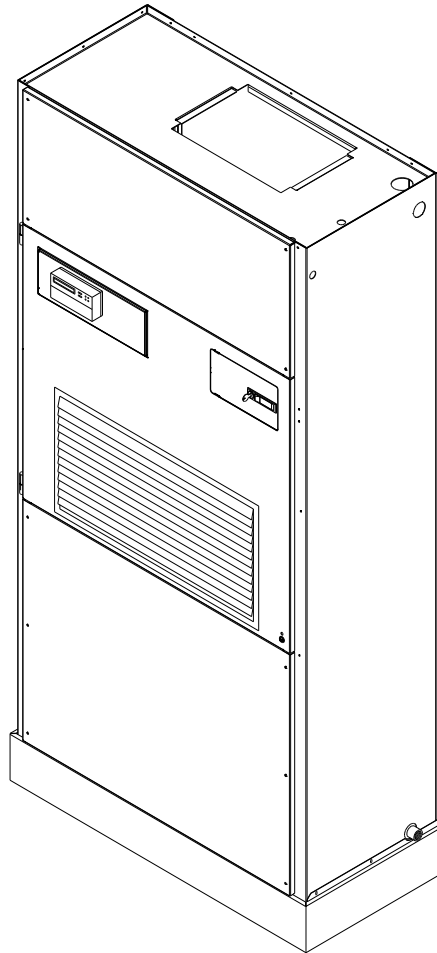

INSTALLATION INSTRUCTIONS

QC Series Chilled Water Unit

Model: QC501



Climate Control Solutions

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual No.: 2100-416K
Supersedes: 2100-416J
Date: 4-28-20

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GETTING OTHER INFORMATION AND PUBLICATIONS

These publications can help when installing the air conditioner or heat pump. These can usually be found at the 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

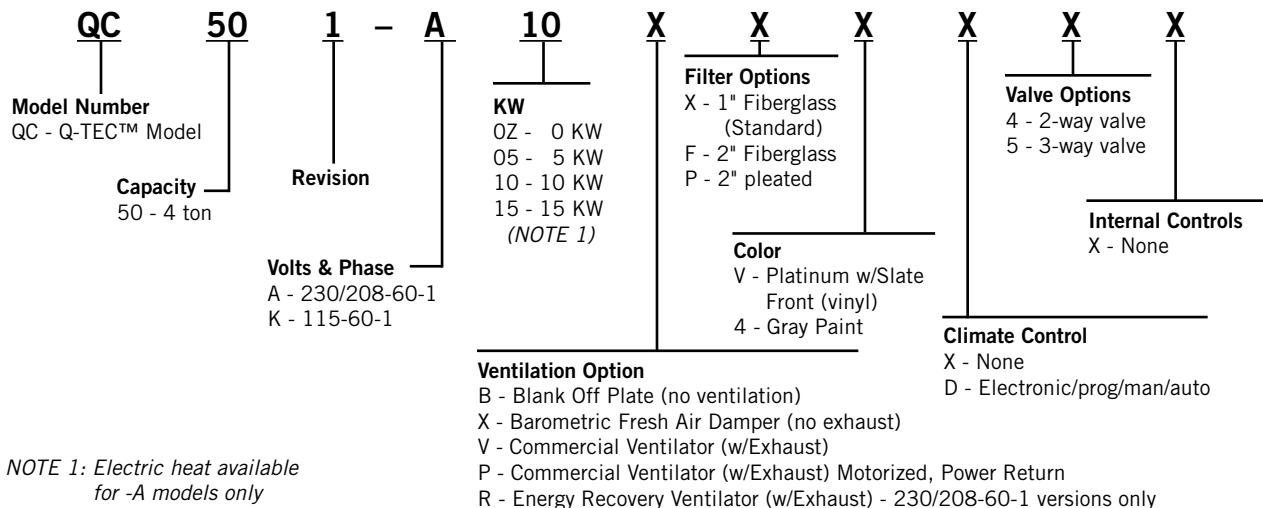


TABLE 1
Factory Built-in Electric Heat Table

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

Models	SINGLE CIRCUIT						DUAL CIRCUIT							
	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 -A05 -A10 -A15	230/208-1	1	7	15	14	14	-	-	-	-	-	-	-	-
1		33	35	8	10	-	-	-	-	-	-	-	-	
1		58	60	6	10	-	-	-	-	-	-	-	-	
1 or 2		83	90	4	8	50	33	50	40	8	8	10	10	
QC501-K0Z	115-1	1	10	15	14	14	-	-	-	-	-	-	-	-

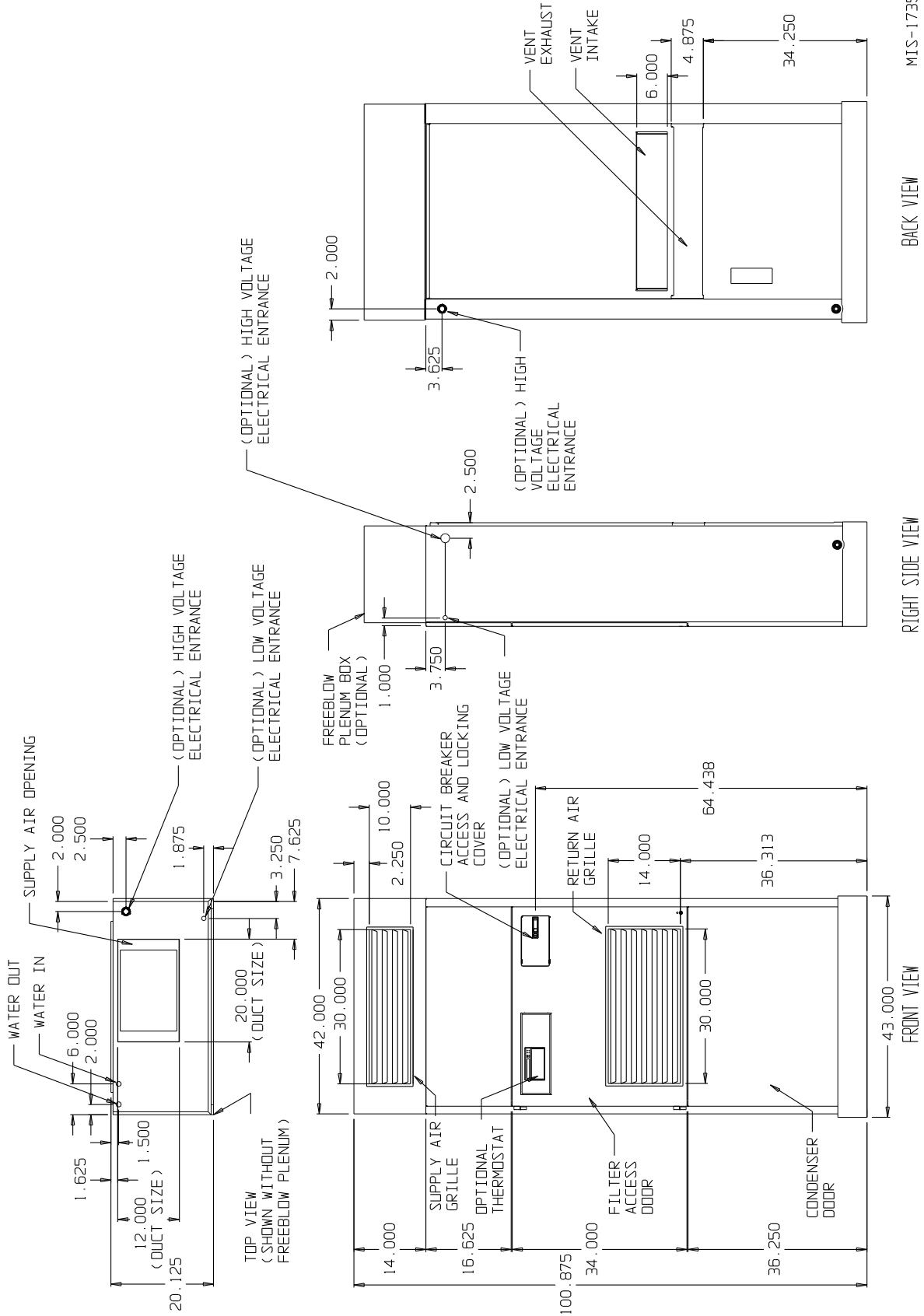
① Maximum size of the time delay fuse or HACR type circuit breaker for protection of field wiring conductors.
 ② Based on 75°C copper wire. All wiring must conform to the National Electrical Code and all local codes.
 ③ These "Minimum Circuit Ampacity" values are to be used for sizing the field power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

GPM	EWT	CFM	BTUH Capacity (1000)			BTUH Capacity (1000)			Water Coil Pressure Drop	
			Stage 1			Stage 1 and 2			PSIG	Ft. Hd.
			Total	Sensible	Latent	Total	Sensible	Latent		
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 A on Figure 2). 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 B on Figure 2). The unit can be tipped forward and slid down the edge of the skid until the front wheels touch the ground (see C on Figure 2). The wheels will not roll as they are shipped from the factory locked. 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. Ensure 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 cannot 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 be 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 as shown in Figure 3 on page 8. 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

