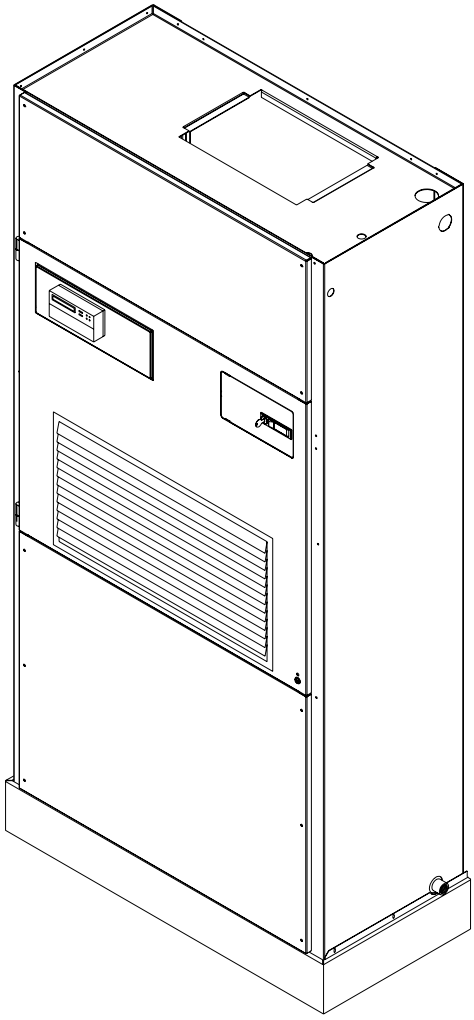
INSTALLATION INSTRUCTIONS

QC SERIES CHILLED WATER UNIT

Model: QC501



MIS-1554

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
Since 1914...Moving ahead, just as planned.

Manual No.: 2100-416E
Supersedes: 2100-416D
File: Vol II Tab 14
Date: 10-10-06

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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 Residential ..... ACCA Manual J Winter and Summer Air Conditioning

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

Closed-Loop/Ground Source Heat Pump ..... IGSHPA Systems Installation Guide

Grouting Procedures for Ground-Source ..... IGSHPA Heat Pump Systems

Soil and Rock Classification for the Design .... IGSHPA of Ground-Coupled Heat Pump Systems

Ground Source Installation Standards ..... IGSHPA

Closed-Loop Geothermal Systems – Slinky .... IGSHPA Installation Guide

FOR MORE INFORMATION, CONTACT THESE PUBLISHERS:

ACCA **Air Conditioning Contractors of America**
1712 New Hampshire Avenue
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

IGSHPA **International Ground Source Heat Pump Association**
490 Cordell South
Stillwater, OK 74078-8018

QC SERIES WATER SOURCE GENERAL INFORMATION

QC MODEL NOMENCLATURE

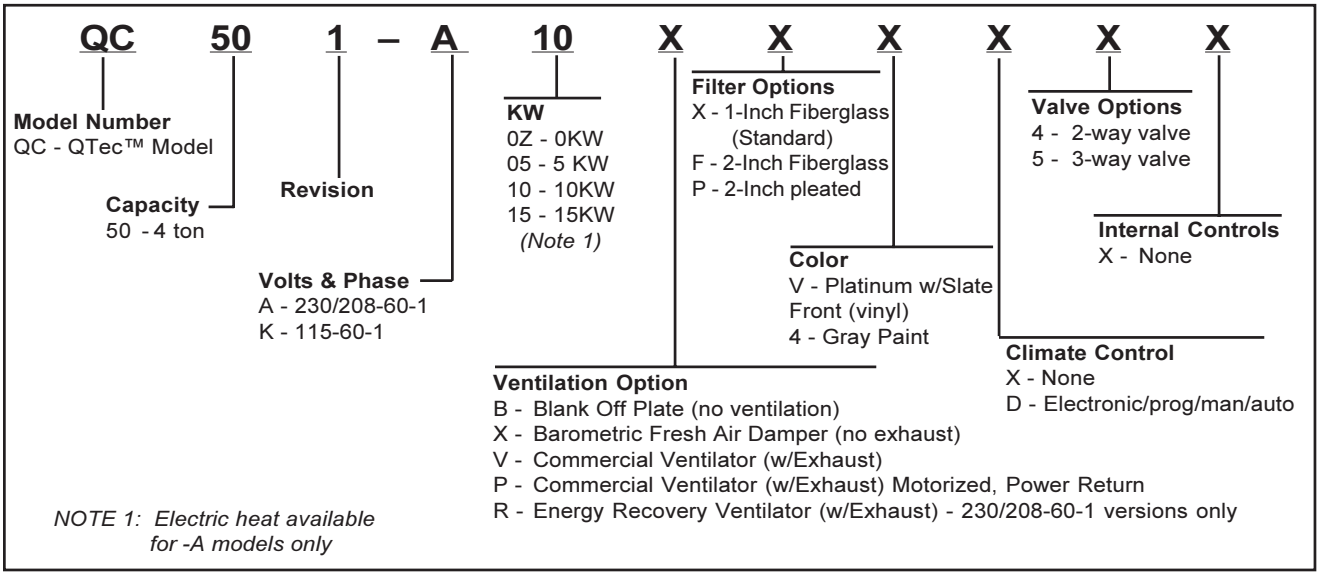


TABLE 1
FACTORY BUILT-IN ELECTRIC HEAT TABLE

Models	QC501-A	
	240V-1	208V-1
KW	BTUH	BTUH
5.0	16,380	12,290
10.0	32,670	24,570
15.0	49,150	36,860

TABLE 2
ELECTRICAL SPECIFICATIONS

		Single Circuit					Dual Circuit							
Models	Rated Volts & Phases	No. Field Power Circuits	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 Circuit 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
QC501-A0Z	230/208-1	1	7	15	14	14	–	–	–	–	–	–	–	–
-A05		1	33	35	8	10	–	–	–	–	–	–	–	–
-A10		1	58	60	6	10	–	–	–	–	–	–	–	–
-A15		1 or 2	83	90	4	8	50	33	50	40	8	8	10	10
QC501-K0Z	115-1	1	10	15	14	14	–	–	–	–	–	–	–	–

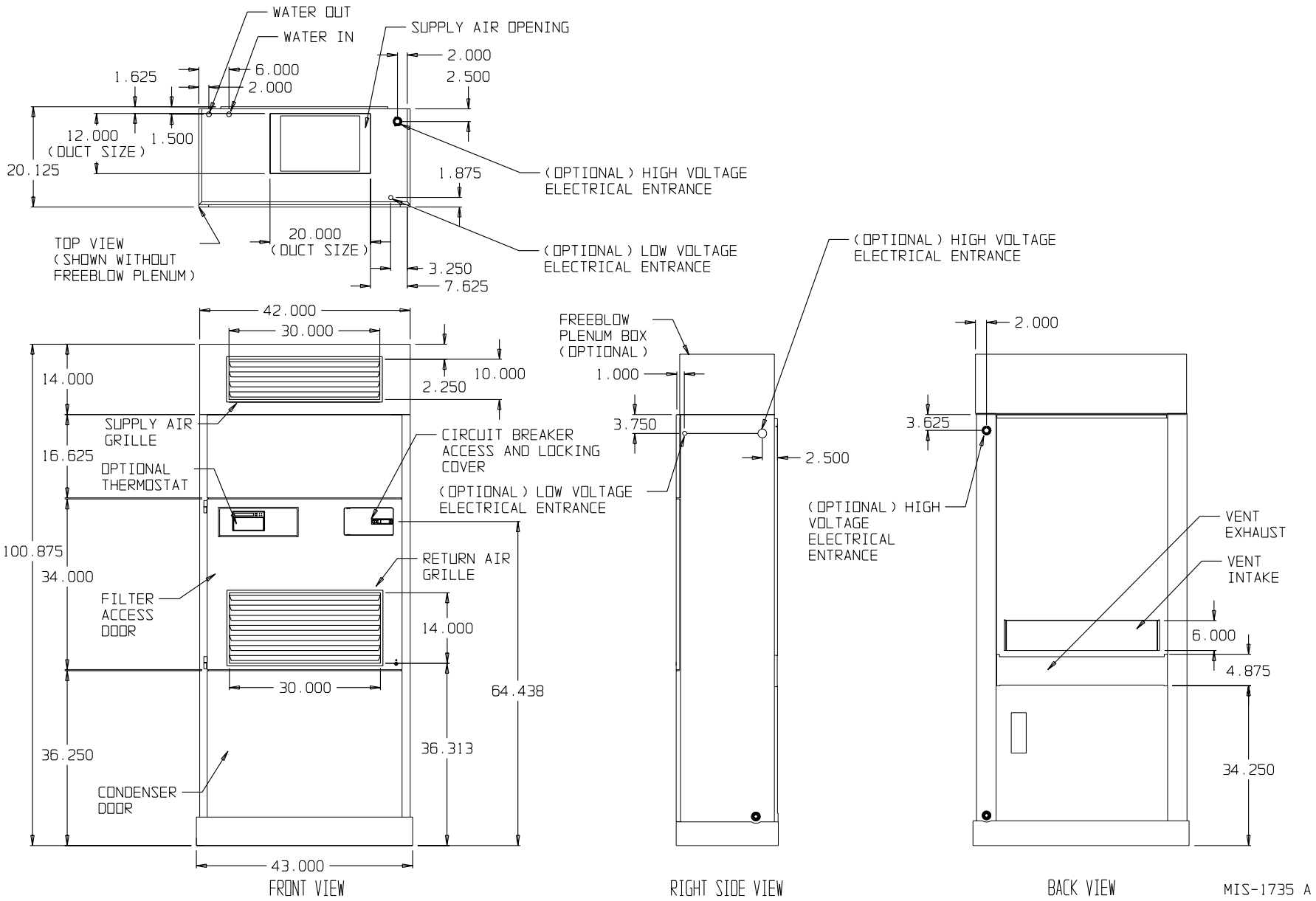
① Maximum size of the time delay fuse or HACR type circuit breaker for protection of field wiring conductors.
② Based on 75°C copper wire. All wiring must conform to the National Electrical Code and all local codes.
③ These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. 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 2A
COOLING PERFORMANCE CHART

