommended that the whole blower assembly, with the motor, be removed from the furnace/air handler. (Follow the manufacturer's procedures). Unplug the two cable connectors to the motor. There are latches on each connector. **DO NOT PULL ON THE WIRES.** The plugs remove easily when properly released.

4. Locate the two standard ¼" hex head bolts at the rear of the control housing (at the back end of the control opposite the shaft end). *Refer to Figure 12.* Remove these two bolts from the motor and control assembly while holding the motor in a way that will prevent the motor or control from falling when the bolts are removed. If an ECM2.0 control is being replaced (recognized by an aluminum casting rather that a deep-drawn black steel can housing the electronics), remove only the hex-head bolts. **DO NOT REMOVE THE TORX-HEAD SCREWS.**

5. The control module is now free of mechanical attachment to the motor endshield but is still connected by a plug and three wires inside the control. Carefully rotate the control to gain access to the plug at the control end of the wires. With thumb and forefinger, reach the latch holding the plug to the control and release it by squeezing the latch tab and the opposite side of the connector plug and gently pulling the plug out of the connector socket in the control. **DO NOT PULL ON THE WIRES. GRIP THE PLUG ONLY.**

6. The control module is now completely detached from the motor. Verify with a standard ohmmeter that the resistance from each motor lead (in the motor plug just removed) to the motor shell is >100K ohms. *Refer to Figure 13.* (Measure to unpainted motor end plate.) If any motor lead fails this test, do not proceed to install the control module. **THE MOTOR IS DEFECTIVE AND MUST BE REPLACED.** Installing the new control module will cause it to fail also.

7. Verify that the replacement control is correct for your application. Refer to the manufacturer's authorized replacement list. **USING THE WRONG CONTROL WILL RESULT IN IMPROPER OR NO BLOWER OPERATION.** Orient the control module so that the 3-wire motor plug can be inserted into the socket in the control. Carefully insert the plug and press it into the socket until it latches. **A SLIGHT CLICK WILL BE HEARD WHEN PROPERLY INSERTED.** Finish installing the replacement control per one of the three following paragraphs, 8a, 8b or 8c.

8a. **IF REPLACING AN ECM 2.0 CONTROL** (control in cast aluminum can with air vents on the back of the can) **WITH AN ECM 2.3 CONTROL** (control containing black potting for water protection in black deep-drawn steel case with no vents in the bottom of the can), locate the two through-bolts and plastic tab that are packed with the replacement control. Insert the plastic tab into the slot at the perimeter of the open end of the can so that the pin is located on the inside of the perimeter of the can. Rotate the can so that the tab inserts into the tab locater hole in the endshield of the motor. Using the two through-bolts provided with the replacement control, reattach the can to the motor.

THE TWO THROUGH-BOLTS PROVIDED WITH THE REPLACEMENT ECM 2.3 CONTROL ARE SHORTER THAN THE BOLTS ORIGINALLY REMOVED FROM THE ECM 2.0 CONTROL AND MUST BE USED IF SECURE ATTACHMENT OF THE CONTROL TO THE MOTOR IS TO BE ACHIEVED. ***DO NOT OVERTIGHTEN THE BOLTS.***

8b. **IF REPLACING AN ECM 2.3 CONTROL WITH AN ECM 2.3 CONTROL**, the plastic tab and shorter through-bolts are not needed. The control can be oriented in two positions 180° apart. **MAKE SURE THE ORIENTATION YOU SELECT FOR REPLACING THE CONTROL ASSURES THE CONTROL'S CABLE CONNECTORS WILL BE LOCATED DOWNWARD IN THE APPLICATION SO THAT WATER CANNOT RUN DOWN THE CABLES AND INTO THE CONTROL.** Simply orient the new control to the motor's endshield, insert bolts, and tighten. ***DO NOT OVERTIGHTEN THE BOLTS.***

8c. **IF REPLACING AN ECM 2.0 CONTROL WITH AN ECM 2.0 CONTROL** *(It is recommended that ECM 2.3 controls be used for all replacements),* the new control must be attached to the motor using through bolts identical to those removed with the original control. ***DO NOT OVERTIGHTEN THE BOLTS.***

9. Reinstall the blower/motor assembly into the HVAC equipment. Follow the manufacturer's suggested procedures.

10. Plug the 16-pin control plug into the motor. The plug is keyed. Make sure the connector is properly seated and latched.

11. Plug the 5-pin power connector into the motor. Even though the plug is keyed, **OBSERVE THE PROPER ORIENTATION. DO NOT FORCE THE CONNECTOR.** It plugs in very easily when properly oriented. **REVERSING THIS PLUG WILL CAUSE IMMEDIATE FAILURE OF THE CONTROL MODULE.**

12. Final installation check. Make sure the motor is installed as follows:
   a. Unit is as far INTO the blower housing as possible.
   b. Belly bands are not on the control module or covering vent holes.
   c. Motor connectors should be oriented between the 4 o'clock and 8 o'clock positions when the blower is positioned in its final location and orientation.
   d. Add a drip loop to the cables so that water cannot enter the motor by draining down the cables. *Refer to Figure 14.*

The installation is now complete. Reapply the AC power to the HVAC equipment and verify that the new motor control module is working properly. Follow the manufacturer's procedures for disposition of the old control module.

Figure 12
Control Disassembly

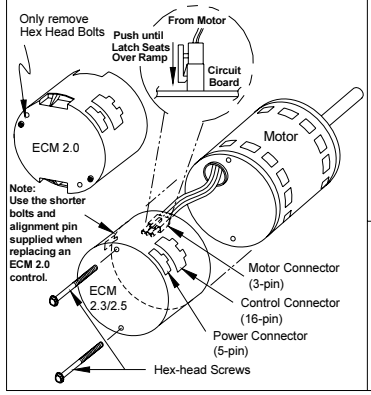

Figure 13
Winding Test

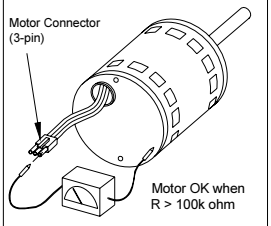

Figure 14
Drip Loop