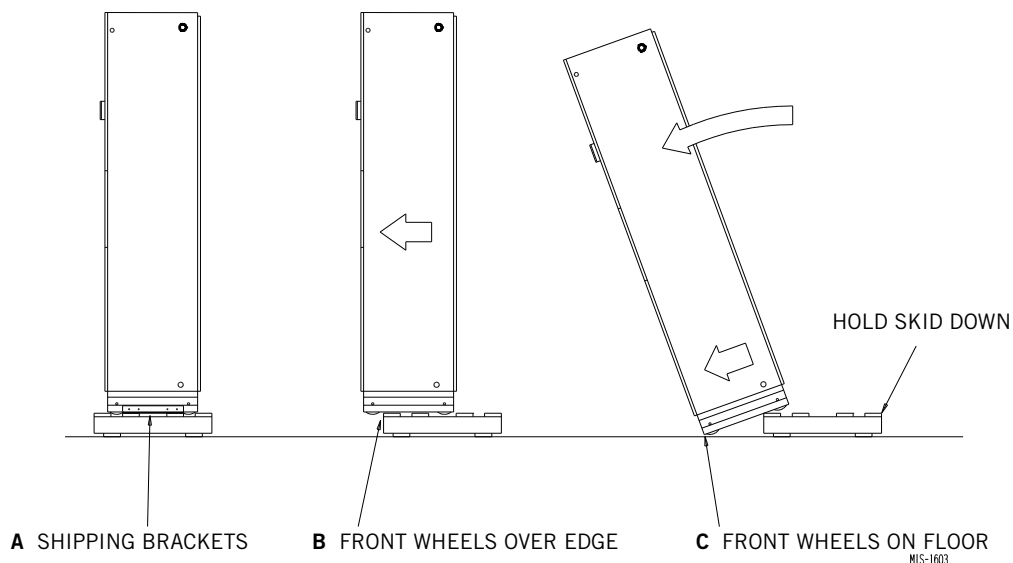
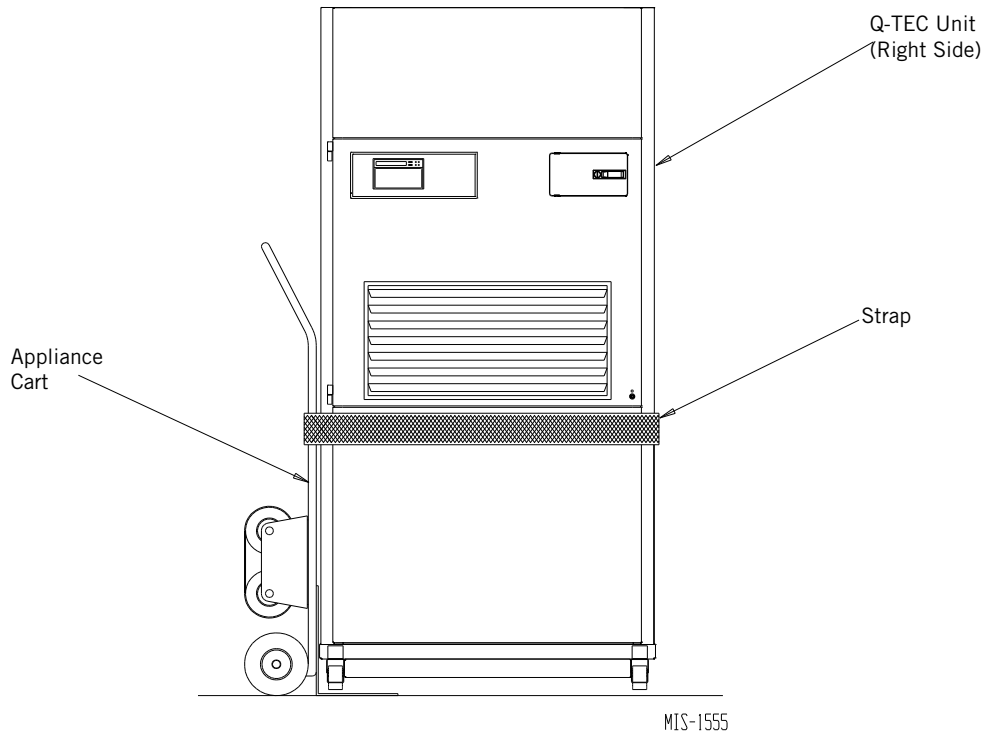


FIGURE 3
Proper Handling of Unit after Removal from Skid



Removal of Wall Bracket from Shipping Location

Units without Vent Options

The wall brackets are attached to the back of the unit, as shown in the BACK VIEW in Figure 5 on page 10. Remove and retain the wall brackets for use when attaching the unit to the wall.

Units with Vent Options

Units equipped with a vent option require a wall sleeve. Remove and retain the unit to sleeve brackets for use when attaching the unit to the sleeve. The brackets are attached to the shipping crate, as shown in FRONT VIEW in Figure 5 on page 10.

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.

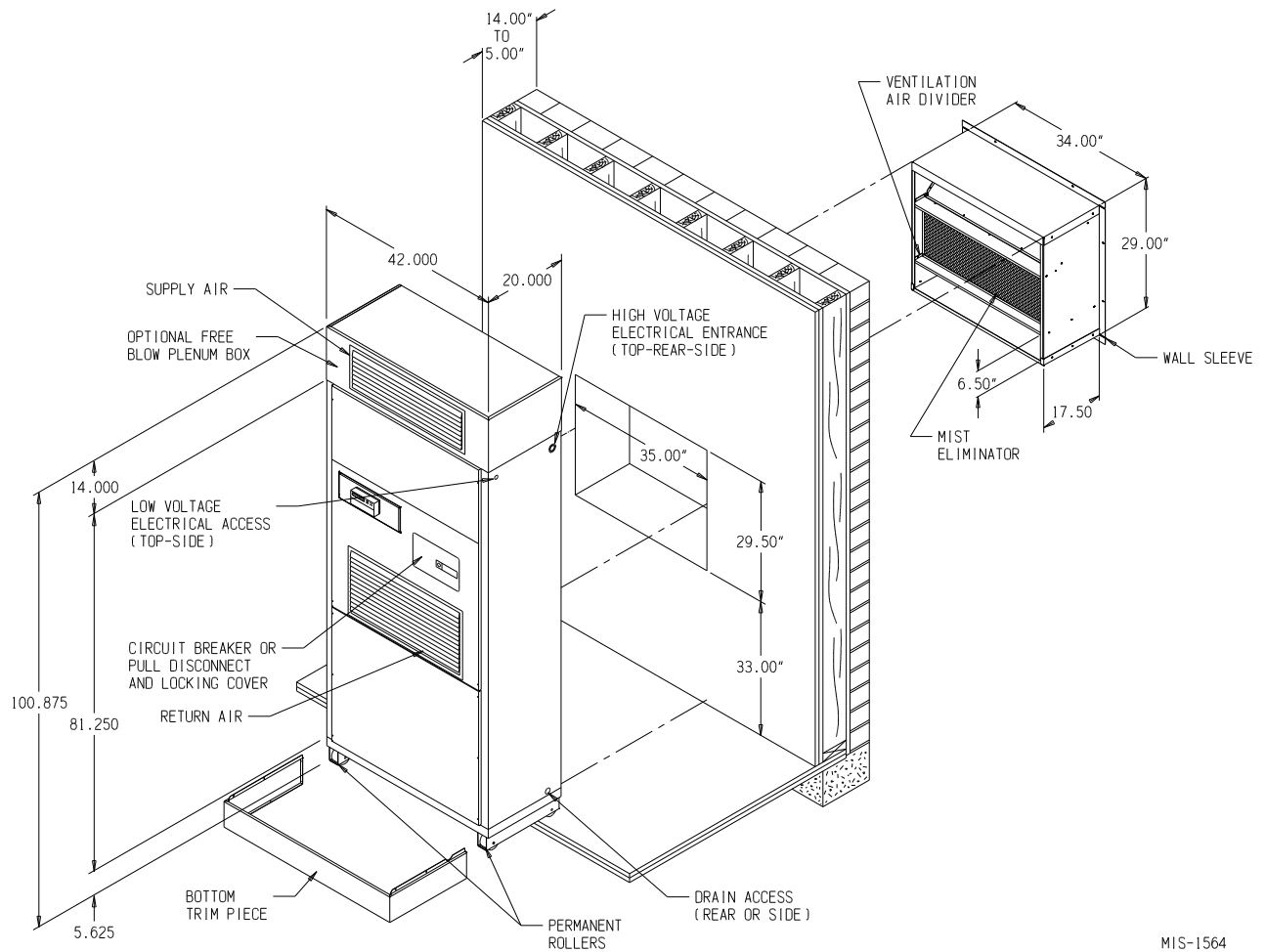
These instructions explain the recommended method to install the water source self-contained unit and the electrical wiring connections to the unit.

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.

FIGURE 4
Installation of Unit through Wall with Wall Sleeve



MIS-1564

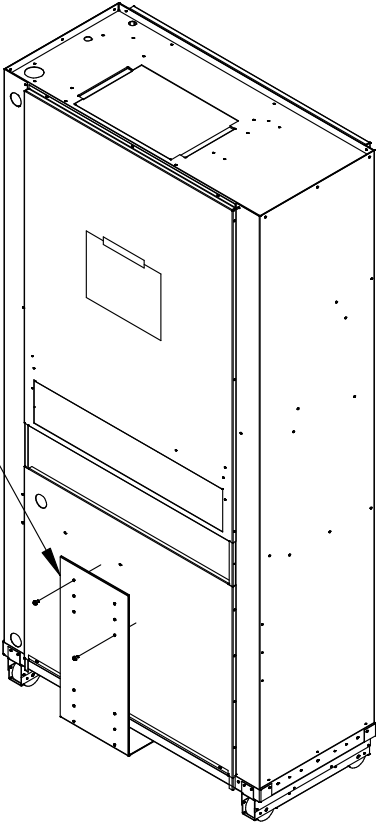
Minimum Installation Height

The minimum installation height of the unit with a free blow plenum is 8' 6". This provides enough clearance for the plenum to be removed (see Figure 7 on page 12).

The minimum installation height for ducted applications is 8' 4½". This provides enough clearance to install the duct work (see Figure 8 on page 12).