GPM	EWT	CFM	BTUH Capacity (1000) Stage 1			BTUH Capacity (1000) Stage 1 and 2			Water Coil Pressure Drop	
			Total	Sensible	Latent	Total	Sensible	Latent	PSIG	Ft. Hd.
6	42	1000	15.1	10.5	4.6	38.5	25.3	13.2	1.9	4.4
8			16.4	11.1	5.3	41.5	26.8	14.7	3.3	7.5
10			17.4	11.7	5.7	43.2	27.4	15.8	4.9	11.3
6	44	1000	13.9	10.0	3.9	35.8	24.2	11.6	1.9	4.4
8			15.1	10.6	4.5	38.4	25.4	13.0	3.3	7.5
10			16.0	11.1	4.9	40.0	26.0	14.0	4.9	11.3
6	46	1000	12.8	9.6	3.2	33.0	23.0	10.0	1.9	4.4
8			13.9	10.1	3.8	35.3	24.0	11.3	3.3	7.5
10			14.7	10.6	4.1	36.9	24.6	12.3	4.9	11.3
6	48	1000	11.6	9.1	2.5	30.3	21.9	8.4	1.9	4.4
8			12.6	9.6	3.0	32.2	22.6	9.6	3.3	7.5
10			46.6	10.0	3.3	33.7	23.2	10.5	4.9	11.3
6	42	1200	15.9	11.5	4.4	42.1	29.0	13.1	1.9	4.4
8			17.4	12.2	5.2	46.0	30.6	15.4	3.3	7.5
10			18.8	12.8	6.0	49.3	31.9	17.4	4.9	11.3
6	44	1200	14.8	11.1	3.7	39.3	27.7	11.6	1.9	4.4
8			16.2	11.7	4.5	42.7	29.2	13.5	3.3	7.5
10			17.4	12.3	5.1	45.6	30.4	15.2	4.9	11.3
6	46	1200	13.6	10.7	2.9	36.4	26.5	9.9	1.9	4.4
8			14.9	11.3	3.6	39.5	27.9	11.6	3.3	7.5
10			16.1	11.7	1.1	42.0	29.0	13.0	4.9	11.3
6	48	1200	12.5	10.3	2.2	33.6	25.2	8.4	1.9	4.4
8			13.7	10.8	2.9	36.2	26.5	9.7	3.3	7.5
10			14.7	11.2	3.5	38.3	27.5	10.8	4.9	11.3

FIGURE 1
UNIT DIMENSIONS



SHIPPING DAMAGE

Upon receipt of equipment, the carton should be checked for external signs of shipping damage. The skid must remain attached to the unit until the unit is ready for installation. If damage is found, the receiving party must contact the last carrier immediately, preferably in writing, requesting inspection by the carrier's agent.

UNIT REMOVAL FROM SKID

⚠ WARNING

This unit is heavy and requires more than one person to handle and remove from the skid. Check unit wheels to insure that wheels are locked before removing from skid. Extreme caution must be taken to prevent injury to personnel and damage to the unit.

It is recommended that the unit not be removed from the skid with a forklift.

The shipping brackets on each side of the unit must be removed and discarded. See Figure 2-A on Page 7. The return air grille panel can be removed to provide a place to hold the unit. The unit can be slid forward on the skid until the front wheels hang over the edge of the skid. See Figure 2-B. The unit can be tipped forward and slid down the edge of the skid until the front wheels touch the ground. See Figure 2-C. The wheels will not roll. They are shipped from the factory locked so they will not roll. The back of the skid will have to be held down to keep it from tipping up. The skid can be slid out from under the unit. The unit can then be set upright.

HANDLING UNIT AFTER REMOVAL FROM SKID

⚠ WARNING

Exercise extreme caution when pushing the unit on the rollers. Handle and push from the lower 1/3 of the unit. Insure that debris is not on the floor where the unit is to be moved on the rollers. Failure to do so could result in the unit tipping over and causing bodily injury and/or damage to the unit.

The unit will have to be turned sideways and removed from the skid to fit through a 36" doorway. If the door height allows, the unit can be slid sideways through the door.

If the unit can not be slid through the door, then the unit will have to be put on a cart and tipped down to roll through the door. It is recommended that an appliance cart by used with a strap to hold the unit on the cart. The wheels of the unit ***must be locked***. If the wheels were allowed to roll, the unit could roll off the cart. The blade of the appliance cart should be slid under the wheels of the unit. See Figure 3. The strap of the appliance cart should be placed around the unit and strapped tightly. Help will be required to tip the unit back onto the cart. The unit can be leaned far enough back to be rolled through the door. Be careful when setting the unit back up to keep from damaging the unit.

FIGURE 2
REMOVAL OF UNIT FROM SKID

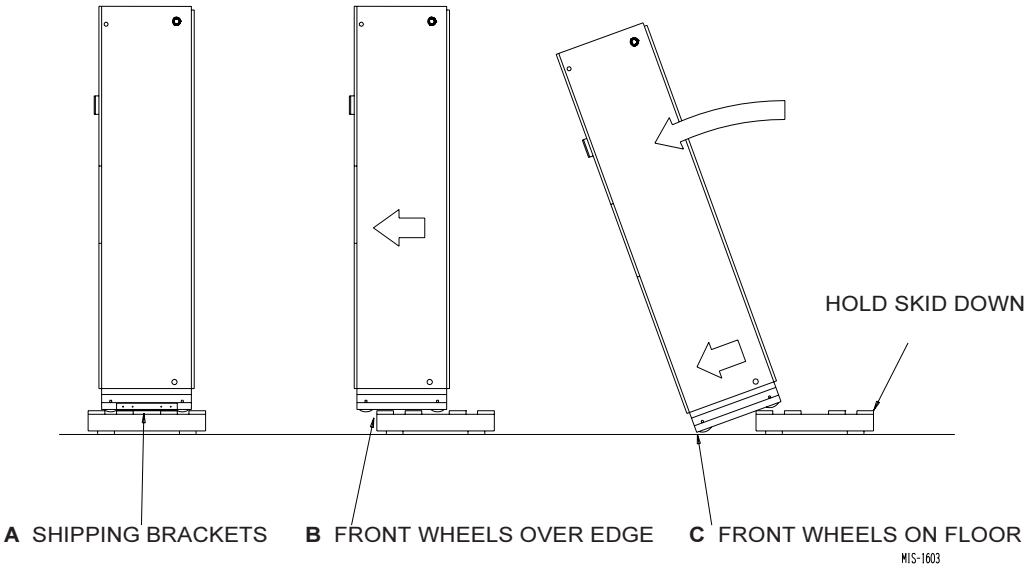
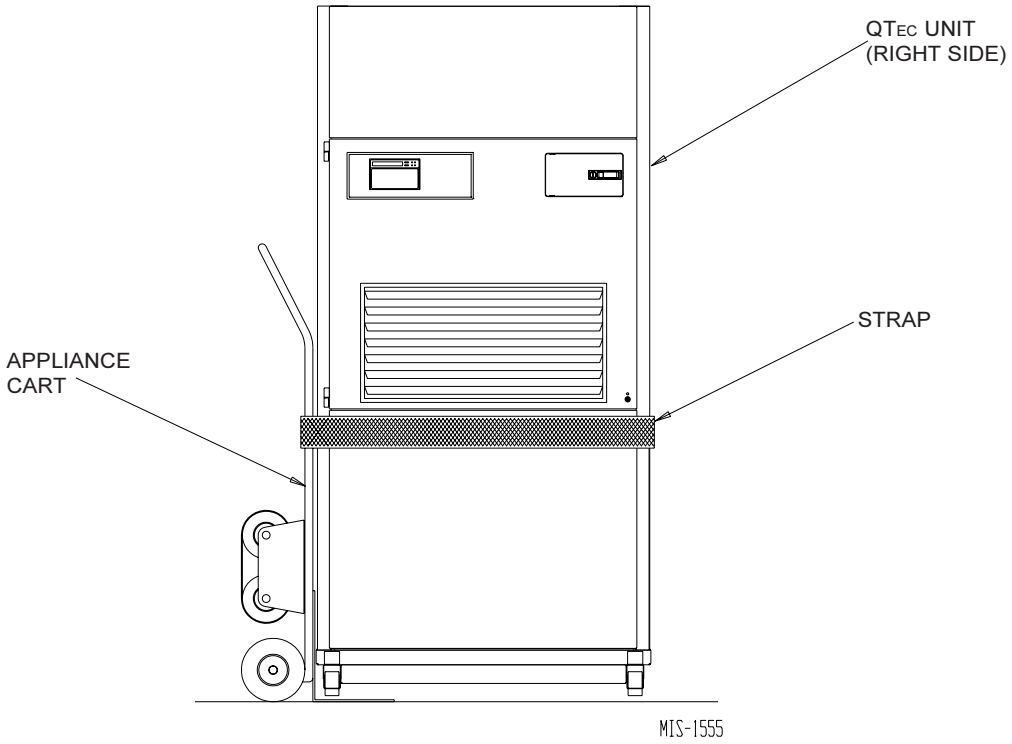


FIGURE 3
PROPER HANDLING OF UNIT
AFTER REMOVAL FROM SKID



REMOVAL OF WALL BRACKET FROM SHIPPING LOCATION

The wall brackets are attached to the back of the unit. Remove and retain the wall brackets for use when attaching the unit to the wall. In those installations where a wall sleeve is required these two wall brackets are to be discarded. A different style bracket is supplied with the sleeve assembly.

GENERAL

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

The unit is designed for use with or without duct work. For use without duct work, Plenum Box QPB** is recommended.

These instructions explain the recommended method to install the water source 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 "Start 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 3 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 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.

MINIMUM INSTALLATION HEIGHT

The minimum installation height of the unit with a Free Blow Plenum is 8 ft. 6 in. This provides enough clearance for the plenum to be removed. See Figure 5.

The minimum installation height for ducted applications is 8 ft. 4½ in. This provides enough clearance to install the duct work. See Figure 6.