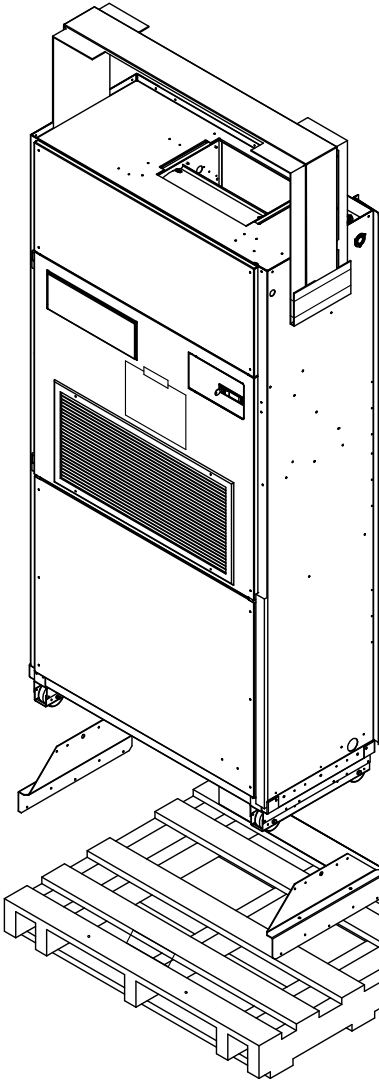
FIGURE 5
Shipping Assembly – Bracket Locations

BACK VIEW



Q-SERIES WALL BRACKETS(2)
 PART #112-289 ATTACHED
 TO BACK OF UNIT
 NOTE: FOR USE WITH
 BLANK-OFF PLATE OPTION ONLY

Q-SERIES SLEEVE MOUNTING BRACKETS (2).
 ATTACHED TO SHIPPING PALLET.
SMALL CABINET
 PART #112-289 (2 PLACES)
LARGE CABINET
 PART #113-387 (2 PLACES)
 NOTE: NOT A PICTORIAL REPRESENTATION
 OF THE ACTUAL SIZES

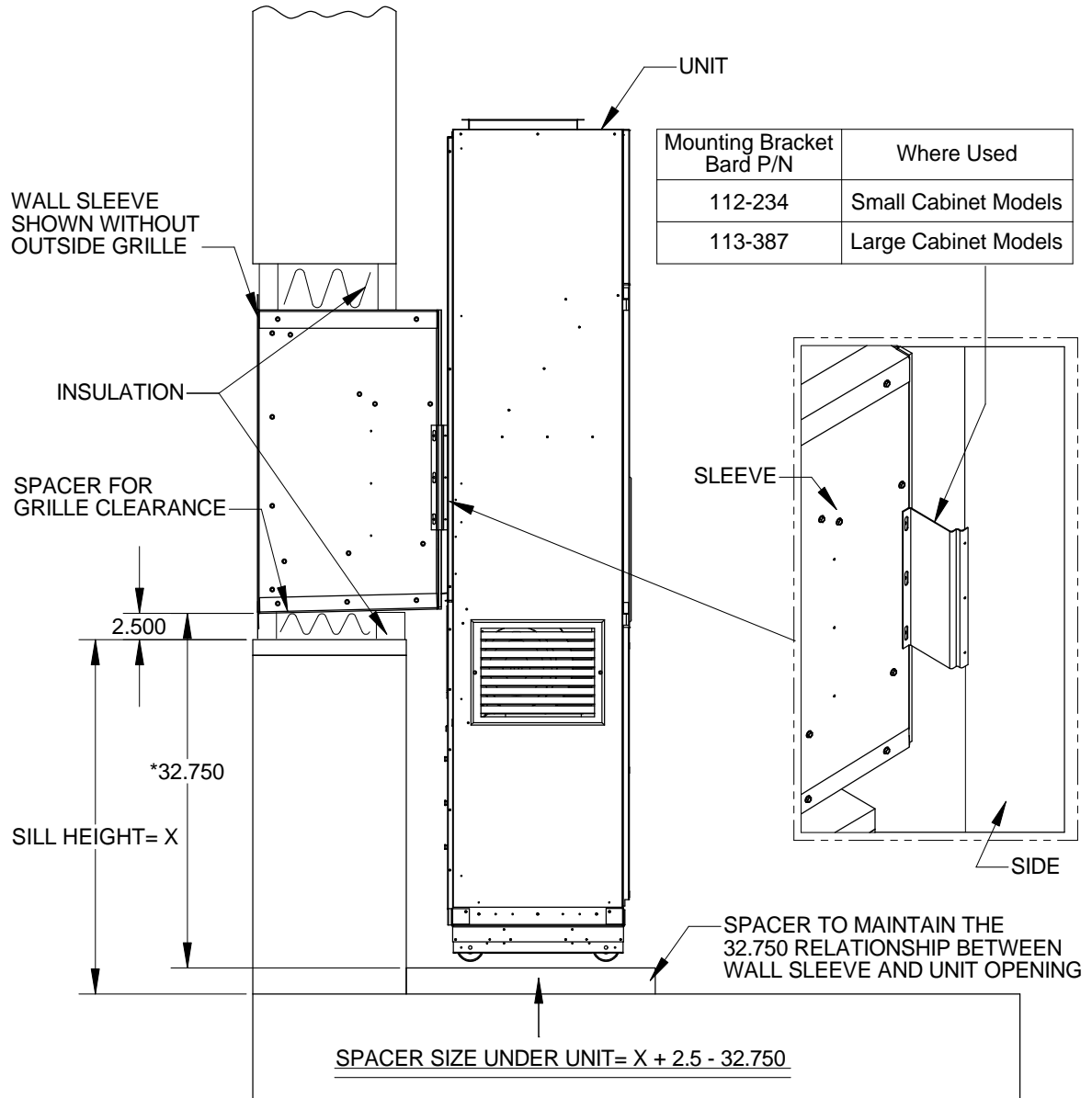


SIDE TRIM
 PART #134-178-7

FRONT VIEW

MIS-4162

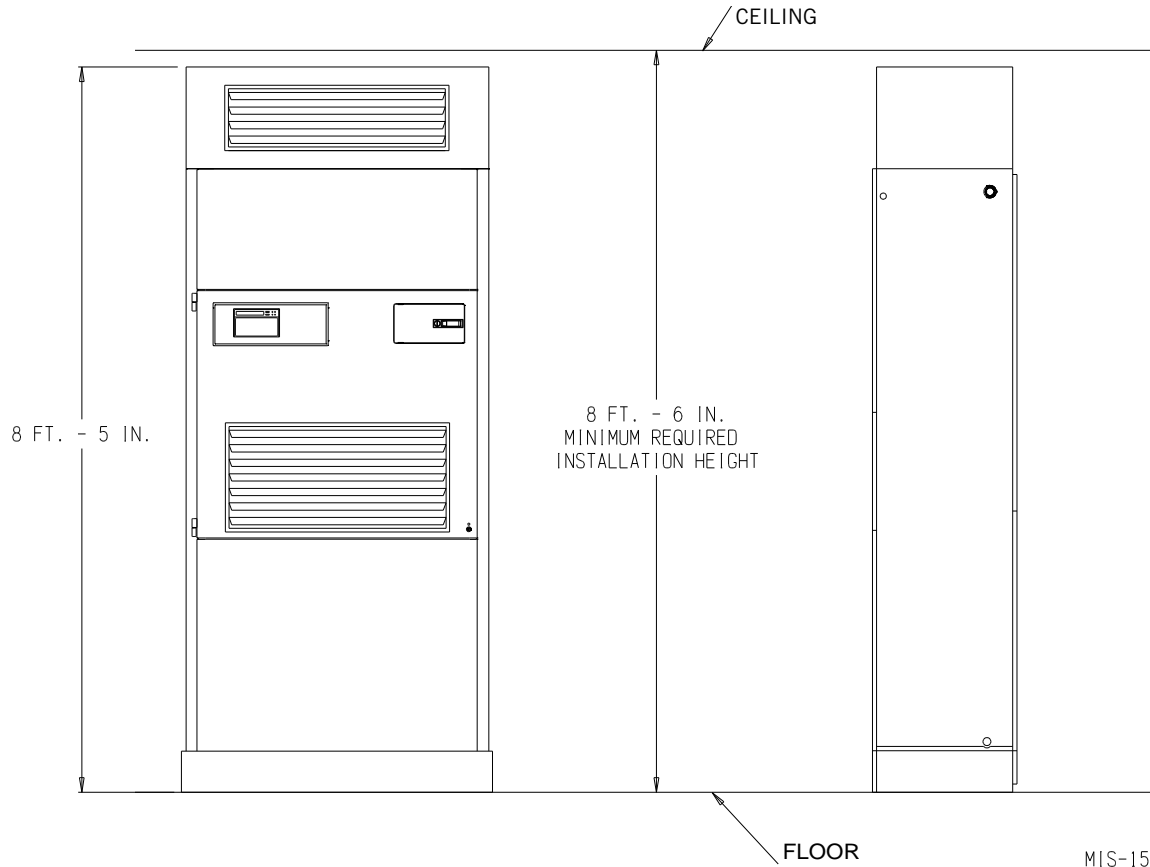
FIGURE 6
Installation of QC Wall Sleeve Through a Window Opening



*THIS DIMENSION MUST REMAIN CONSTANT
 WHEN FABRICATING UNIT AND WALL SLEEVE
 REGARDLESS OF THE WINDOW SILL DIMENSIONS

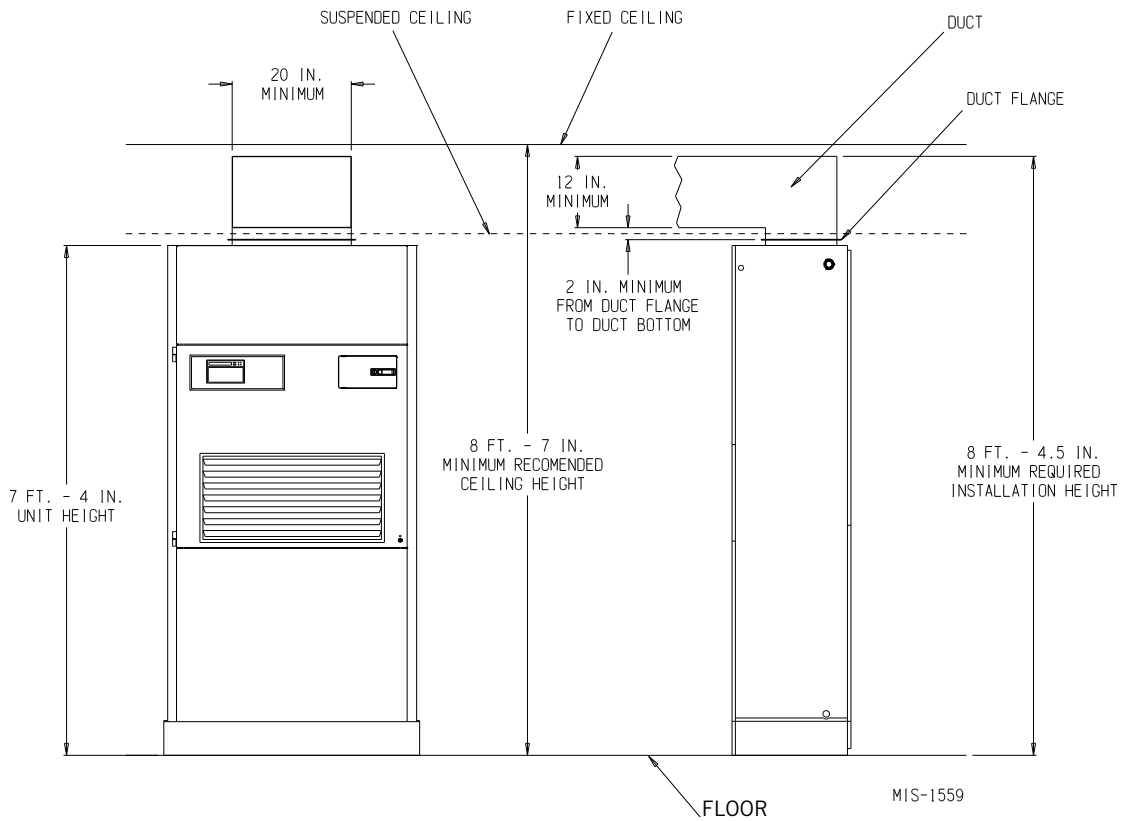
MIS-1614 A

FIGURE 7
Installation with Free Blow Plenum



MIS-1558

FIGURE 8
Ducted Application



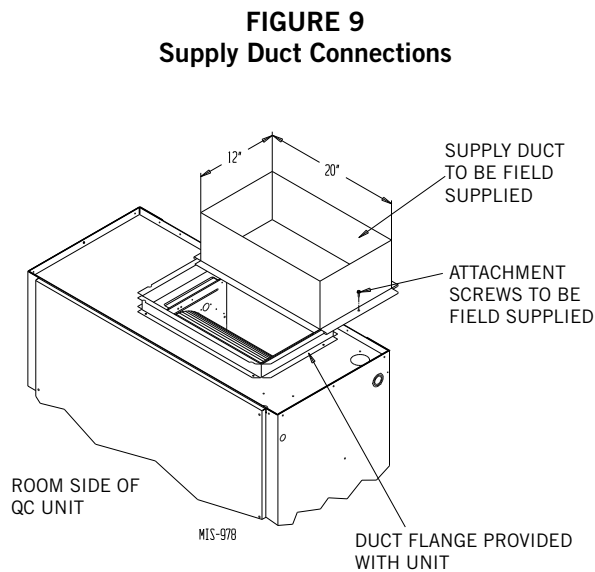
MIS-1559

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 1" 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 Q-TEC series unit has provision to attach a supply air duct to the top of the unit. Duct connection size is 12" x 20". 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 9 for suggested attachment method.

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



The Q-TEC 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.

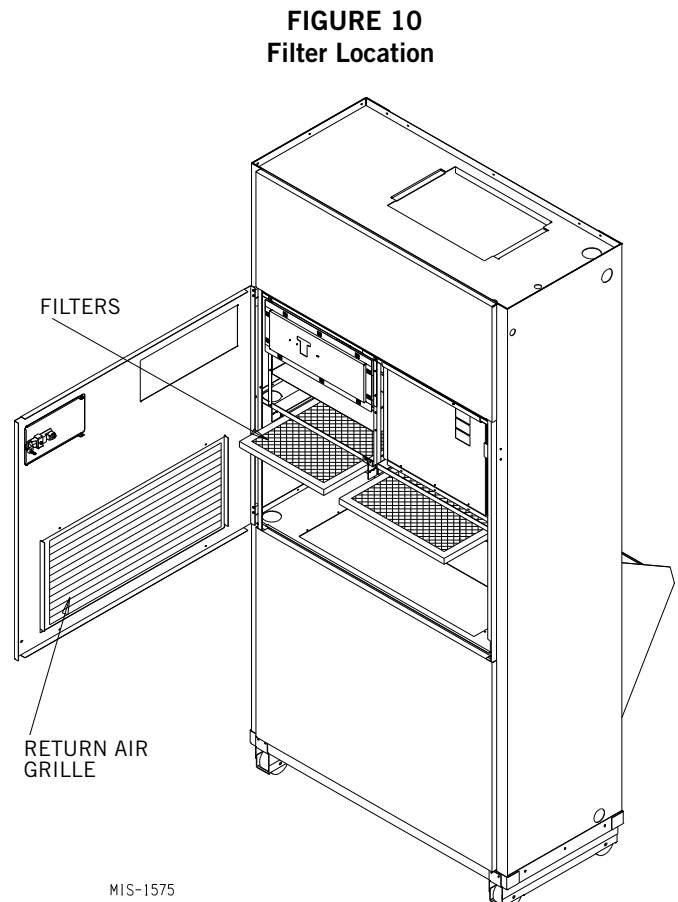
When used with a ducted supply, a QCX cabinet extension can be used to conceal the duct work above the unit to the ceiling. This extends 20" above the unit for a total height above the floor of 10'-7/8". See specifications sheet for the correct cabinet extension model number. The unit is equipped with 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 6 on page 25. 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" 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" filters. The tabs for the 1" filters must be bent down to allow the 2" filters to slide in place.



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" 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 11A, 11B and 11C.

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 11A). 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 11A
Side Drain (Side View)

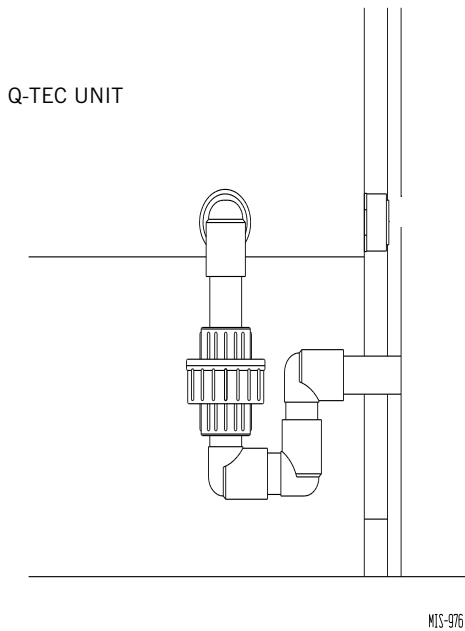


FIGURE 11B
Optional Rear Drain

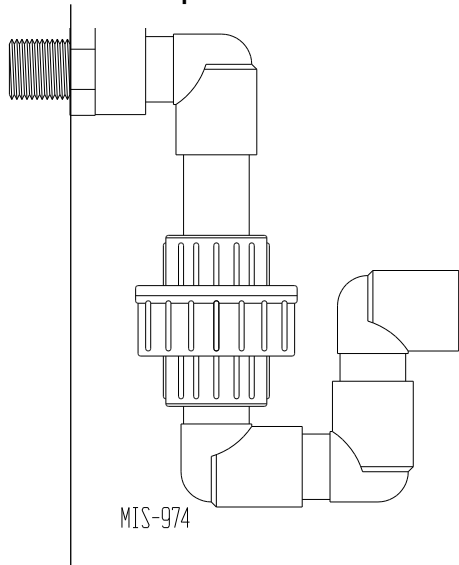
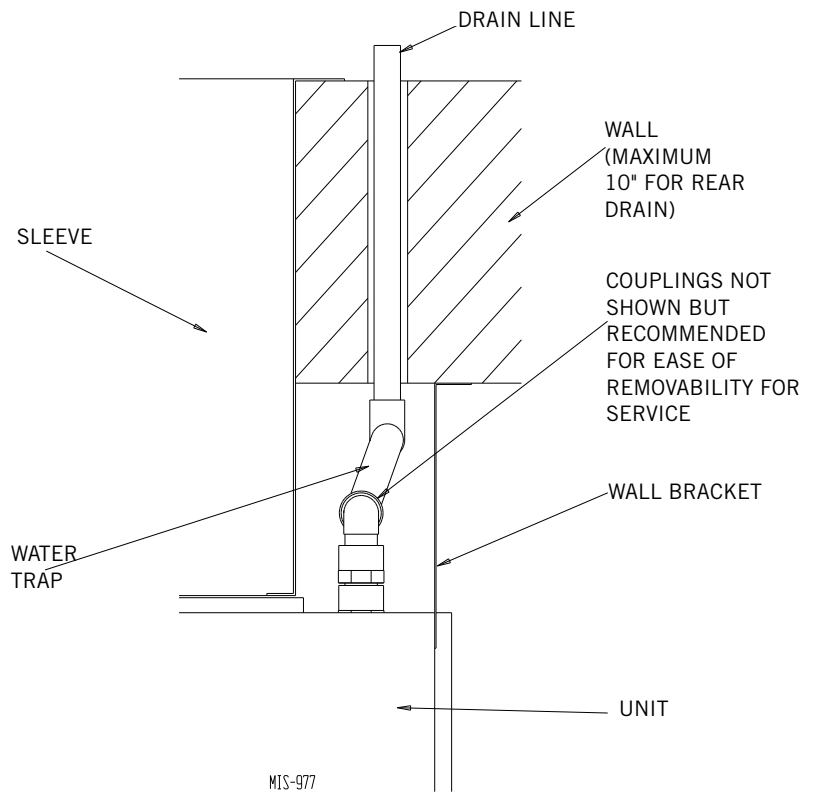


FIGURE 11C
Rear Drain (Top View)



The **rear drain** can be used where there is a distance of 4 1/2" available between the unit and wall to install a trap (see Figure 11B). 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 11C). **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 below.

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 re-installed.

Barometric Fresh Air Damper (Optional)

Before starting the removal 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 12 on page 16.

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.