FIGURE 4
INSTALLATION OF UNIT THROUGH WALL WITH WALL SLEEVE

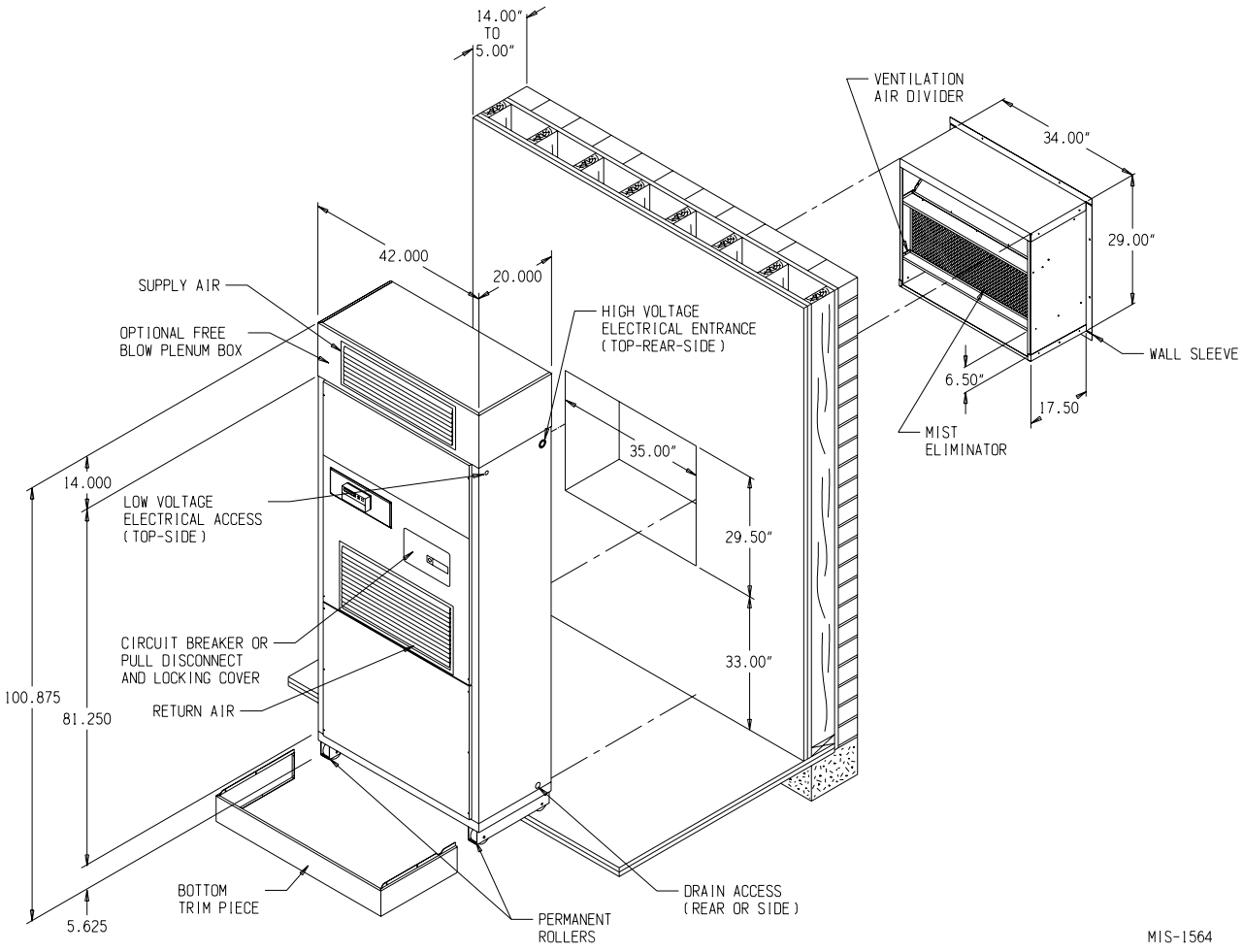


FIGURE 5
INSTALLATION WITH FREE BLOW PLENUM

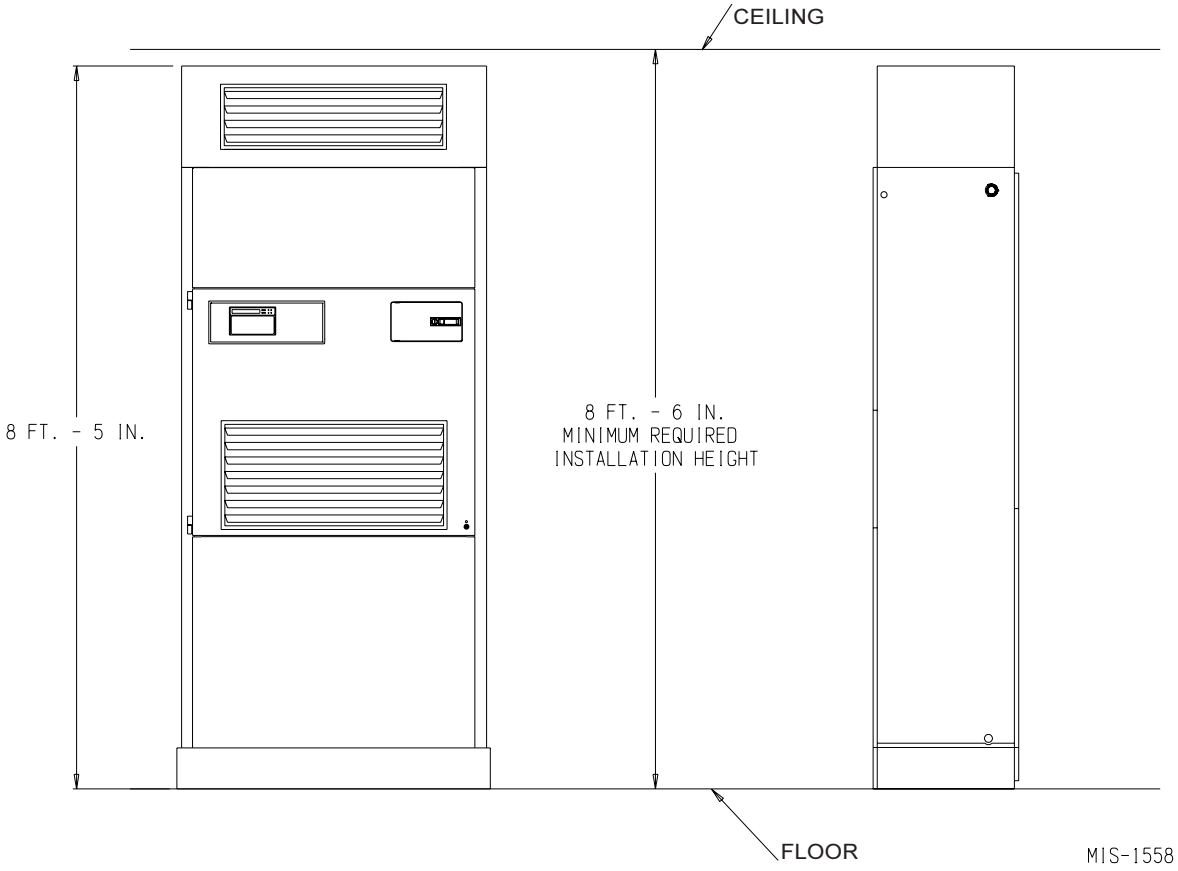
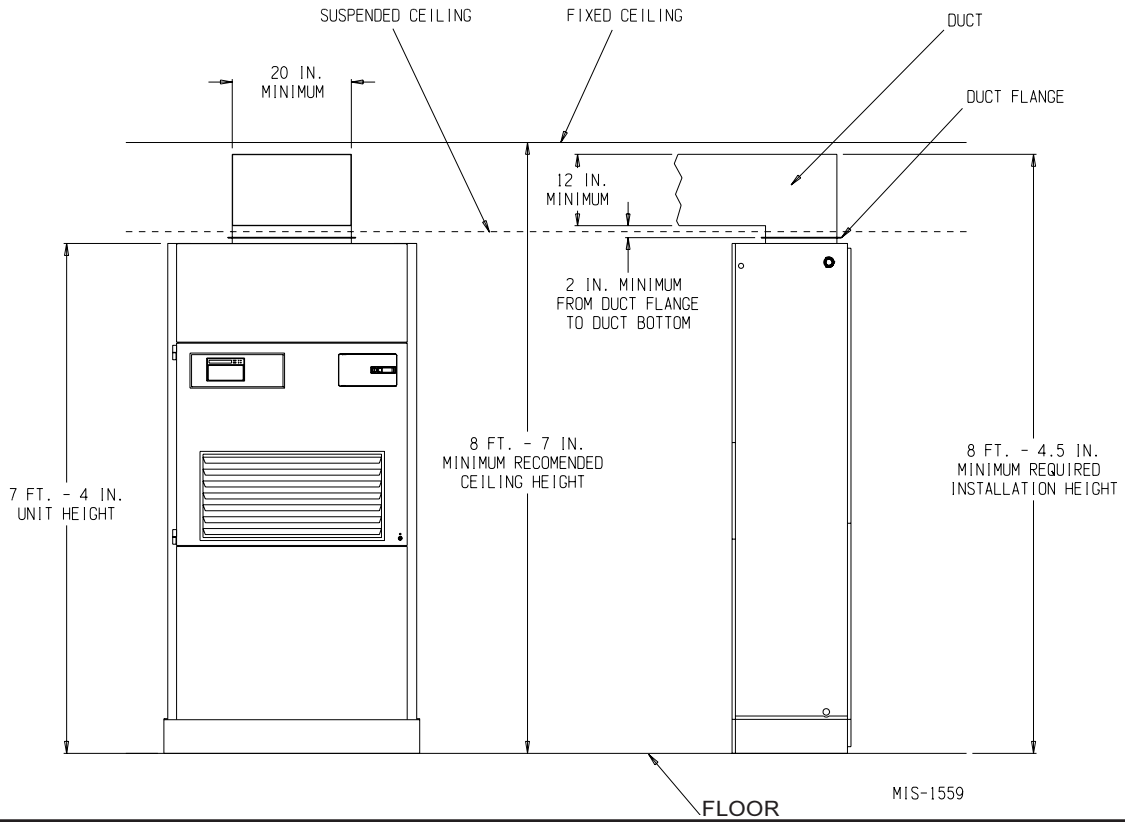


FIGURE 6
DUCTED APPLICATION



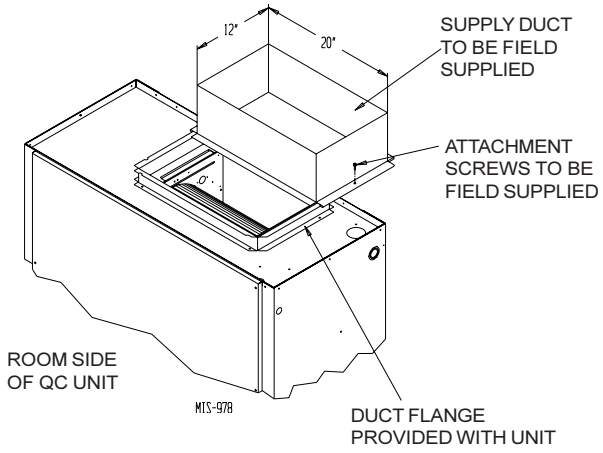
DUCT WORK

Any heat pump is more critical of proper operating charge and an adequate duct system than a straight air conditioning unit. All duct work must be properly sized for the design airflow 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. 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.

The QTEC series unit has provision to attach a supply air duct to the top of the unit. Duct connection size is 12 inches x 20 inches. The duct work is field supplied and must be attached in a manner to allow for ease of removal when it becomes necessary to slide the unit out from the wall for service. See Figure 7 for suggested attachment method.

NOTE: Unit cabinet, supply air duct and free blow plenum are approved for "0" clearance to combustible material.

FIGURE 7
SUPPLY DUCT CONNECTIONS



The QTEC series units are designed for use with free return (non-ducted) and either free blow with the use of QPB Plenum Box or a duct supply air system.

The QPB Plenum Box mounts on top of the unit and has both vertically and horizontally adjustable louvers on the front discharge grille.

When used with a ducted supply, a QCX Cabinet Extension can be used to conceal the duct work above the unit to the ceiling. This extends 20" above the unit for a total height above the floor of 10'-7/8". See Spec. Sheet for the correct Cabinet Extension model number. The unit is equipped with a variable speed indoor blower motor, which increases in speed with an increase in duct static pressure. The unit will therefore deliver proper rated airflow up to the Maximum ESP shown in Table 5. However, for quiet operation of the air system, the duct static should be kept as low as practical, within the guidelines of good duct design.