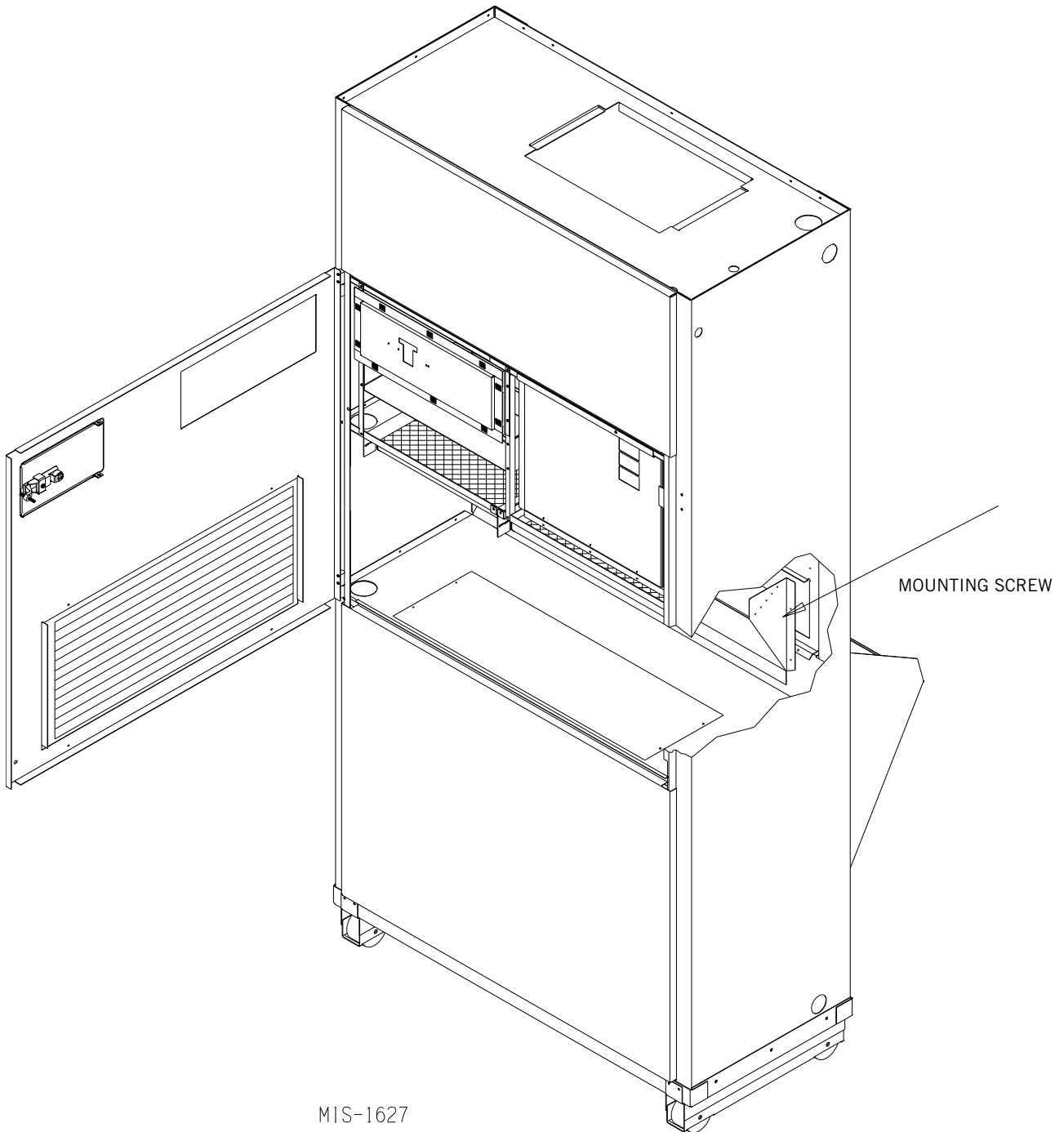
Commercial Room Ventilator Option

Before starting 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 12
Fresh Air Damper Removal



Q-TEC 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 13.

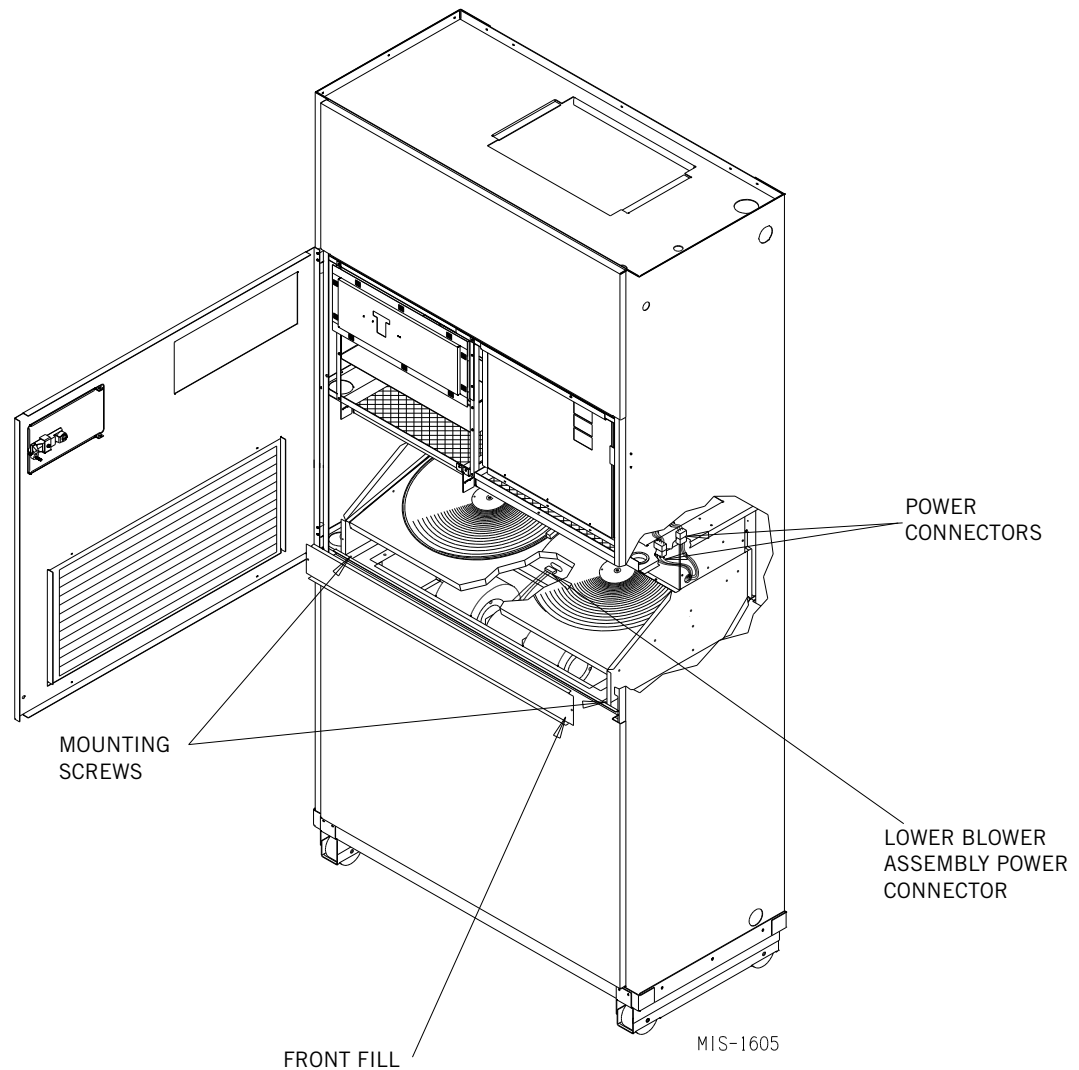
1. The front fill plate of the QERV must be removed. There is one screw on either side of the plate. Remove these screws and remove the plate.
2. On either side of the QERV there are mounting screws that hold the QERV in place. Remove both of these screws.
3. Underneath the heat recovery cassette there 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 13
Removal of the Q-TEC Energy Recovery Ventilator



INSTALLATION

Mounting the Unit

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

When installing a QC unit near an interior wall on the right side, a minimum of 12" 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 when there is not a vent sleeve used with the wall mounting brackets provided. (NOTE: See Figure 5 on page 10 for wall and sleeve bracket locations on shipping crate and for a pictorial representation of brackets.) The unit itself, the supply duct and the free blow plenum are suitable for "0" clearance to combustible material.

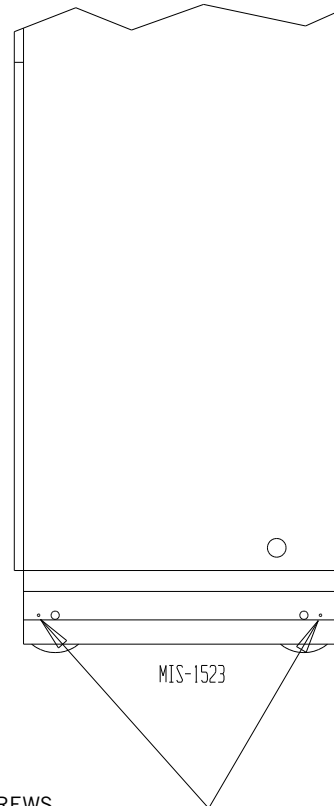
NOTE: When a wall sleeve is to be used, attach the unit to the sleeve with bracket supplied with the wall sleeve. See Figure 5 for wall sleeve bracket.

Following are the steps for mounting the QC units; for reference see Figure 15.

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 on page 6 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 14.
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 14
Removing Locking Screws from Wheels



REMOVE SCREWS
FROM WHEELS BEFORE
ROLLING INTO PLACE

FIGURE 15
Unit Mounting without Ventilation Wall Sleeve

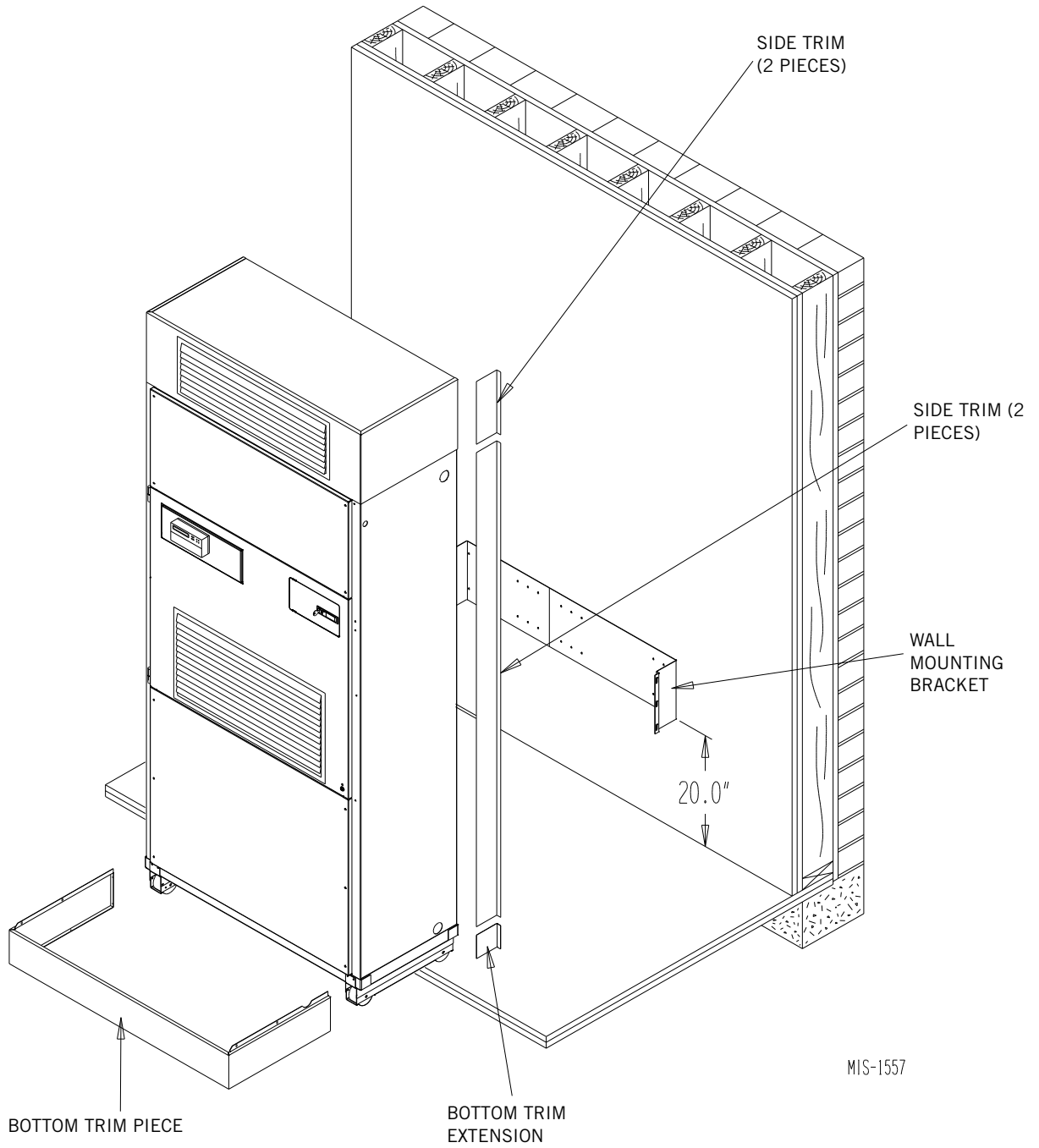
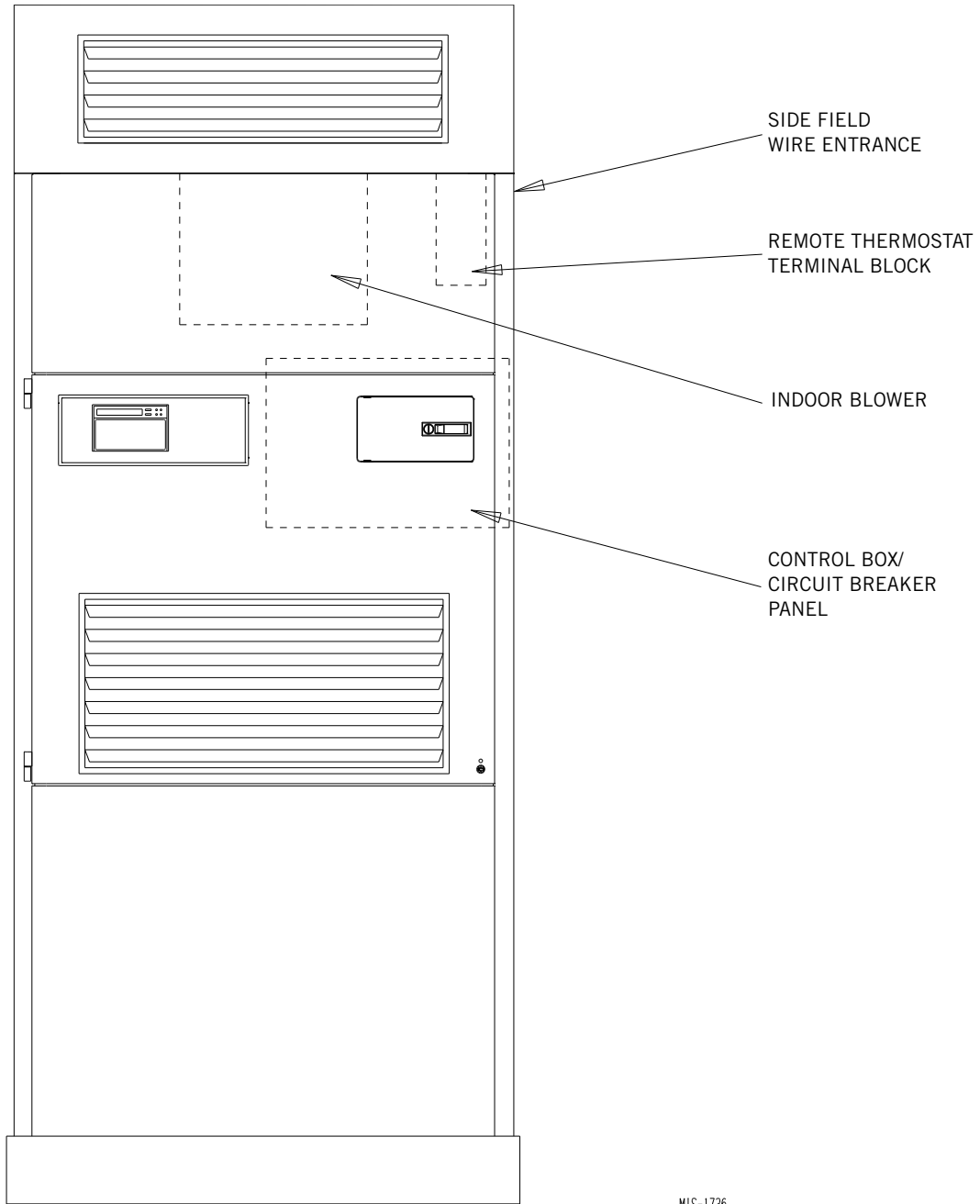


FIGURE 16
Component Location



MIS-1736

Wiring – Main Power

Refer to the unit rating plate and/or Table 2 on page 4 for wire sizing information and maximum fuse or 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 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

All 230/208V 1 phase and 3 phase equipment have 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 4.

TABLE 4
Operating Voltage Range

TAP	RANGE
240V	253 - 216
208V	220 - 18

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 18 on page 23 for wiring diagram. Compatible thermostat is listed in Table 5.

TABLE 5
Wall Thermostat

Thermostat	Predominant Features
8403-060 (1120-445)	3 stage Cool; 3 stage Heat Programmable/Non-Programmable Electronic HP or Conventional Auto or Manual changeover

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 on page 6 for location of fluid connection. Connection size is 1" FPT.

If the free blow plenum box is to be used, there are knockouts 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.

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.

“Y1” terminal or pin 7 of P2 is the *first stage cooling input*.

“W1” 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*.

“Y2” terminal or pin 12 of P2 is the *second stage cooling input*.

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

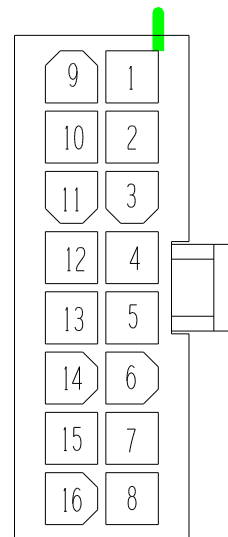
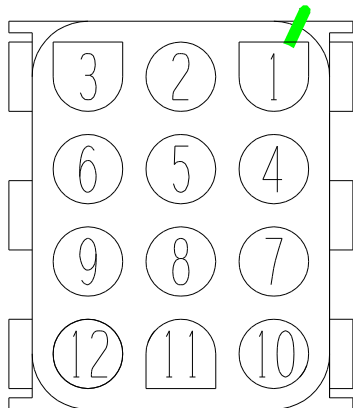
“3” terminal of pin 5 of P2 is the *ventilation input*. This terminal energizes any factory installed ventilation option.

Low Voltage Connections for DDC Control	
Fan Only	Energize G
1st Cooling Mode	Energize Y1, G
2nd Cooling Mode	Energize Y1, Y2, G
1st Stage Heating	Energize G, W1
2nd Stage Heating	Energize G, W1, W2
Ventilation	Energize G, 3

FIGURE 17
Blower Motor Low Voltage Wire Harness Plug

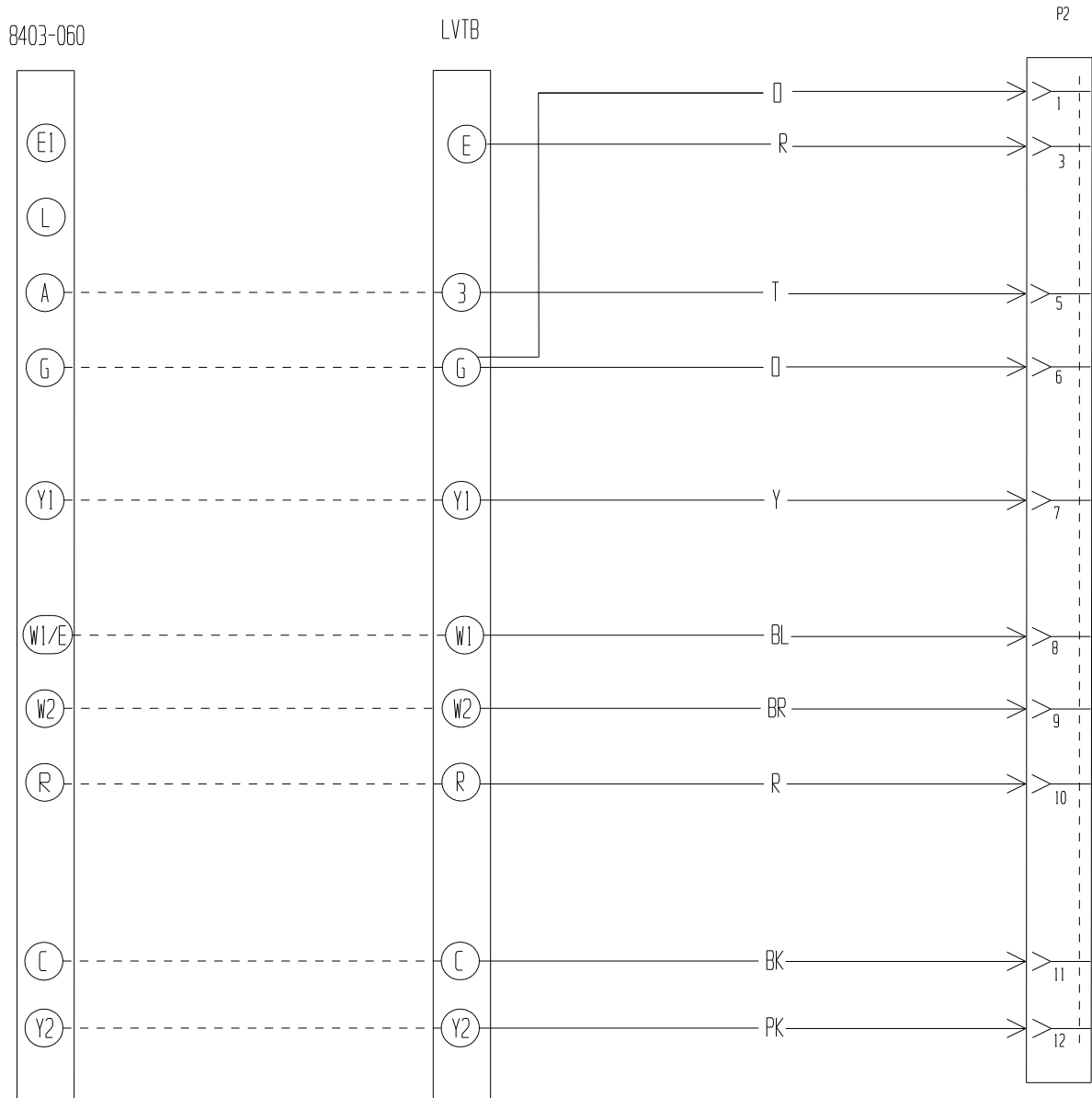
THERMOSTAT PLUG
 TERMINALS
 P2 AND P4
 (VIEWED FROM PIN END)