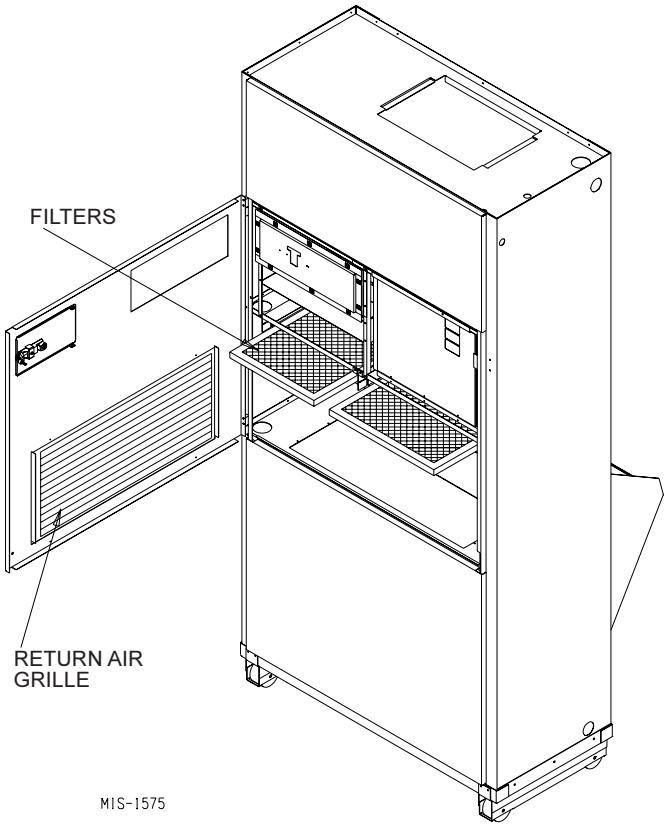
FILTERS

Two 1-inch throw away filters are supplied with each unit. The filters fit into a fixed rack.

The filters are serviced from the inside of the building . To gain access to the filters release the latch on the circuit breaker door and one 1/4 turn fastener near the bottom of the door. This door is hinged on the left so it will swing open.

The internal filter brackets are adjustable to accommodate 2-inch filters. The tabs for the 1-inch filters must be bent down to allow the 2-inch filters to slide in place.

FIGURE 8
FILTER LOCATION



CONDENSATE DRAIN

The condensate drain hose is routed down from the evaporator drain pan on the right side of the unit into the compressor compartment. There are three locations that the drain can exit the cabinet. For a stand pipe type of drain, the drain hose can exit the rear of the cabinet. There is adequate hose length to reach the floor on the right hand side of the unit.

If the drain is to be hard plumbed, there is a 3/4 inch pipe connection located on the right hand cabinet side near the rear and one on the cabinet rear panel. In these installations the drain tube is to be slipped over the pipe connection inside of the cabinet.

See Figures 9A, 9B and 9C.

NOTE: Whichever type of drain connection is used a "P" trap must be formed.

The ***side drain*** requires a water trap for proper drainage. See Figure 9A. The drain can be routed through the floor or through the wall. ***If the drain is to be routed through an unconditioned space, it must be protected from freezing***. The drain line must be able to be removed from the unit if it is necessary to remove the unit from the wall.

FIGURE 9A
SIDE DRAIN (SIDE VIEW)

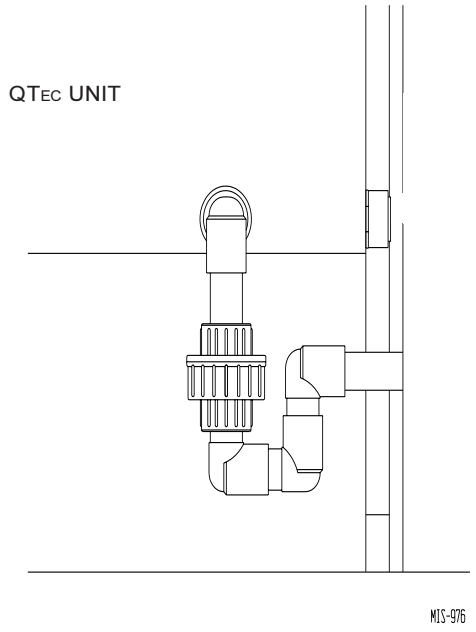


FIGURE 9B
OPTIONAL REAR DRAIN

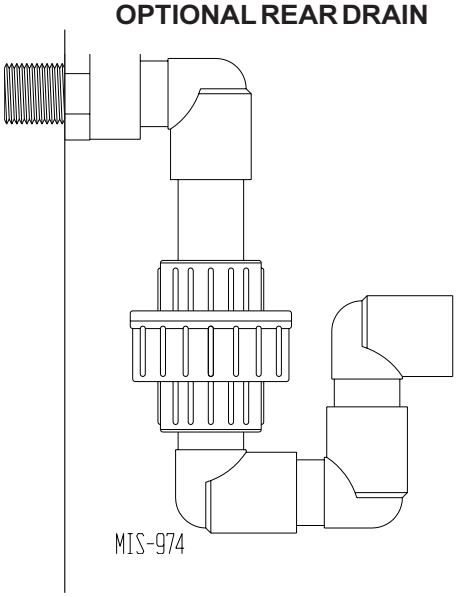
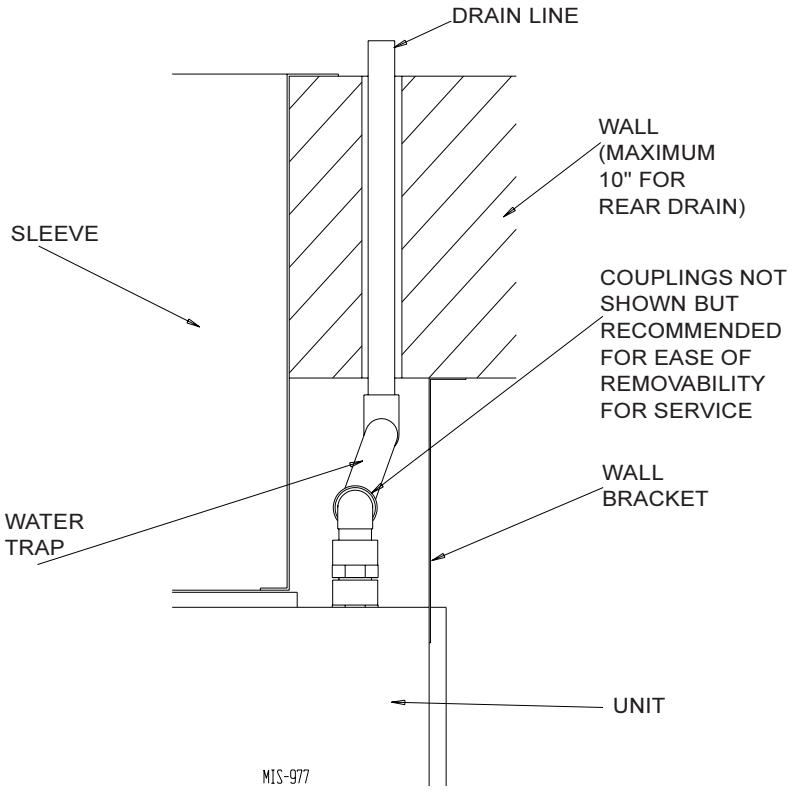


FIGURE 9C
REAR DRAIN (TOP VIEW)



The ***rear drain*** can be used with wall thickness of up to 10 inches where a water trap can be installed between the unit and the interior wall. See Figure 9B. The trap cannot extend beyond the edge of the unit or it will interfere with the wall mounting bracket. The drain can be routed through the floor or through the wall. If the drain is routed through the wall, the drain line must be positioned such that it will not interfere with the sleeve flange or the grille. See Figure 9C on Page 12. ***If the drain is to be routed through an unconditioned space, it must be protected from freezing.***

MIST ELIMINATOR SERVICE (Optional – only used with one of the vent options)

A mist eliminator is supplied with the wall sleeve. The mist eliminator is constructed of aluminum frame and mesh. The mist eliminator is located in the top section of the wall sleeve and can be removed from the inside of the building without removing the unit from the wall. This requires that the ventilation package must be removed.

The steps necessary to remove each of the vent options are listed following.

It is recommended that the mist eliminator be inspected annually and serviced as required. The mist eliminator can be inspected from the outside of the building by looking through the outdoor grille. The mist eliminator can be serviced from the outside. The outdoor grille must be removed to do so.

The mist eliminator can be cleaned by washing with soap and water. The excess water should be shaken off the mist eliminator before it is reinstalled.

BAROMETRIC FRESH AIR DAMPER (Optional)

Before start to remove make sure the power has been turned off. The hinged return air grille panel must be opened. The fresh air damper assembly can be seen on the back of the unit. Refer to Figure 10.

1. The fresh air damper is attached to the back of the unit with one screw on either side of the assembly. Both of the screws must be removed.
2. Once the mounting screws are removed, tilt the assembly down and lift it out.

The mist eliminator can be seen through the opening. The mist eliminator must be raised up and the bottom can be pulled toward the front of the unit.

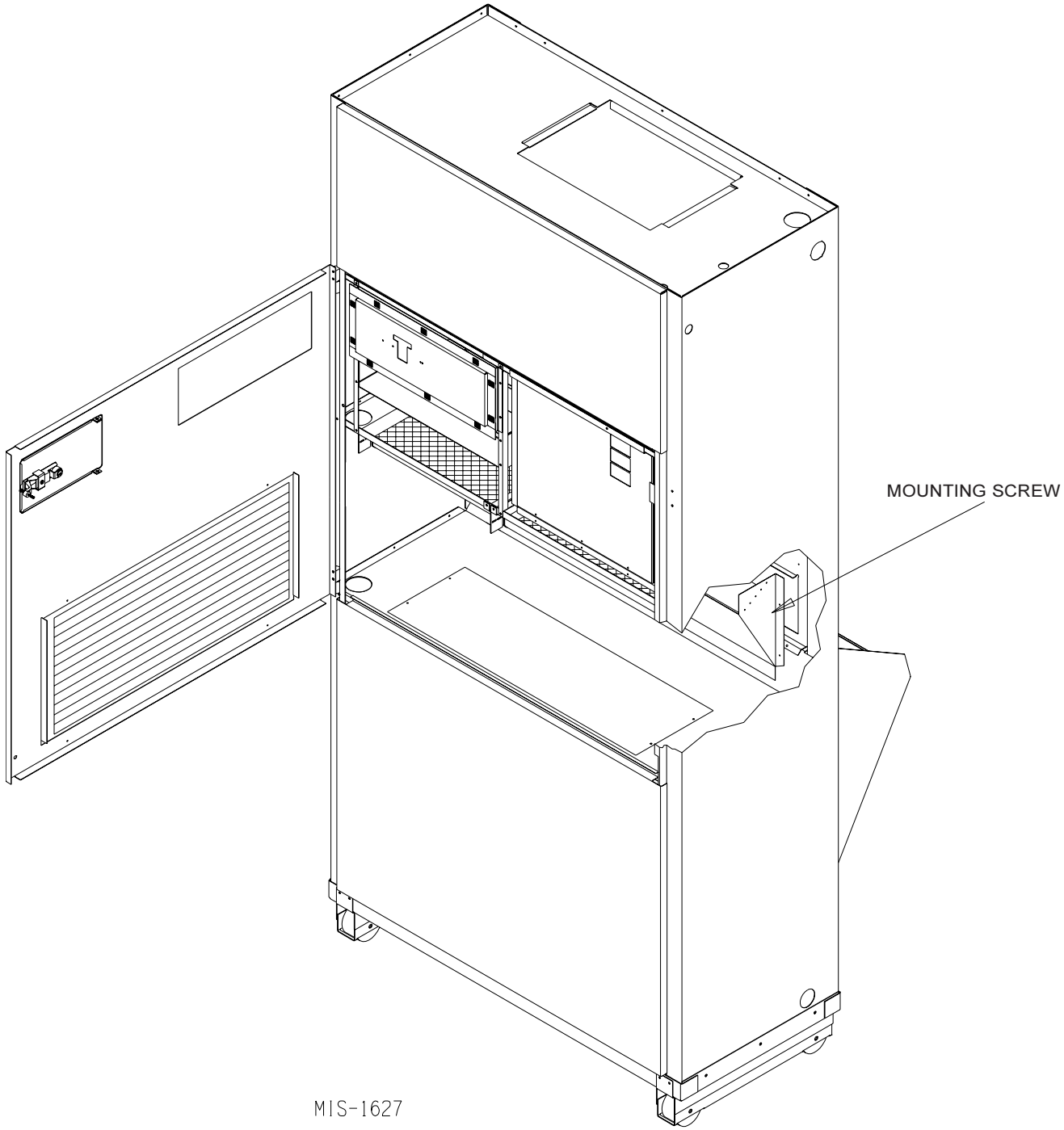
COMMERCIAL ROOM VENTILATOR OPTION

Before stating the removal make sure the power has been turned off. The hinged return air grille must be opened. The commercial room ventilator (CRV) can be seen after the panel has been removed. The CRV must be removed to gain access to the mist eliminator.