BLOWER MOTOR
 LOW VOLTAGE PLUG
 (VIEWED FROM PIN END)



MIS-1285

FIGURE 18
Remote Thermostat Wiring Diagram
"X" Option



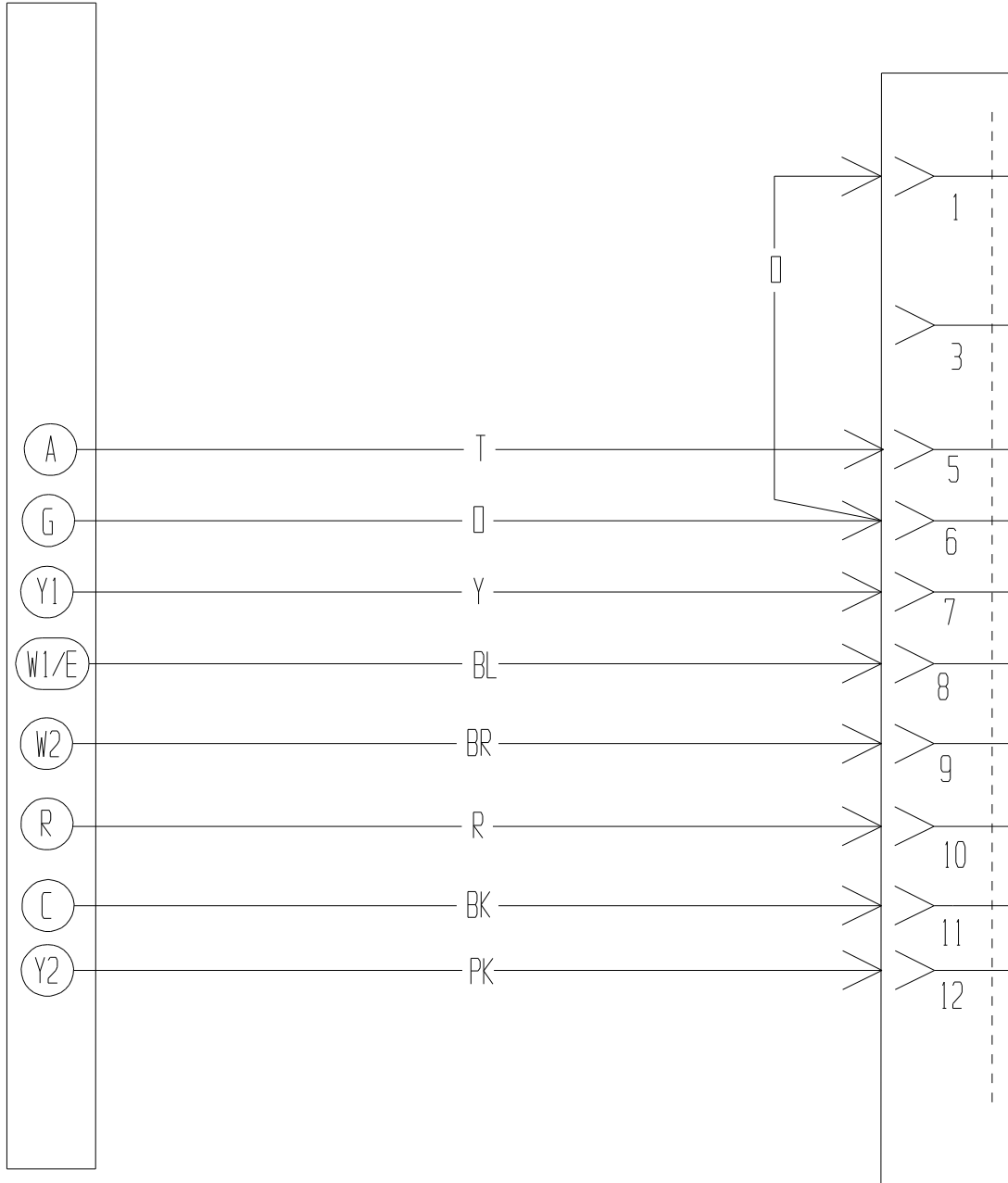
MIS-1734 C

FIGURE 19
Remote Thermostat Wiring Diagram
"D" Thermostat Option

8403-060

4102-049

P2



Optional CFM

These units are shipped from the factory set to operate at the optional CFM level shown in Table 6. 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 terminals 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 and to not close off supply air registers needlessly. 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-Y1 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 blown 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 6
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 (" 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 "Y1".
- 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 INDOOR 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 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

• Air noise

- Determine if it's air noise, cabinet, duct or motor noise; interview customer, if necessary
- 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

Symptom

• Noisy blower or cabinet

Cause/Procedure

- 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
- Evidence of moisture present inside air mover

• Replace motor and **Perform Moisture Check**

• **Perform Moisture Check**

Do

- Check out motor, controls, wiring and connections thoroughly before replacing motor
- Orient connectors down so water can't get in
- Install "drip loops"
- Use authorized motor and model #'s for 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

Don't

- Automatically assume the motor is bad.
- Locate connectors above 7 and 4 o'clock positions
- Replace one motor or control model # with another (unless an authorized replacement)
- Use high pressure drop filters some have 1/2" H2O drop!
- Use restricted returns
- Oversize system, then compensate with low airflow
- 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 unit 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 not necessary to remove the motor from the blower assembly, nor the blower assembly from the unit. Unplug the two cable connectors to the motor control assembly. There are latches on each connector. **DO NOT PULL ON THE WIRES.** The plugs remove easily when properly released.

4. Locate the screws that retain to the motor control bracket to the sheet metal of the unit and remove them. Remove two (2) nuts that retain the control to the bracket and then remove two (2) nuts that retain sheet metal motor control end plate. Refer to Figure 20.

5. Disconnect the three (3) wires interior of the motor control by using your thumb and forefinger squeezing the latch tab and the opposite side of the connector plug, gently pulling the connector. **DO NOT PULL ON THE WIRES, GRIP THE PLUG ONLY.** Refer to Figure 20.

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 21. (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.**

8. Reverse the steps #5, 4, 3 to reconnect the motor control to the motor wires, securing the motor control cover plate, mounting the control to the bracket, and mounting the motor control bracket back into the unit. **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. DO NOT OVERTIGHTEN THE BOLTS.**

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

10. 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.**

11. Final installation check. Make sure the motor is installed as follows:

- Motor connectors should be oriented between the 4 o'clock and 8 o'clock positions when the control is positioned in its final location and orientation.
- Add a drip loop to the cables so that water cannot enter the motor by draining down the cables. Refer to Figure 22.

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.