1. The two mounting screws in the front of the CRV must be removed.
2. The power connectors for the CRV (located on the right side of the unit) must be disconnected. Squeeze the tabs on the sides of the connector and pull straight out. Unplug both of the connectors.
3. Slide the CRV straight out of the unit.

The mist eliminator can be seen through the opening in the back of the unit. The mist eliminator must be raised up and the bottom can be pulled toward the front of the unit and removed.

FIGURE 10
FRESH AIR DAMPER REMOVAL



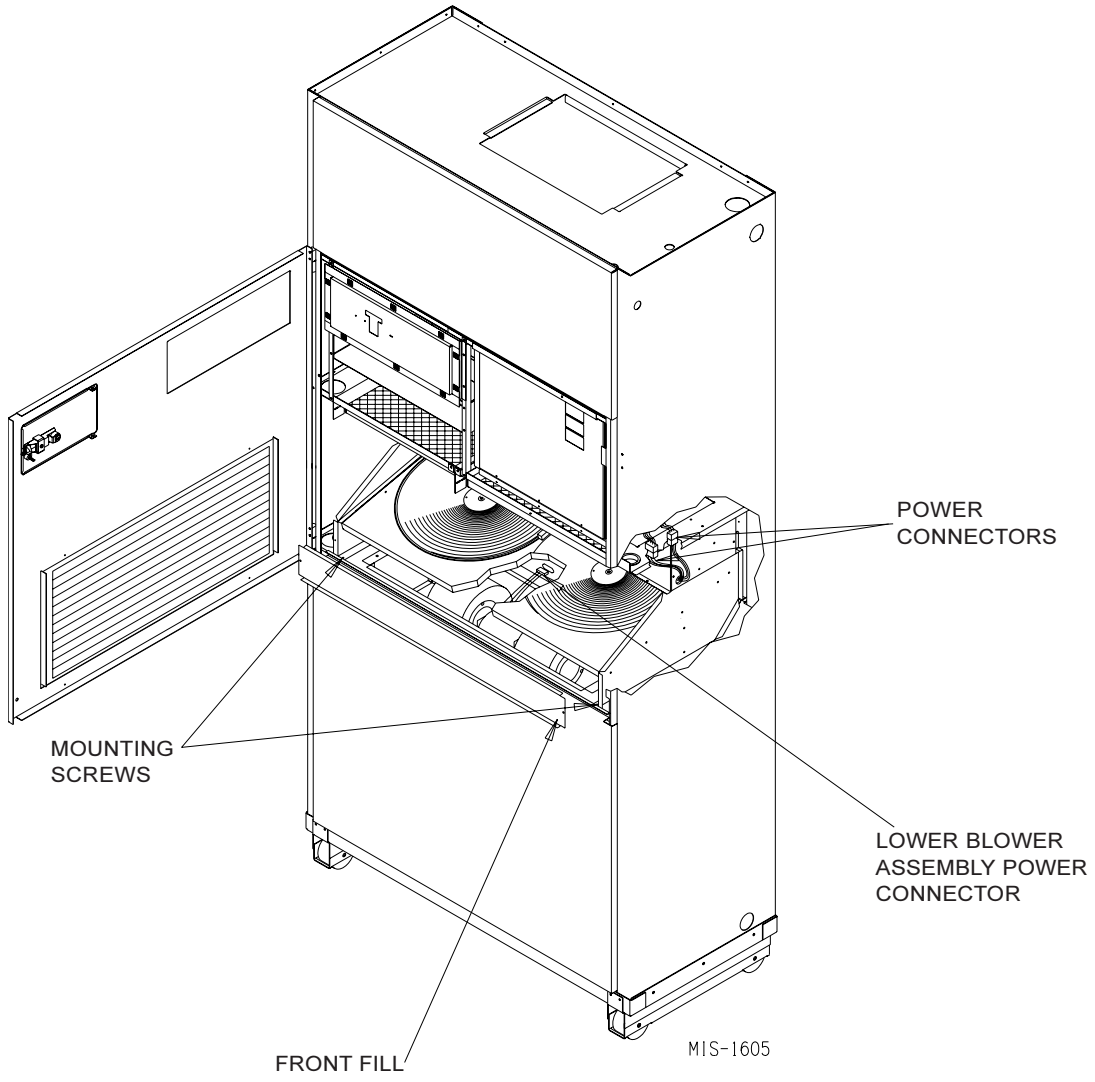
QTEC ENERGY RECOVERY VENTILATOR OPTION

Before starting the removal make sure that the power has been turned off. The hinged return air grille panel must be opened. The energy recovery ventilator (QERV) can be seen after the panel is opened. To gain access to the mist eliminator, the QERV must be removed. Refer to Figure 11.

1. The front fill plate of the QERV must be removed. There is one screw on either side of the plate. Remove these screws and remove the plate.
2. On either side of the QERV there are mounting screws that hold the QERV in place. Remove both of these screws.
3. Underneath the heat recovery cassette there is a power connector for the lower blower assembly. To disconnect this plug, the tabs on both sides of the plug must be squeezed to release the plug. While squeezing the tabs, pull the plug out of the socket.
4. The QERV is plugged into the unit on the right side of the unit. Both of these plugs must be disconnected to remove the QERV. Squeeze the tabs on the sides of the connector and pull straight out.
5. Slide the QERV assembly straight out of the unit being careful not to let the cassette slide out of the QERV.

The mist eliminator can be seen through the opening in the back of the unit. The mist eliminator must be raised up and the bottom can be pulled toward the front of the unit and removed.

FIGURE 11
REMOVAL OF THE QTEC ENERGY RECOVERY VENTILATOR



MOUNTING THE UNIT

When installing a QC unit near an interior wall on the left side, a minimum of 8 inches is required; 12 inches is preferred.

When installing a QC unit near an interior wall on the right side, a minimum of 12 inches is required as additional space is required to connect the drain.

This clearance is required to allow for the attachment of the unit to the wall mounting brackets and the side trim pieces to the wall.

This unit is to be secured to the wall with the wall mounting brackets provided. The unit itself, the supply duct, and the free blow plenum are suitable for "0" clearance to combustible material.

NOTE: When a wall sleeve is to be used discard the brackets shipped with the heat pump and attache the unit to the sleeve with bracket supplied with the wall sleeve.

Following are the steps for mounting the QC units for reference see Figure 13.

1. Attach wall mounting bracket to the structure wall with field supplied lag bolts. The fluid piping connections are to be within the confines of this bracket. See Figure 1 for cabinet openings and location of fluid coil connection points.
2. Position the unit in front of the wall mounting bracket.
3. Remove the locking screws from the wheels. Refer to Figure 12.
4. Roll the unit up to the wall mounting bracket. The unit must be level from side to side. If any adjustments are necessary, shim up under the rollers with sheets of steel or any substance that is not affected by moisture.
5. Secure the unit to the wall bracket with provided #10 hex head sheet metal screws. There are prepunched holes in the cabinet sides, and the bracket has slotted holes to allow for some misalignment.
6. Position the bottom trim piece to the unit and attach with provided screws (dark colored).
7. Position side trim pieces to the wall and attach with field supplied screws. There are two long and two short pieces supplied. The long pieces are to enclose the gap behind the unit. The short pieces are to fill the gap behind the cabinet extension or the free blow plenum box. They may be cut to suit the ceiling height or overlap the unit side trim. There is sufficient length to trim up to a 10'2" ceiling.

FIGURE 12
REMOVING LOCKING SCREWS FROM WHEELS

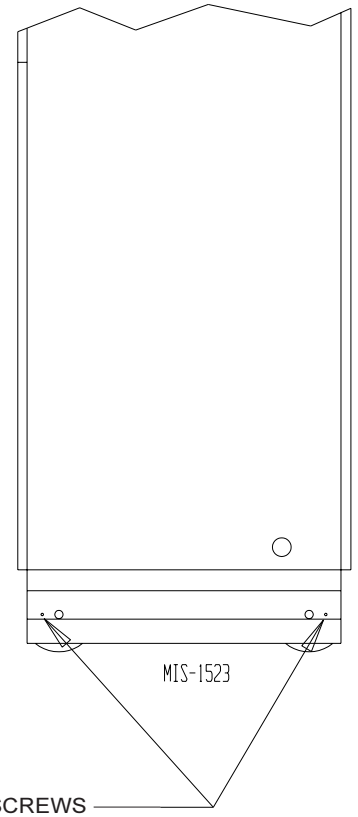


FIGURE 13
UNIT MOUNTING WITHOUT VENTILATION WALL SLEEVE
(REFER TO MOUNTING INSTRUCTIONS ON PAGE 13)