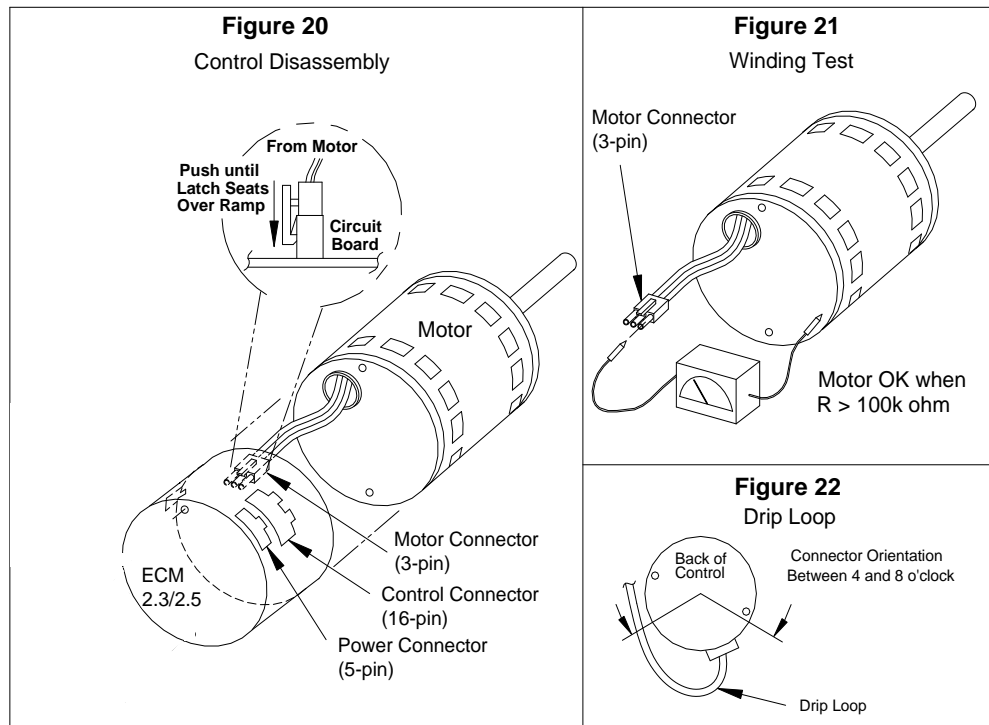
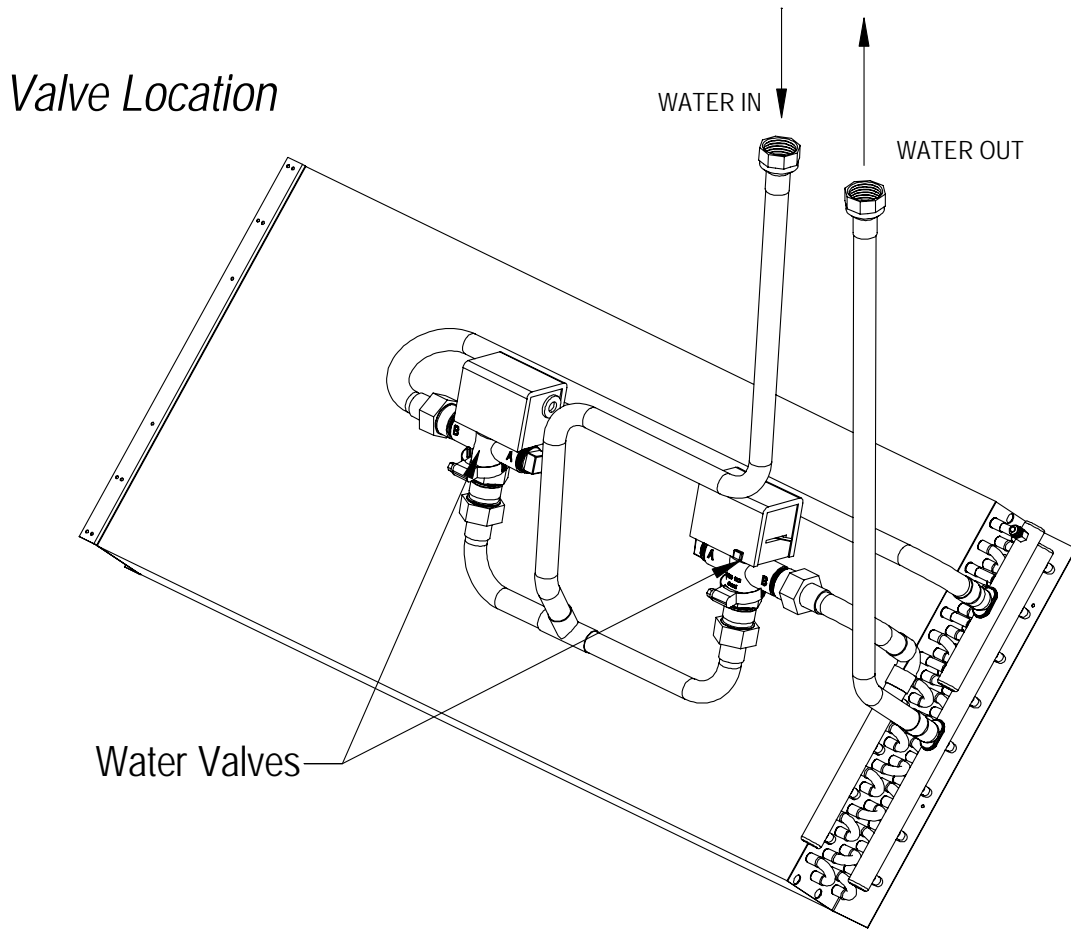
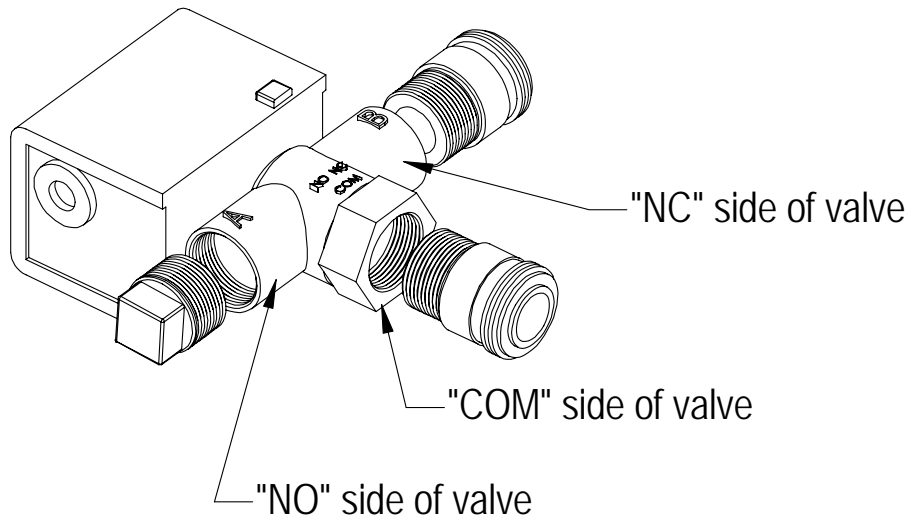


FIGURE 23
Internal 2-Way Valve Piping

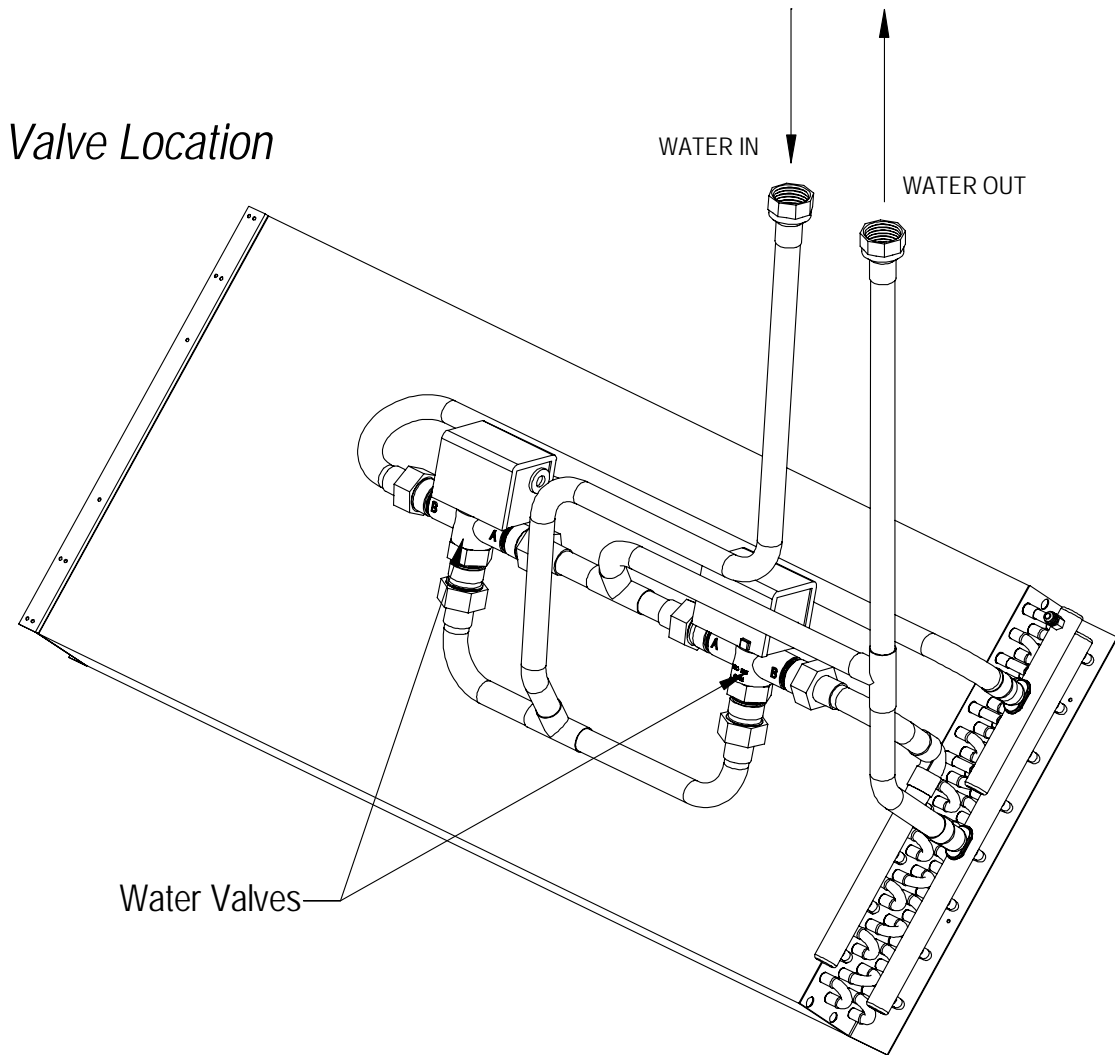


Valve Detail

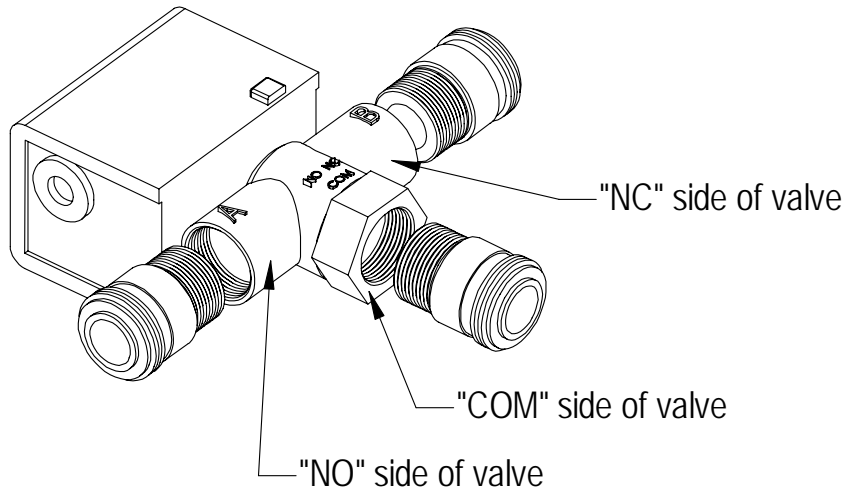


MIS-1899 A

FIGURE 24
Internal 3-Way Valve Piping



Valve Detail



MIS-1900 A