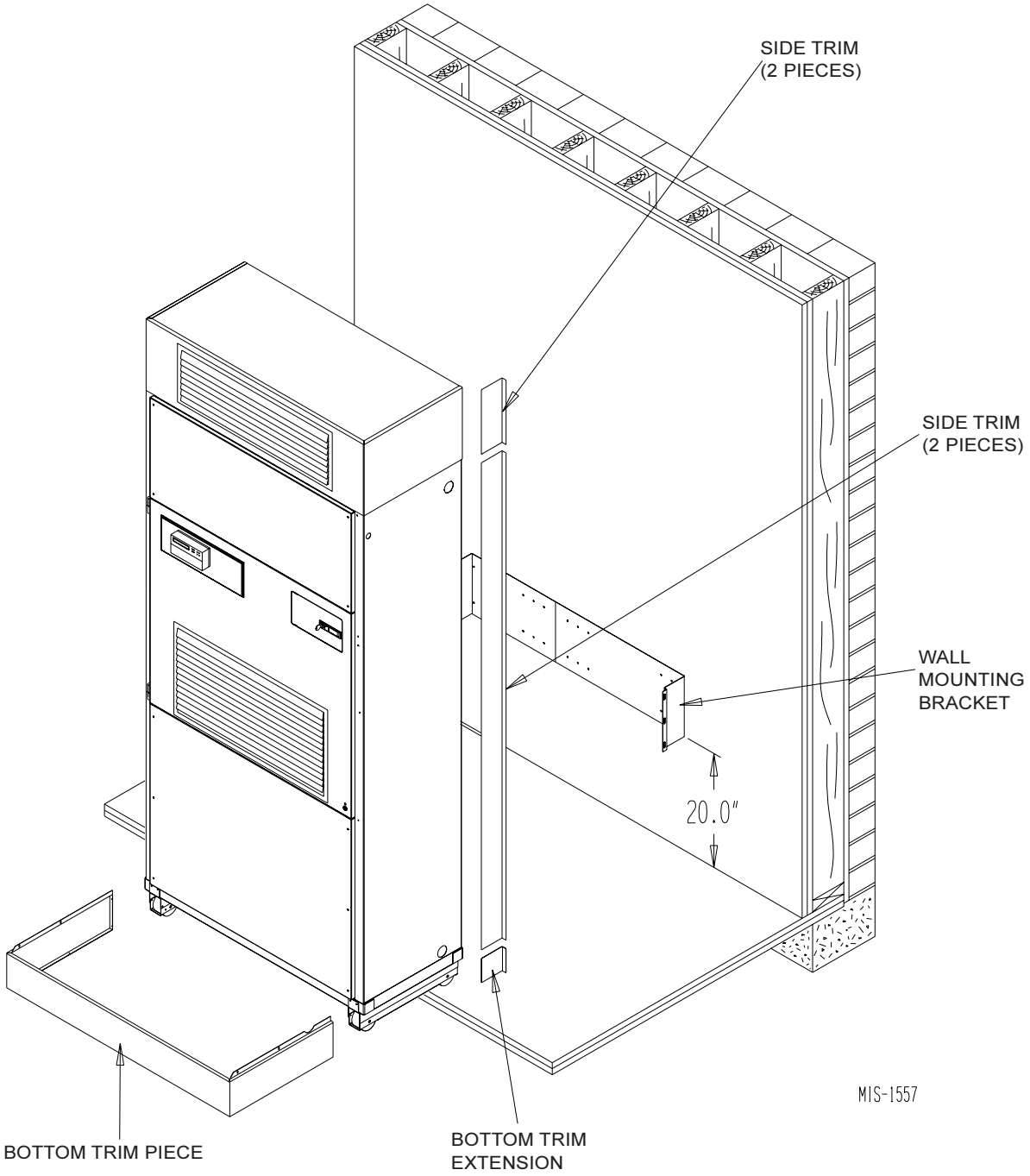
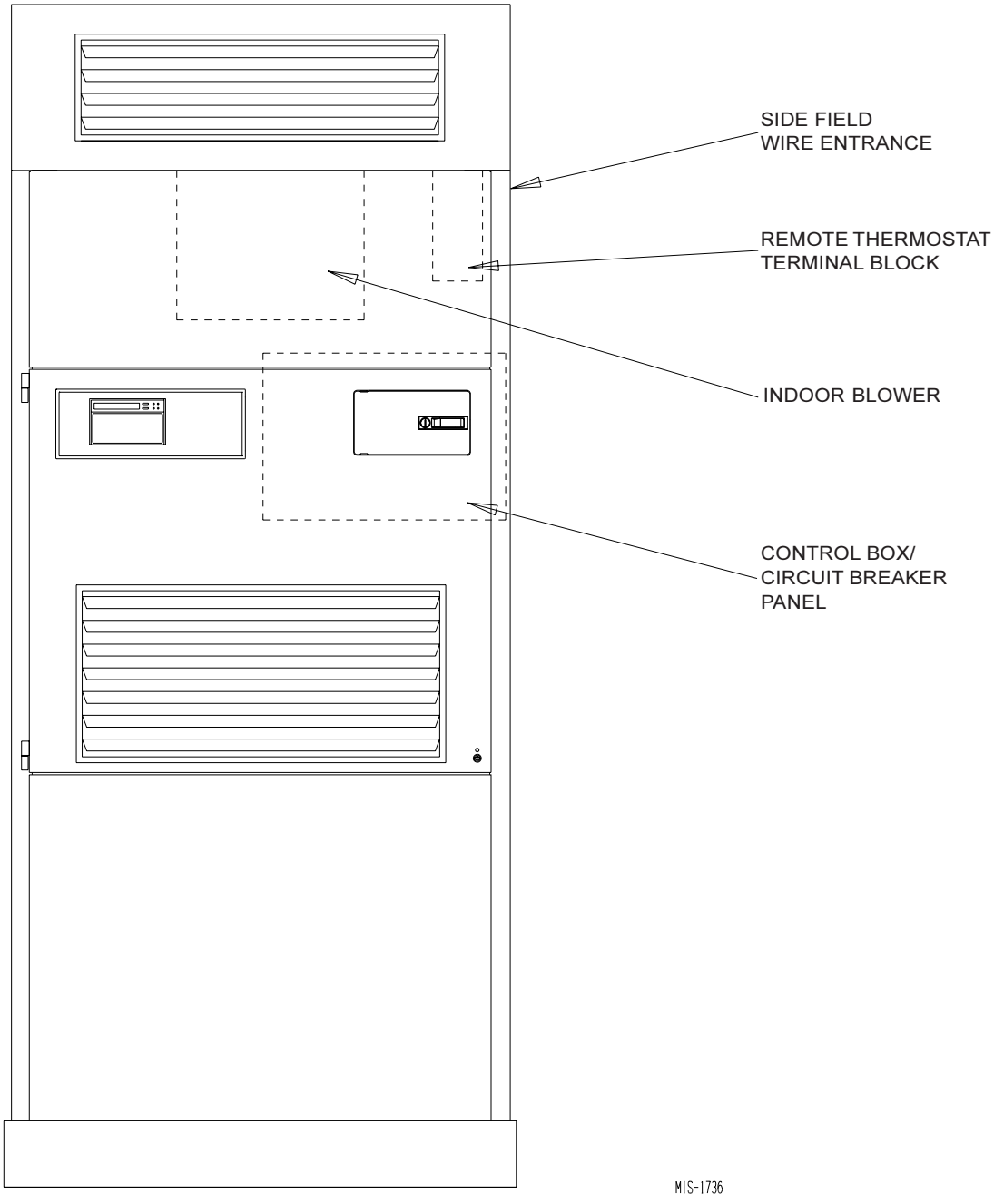


FIGURE 14
COMPONENT LOCATION



WIRING – MAIN POWER

Refer to the unit rating plate and/or Table 2 for wire sizing information and maximum fuse or "HACR Type" circuit breaker size. Each 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.

The field wiring connections are located behind the top panel in the circuit breaker panel. The return air panel must be removed first. This panel is equipped with a door switch which shuts the unit down when it is removed. The filter rack must be removed next.

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 as noted in Table 3.

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).

The standard Climate Control ***Option X*** is a remote thermostat connection terminal block. See Figure 16 for wiring diagram. Compatible thermostats are listed in Table 4.

The Climate Control ***Option D*** is an electronic, programmable thermostat. The subbase of the thermostat is factory wired to the front panel of the unit. Compatible for use with Energy Recovery Ventilator or Economizer.

GENERAL

This unit is equipped with a variable speed ECM motor. The motor is designed to maintain rated airflow up to the maximum static allowed. ***It is important that the blower motor plugs are not plugged in or unplugged while the power is on. Failure to remove power prior to unplugging or plugging in the motor could result in motor failure.***

⚠ CAUTION

Do not plug in or unplug blower motor connectors while the power is on.
Failure to do so may result in motor failure.

FLUID CONNECTIONS

See Figure 1 for location of fluid connection. Connection size is 1" FPT.

If the free blow plenum box is to be used, there are knock outs in the top of the box that can be removed to allow passage of the fluid piping.

All plumbing to and from the unit is to be installed in accordance with local plumbing codes. The use of plastic pipe where permissible is recommended to prevent electrolytic corrosion of the fluid pipes.

It is strongly recommended that the fluid piping to the unit be insulated to prevent water droplets from condensing on the pipe surface.

TABLE 4
WALL THERMOSTAT

Thermostat	Predominant Features
8403-049 (1F93-380)	2 stage Cool; 3 stage Heat Programmable Electronic Auto or Manual changeover

LOW VOLTAGE CONNECTIONS

These units use a grounded 24 volt AC low voltage circuit.

The *"R"* terminal is the *hot* terminal and the *"C"* terminal is *grounded.*

"G" terminal or pins 6 and 1 of P2 are the *fan inputs*. ***Both must be energized*** for proper fan operation. This is done automatically in the factory installed climate control options. If the climate control option is abandoned and connections are made directly to P2 both pins 6 and 1 of P2 must be energized for proper operation.

"Y" terminal or pin 7 of P2 is the *first stage cooling input*.

"B" terminal or pin 8 of P2 is the *first stage heating input.*

"R" terminal or pin 10 of P2 is *24 VAC hot*.

"C" terminal or pin 11 of P2 is *24 VAC grounded.*

"L" terminal or pin 12 of P2 is the *second stage cooling input.*

"W2" terminal or pin 9 of P2 is *second stage heating output*.

"3" terminal of pin 5 of P2 is the *ventilation input*. This terminal energizes any factory installed ventilation option.

LOW VOLTAGE CONNECTIONS FOR DDC CONTROL

Fan Only	Energize G
1st Cooling Mode	Energize Y, G
2nd Cooling Mode	Energize Y, L, G
1st Stage Heating	Energize G, B
2nd Stage Heating	Energize G, B, W2
Ventilation	Energize G, 3

FIGURE 15
BLOWER MOTOR LOW VOLTAGE WIRE HARNESS PLUG

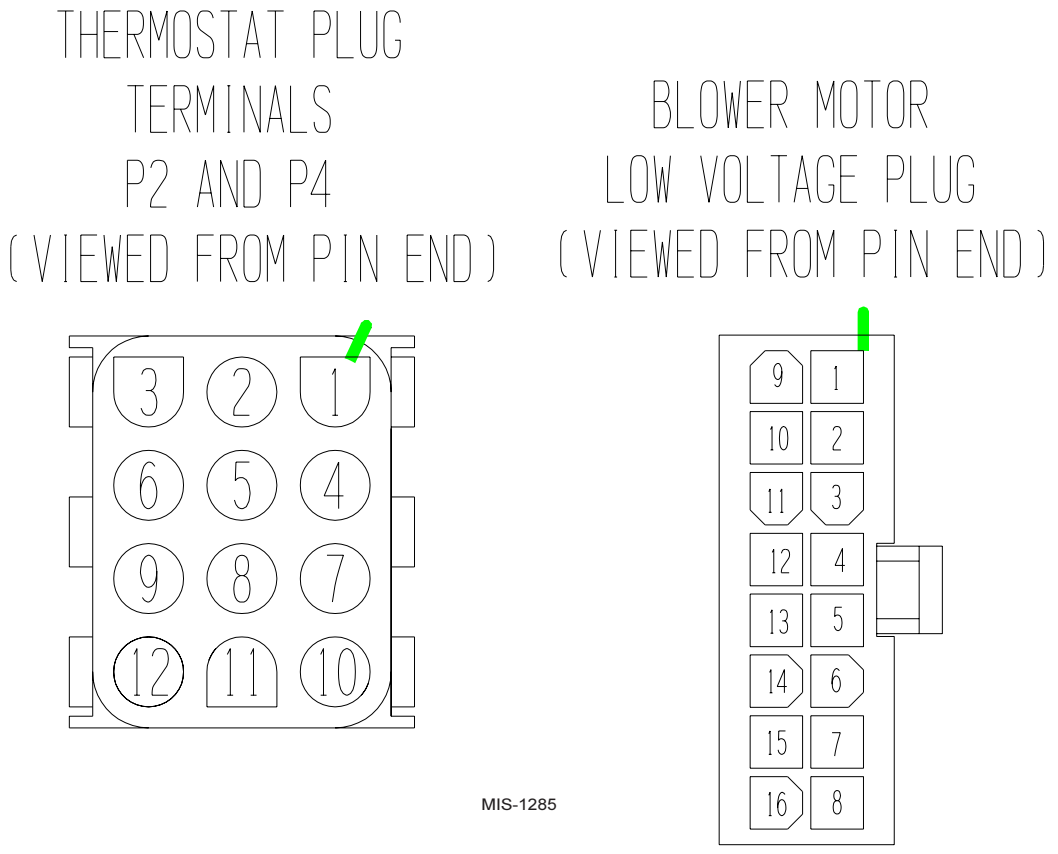


FIGURE 16
REMOTE THERMOSTAT WIRING DIAGRAM
"X" OPTION

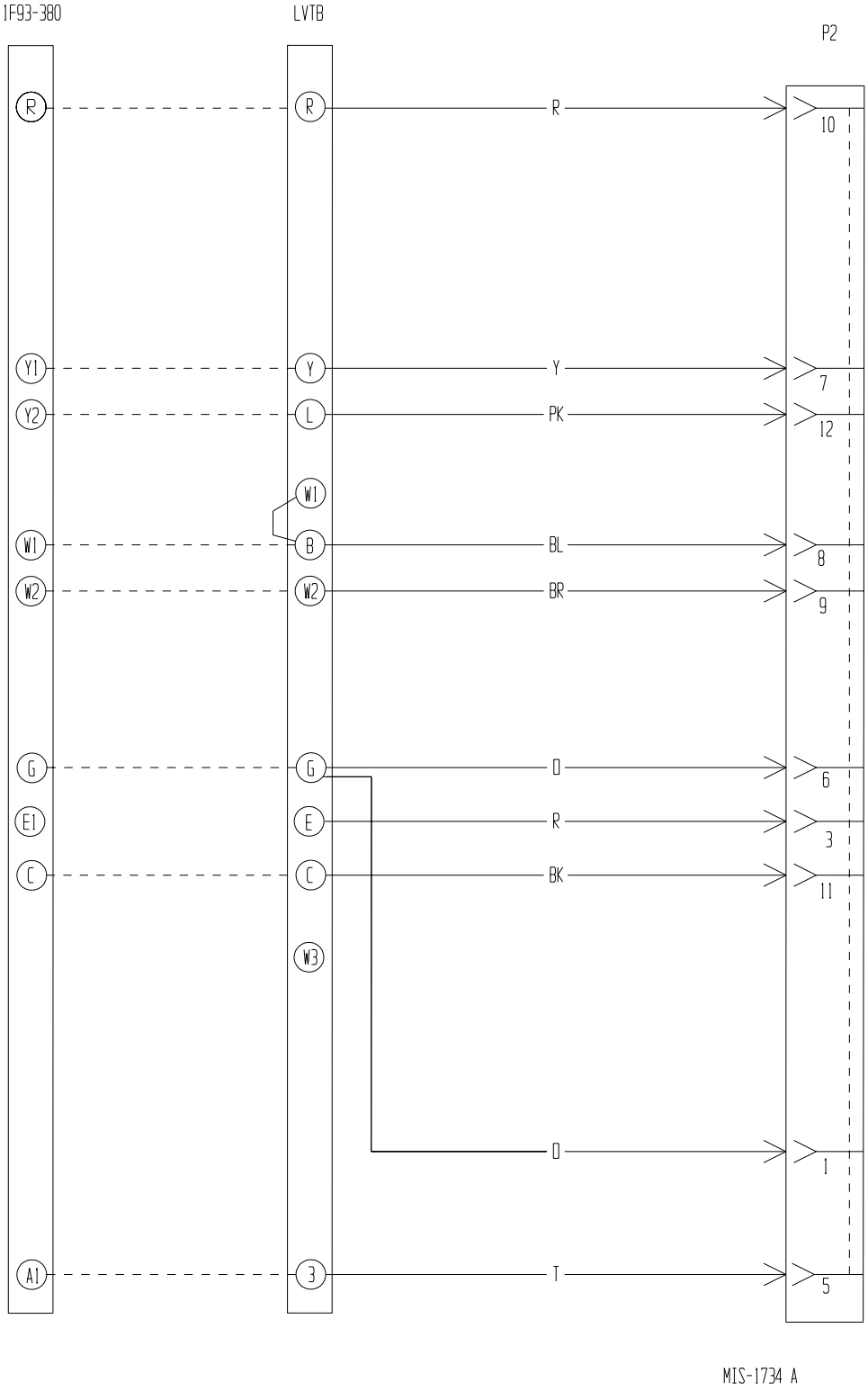
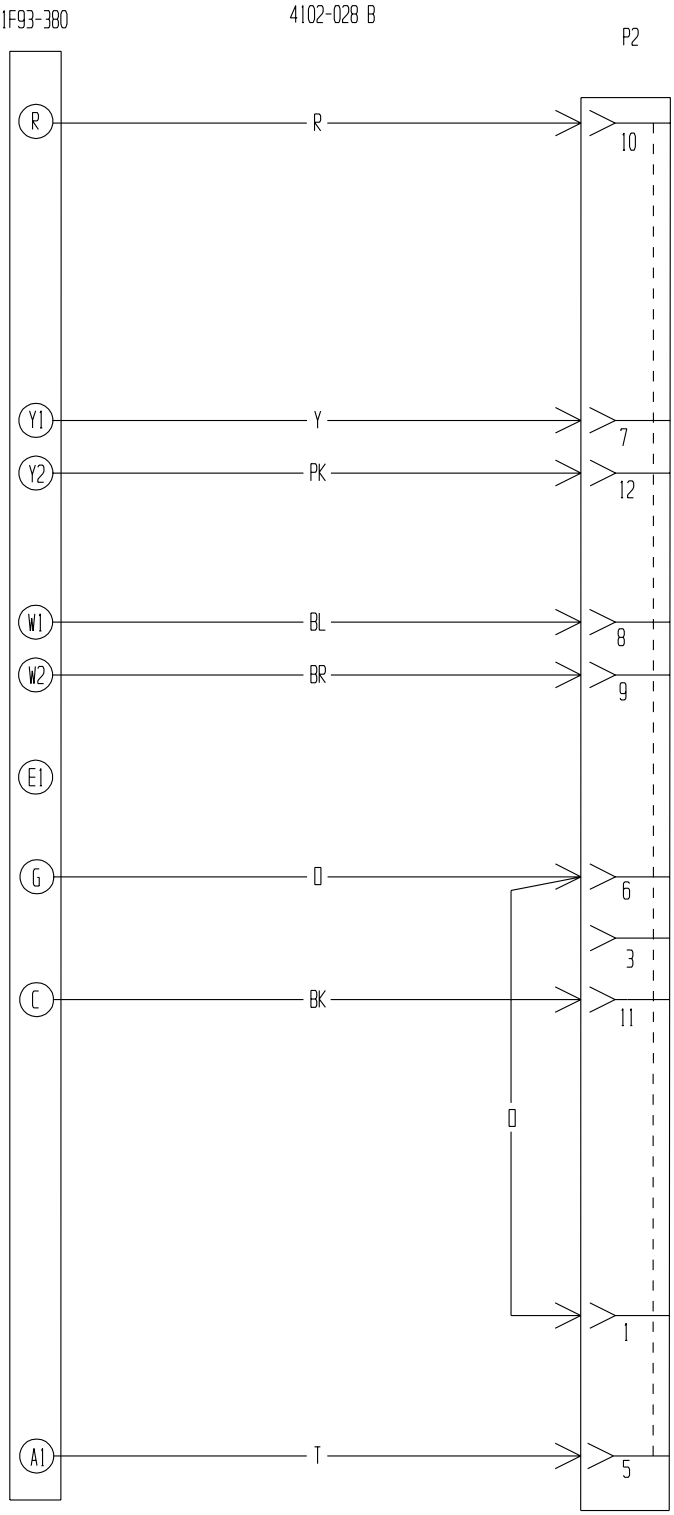


FIGURE 17
REMOTE THERMOSTAT WIRING DIAGRAM
"D" THERMOSTAT OPTION



OPTIONAL CFM

These units are shipped from the factory set to operate at the optional CFM level shown in Table 5. This provides lower operating sound levels for non-ducted, free discharge applications. This CFM level will reduce the system capacity performance by approximately 2% at the same energy efficiency.

Rated CFM is required for ducted applications for maximum performance rating. To obtain full CFM on these models, connect jumper wire as follows:

1. Disconnect all power to the unit. Failure to do so may result in damage to the motor.
2. Open hinged return air grille panel.
3. Open control panel cover.
4. Add pink jumper wire (provided) to terminal 5 and 6 on the terminal board.
5. Reverse steps to reassemble.

IMPORTANT INSTALLER NOTE

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

SERVICE HINTS

1. Caution user to maintain clean air filters at all times. Also, not to needlessly close off supply air registers. This may reduce airflow through the system, which shortens equipment service life as well as increasing operating costs and noise levels.
2. The wall thermostat perform multiple functions. Be sure that all function switches are correctly set for the desired operating mode before trying to diagnose any reported service problems.

SEQUENCE OF OPERATION

FIRST STAGE COOLING – Circuit R-Y makes the thermostat open the first stage cooling water valve.

SECOND STAGE COOLING – Circuit R-Y2 makes the thermostat open the second stage cooling water valve. 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.

CAUTION: Second stage cooling must always be energized in conjunction with first stage. If the second state were energized alone, the condensate from the upper part of the coil could be blow off or re-evaporated as it passes down over the dry portion of the coil.

HEATING – A thermostat demand for heating makes R-W1 circuit as well as R-G circuit. This starts the indoor blower as well as turns on the electric heater.

SECOND STAGE HEATING (15 KW only) – Circuit R-W2 energizes the second contactor and brings on the last 5 KW of heat.

TABLE 5
INDOOR BLOWER PERFORMANCE

MODEL	RATED ESP	① MAX. ESP	② RATED CFM	③ OPTIONAL CFM	④ CONTINUOUS CFM	CFM @ MAX. ESP
QC501	0.0	0.8	1200	1000	1000	1175

NOTE: These units are equipped with a variable speed (ECM) indoor motor that automatically adjusts itself to maintain approximately the same rate of indoor air flow in both heating and cooling, dry and wet coil conditions, and at both 230/208 or 460 volts.

① Maximum ESP (inches WC) shown is with 1" thick disposable filter (reduced by .2 for 2" filter).
② Rated CFM for ducted applications – required for maximum performance rating. To obtain full CFM locate low voltage terminal strip in the circuit breaker box.There is a pink jumper wire with both ends attached to terminal marked “G2”. Move one end of the jumper to terminal “Y”.
③ Optional CFM – the unit is shipped from the factory set to operate at the optional CFM level shown. This provides lower operating sound levels for non-ducted, free discharge applications. This reduces system capacity performance by approximately 2% at the same energy efficiency.
④ Continuous fan CFM is the total air being circulated during continuous fan mode.

TROUBLESHOOTING GE ECM™ 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 load **& down while being tested off of blower**	• It is normal for motor to oscillate with no 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?

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 18.* 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 19.* (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 20.*

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 18
Control Disassembly

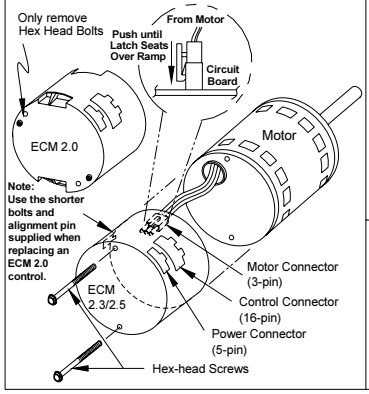


Figure 19
Winding Test

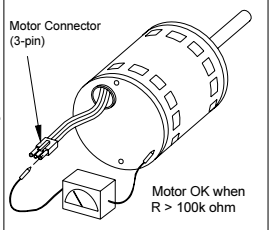


Figure 20
Drip Loop

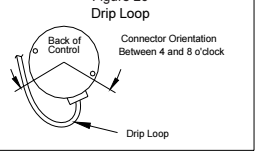
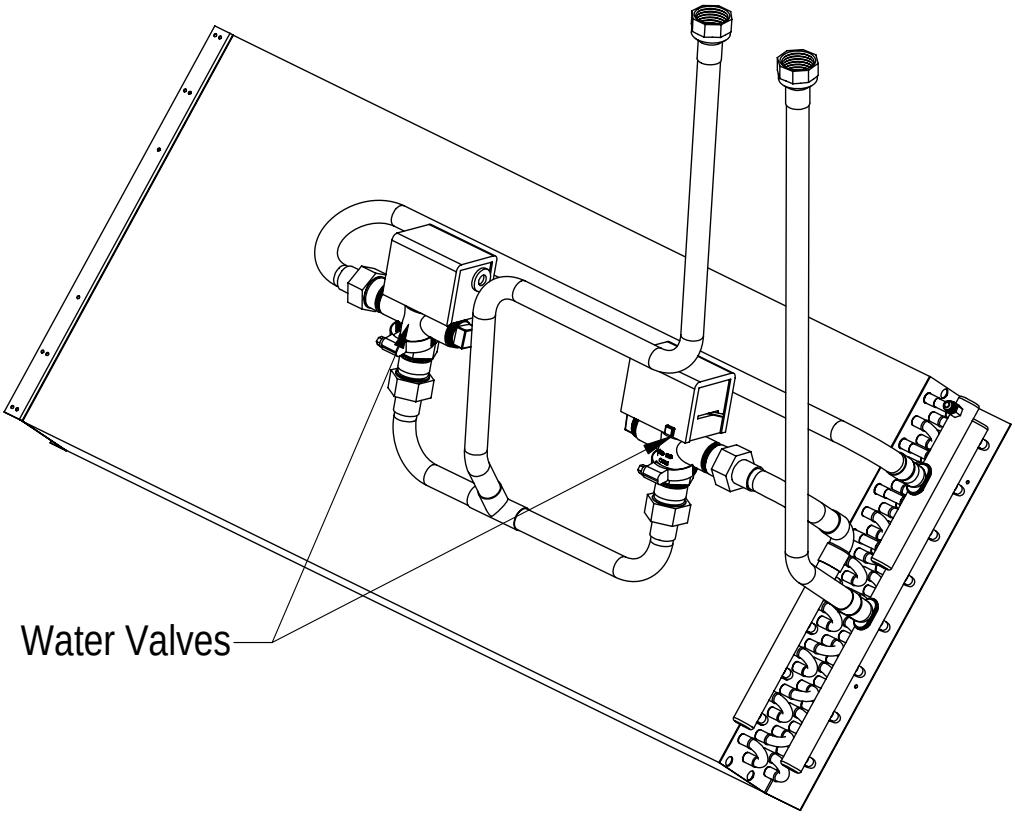
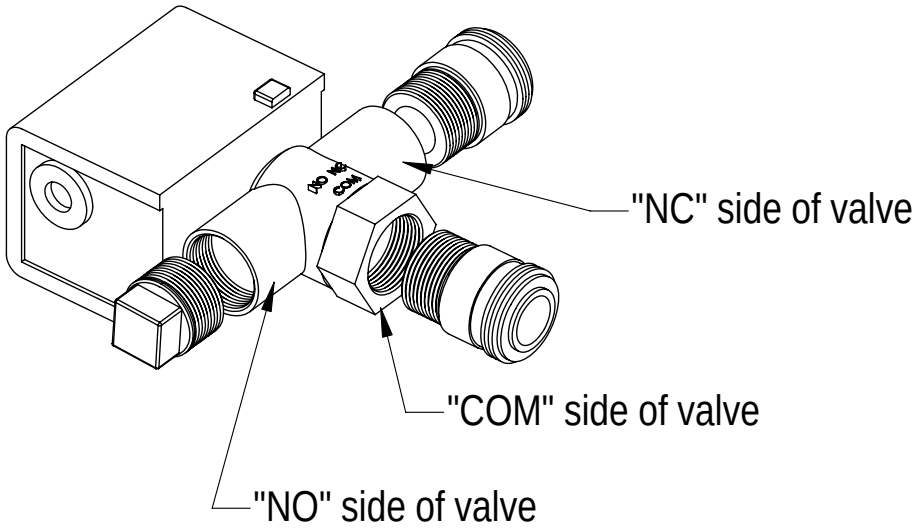


FIGURE 21
INTERNAL 2-WAY VALVE PIPING

Valve Location



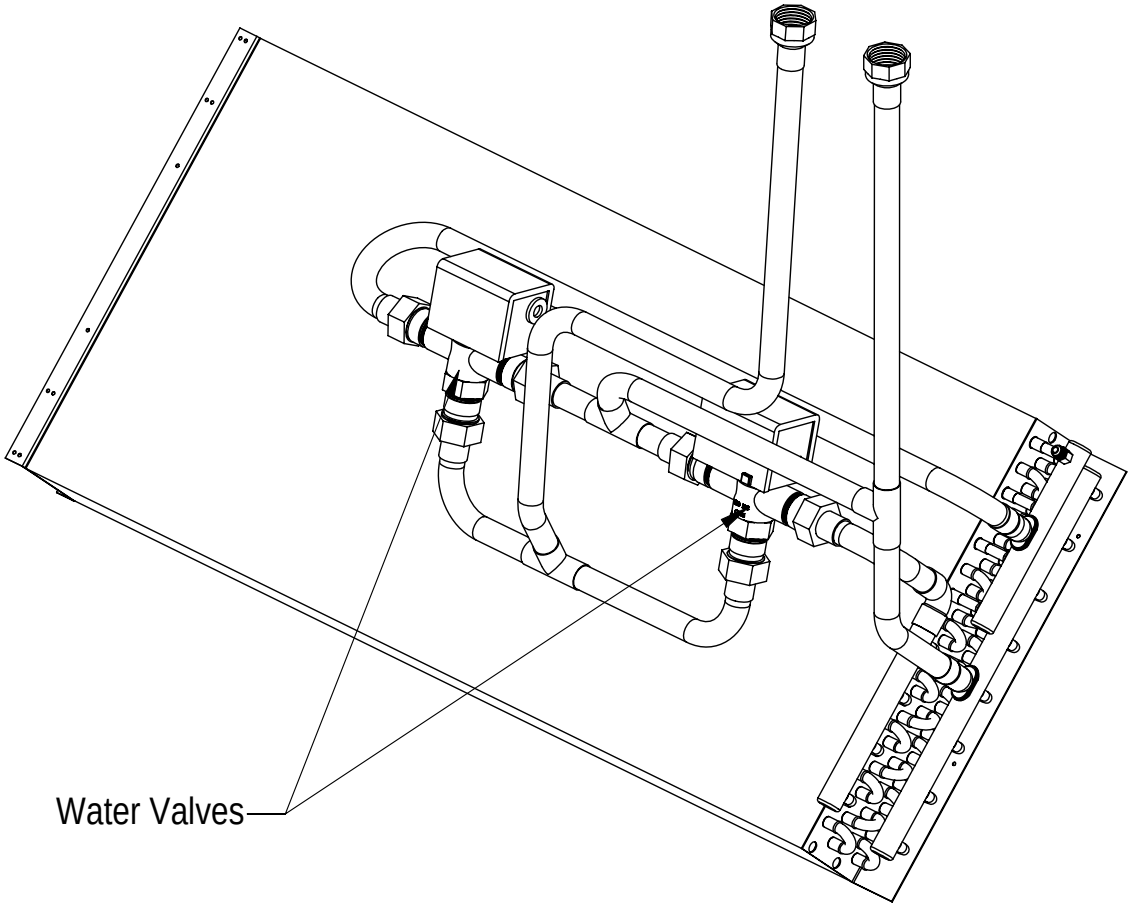
Valve Detail



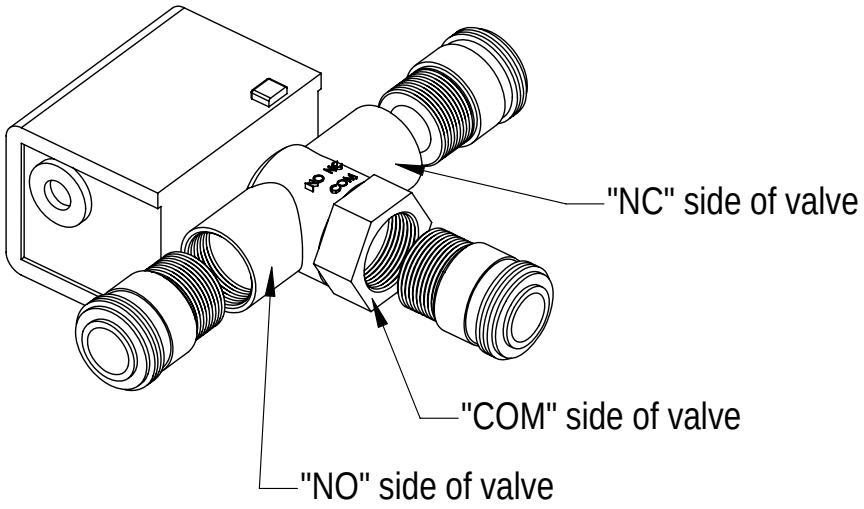
MIS-1899

FIGURE 22
INTERNAL 3-WAY VALVE PIPING

Valve Location



Valve Detail



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